

Annotated Bibliography of  
Economic and Biological Research  
Related to the Fishery Resources  
of the United States

Compiled By  
John M. Ward  
Division of Statistics and Economics  
Office of Science and Technology  
National Marine Fisheries Service

June 10, 1997

## Preface

This annotated bibliography was initially developed from literature related to the economics and biology of the Gulf of Mexico and south Atlantic shrimp fisheries. In the process of assembling this information, it became apparent that much of the research done for other fisheries and in other fields of economics had relevance to the economic and biological problems in the shrimp fishery. For example, an analysis to address the policy implications of bycatch discards in the Gulf of Mexico shrimp fishery would draw on research done by fishery biologists, descriptions and analyses of the problem in other fisheries around the world, and the economic analysis of air and water pollution. As a result, the bibliography became much more extensive than originally planned. While not meant to be a comprehensive listing of all fisheries related economic and biological research, hopefully, it will serve as a useful reference for researchers attempting to analyze proposed fishery management regulations.

The abstracts, where possible, were taken directly from the cited articles and books. An index of author names by subject has been included in this annotated bibliography that will be updated as new information becomes available. Individuals interested in having specific references included in future editions may do so by sending a copy of the article or text to the Southeast Regional Office in care of the editor. This information is also available on diskette for IBM compatible personal computers.

I would like to extend my appreciation to the people who assisted in this project. I would like to acknowledge Richard Raulerson, Assistant Regional Director for Economics and Trade Analysis, Southeast Regional Office, National Marine Fisheries Service for his support of this project and whose idea it was to assemble and publish the information. Dr. John Vondruska provided the information on shrimp processing and situation and outlook reports for shrimp. The staff at the NOAA library in Silver Spring, Maryland tracked down most of the literature cited in the bibliography. Lastly, I appreciate the help of the authors who provided copies of contract reports, staff reports, and other "gray" literature that I could not find elsewhere.

## Table of Contents

Page

## Annotated Bibliography

Abbas, L. (1977). To Eel or Not to Eel: An Economic Analysis of a Part-Time Eel Fishing Enterprise. Sea Grant Publication UNC-SG-77-02, Center for Urban Affairs and Community Services, Information Report No. 1, N.C. State University, Raleigh, North Carolina, February, 8 pp.

This analysis is intended to provide basic information on the fishery and to serve as a framework useful in deciding whether to enter the eel fishery.

Abdullah, Nik Mustapha R., Jabatan Ekonomi Sumber Asli, Fakulti Ekonomi dan Pengurusan (1995). Towards an Integrated Fisheries Information System in Malaysia. Marine Resource Economics, 10(3):312-320.

The authors propose a fisheries information data system to improve fishery management decisions in Malaysia. A description of the existing fishery information data base is critiqued and recommendations for improving it are provided.

Able, Kenneth W. and Susan C. Kaiser (1994). Synthesis of Summer Flounder Habitat Parameters. Decision Analysis Series No. 1, NOAA Coastal Ocean Program, Coastal Ocean Office, National Oceanic and Atmospheric Administration, 1315 East West Highway (NCOP), Silver Spring, MD, May.

This document first presents an overview of the economic importance and current status of summer flounder. It then summarizes our present state of knowledge of summer flounder distribution, life history patterns and stock identification. This is followed by a synopsis of habitat requirements during each life history stage. For convenience, this is presented by general habitat as offshore eggs, offshore larvae, estuarine larvae, estuarine juveniles, offshore juveniles, and estuarine and offshore adults. In several instances, previously undigested data sets are analyzed to provide more detailed information, especially for estuarine juveniles. The information is then discussed in terms of its relevance to resource managers.

Abrams, Burton A. (1985). The Expansion of Fishery Jurisdiction: Fishery Interests and Congressional Voting. Marine Resource Economics, 2(2):143-152.

The Magnuson Fishery Conservation and Management Act of 1976 greatly broadened the scope of U.S. fishery regulation. While the act contained a variety of features, its primary and certainly most controversial provision expanded the regulated fishing zone from 12 to 200 miles. This paper identifies the primary gainers and losers from the act and assesses their roles in influencing the legislative outcome. The voting behavior of congressional representatives is analyzed by multi variate probit analysis to quantify the influences of the major lobbying groups.

Abramson, Norman J. and Patrick K. Tomlinson (1972). "An Application of Yield Models to a California Ocean Shrimp Population." Fishery Bulletin, 70(3):1021-1041.

Two types of yield models were utilized to analyze fishery data from California's northern most bed of ocean shrimp, Pandalus jordani. The Schaefer form of the stock production model was applied to catch and effort data for the years 1954 through 1969. Age-structured catch data for 1955 through 1968 were analyzed by the Murphy method to obtain mortality rates and biomass estimates. Catchability coefficients and a growth curve were also

estimated. Attempts to fit spawner-recruit models to estimates obtained from the age-structured catch data were inconclusive; so, age specific mortality and growth estimates were only used to fit a yield-per-recruit model. After comparing the results from the two models, the Schaefer model was deemed most suitable for managing this fishery. The model estimated the maximum sustainable yield at 2.46 million pounds. A strategy for managing the fishery under a quota system was proposed.

Acheson, James M. (1984). "Government Regulation and Exploitive Capacity: The Case of the New England Groundfishery." Human Organization, 43(4):319-329.

The U.S. Fisheries Conservation and Management Act was designed to control the exploitation of commercial marine species. However, during the first two years after this act went into effect in New England in 1977, the overall economic and regulatory environment sent fishermen a mixed set of signals. Some factors, including aspects of regulation, stimulated expansion of the groundfishing fleet; others had the opposite effect.

Two surveys indicated fishermen were unhappy with the regulations and believed federal regulation would drive them out of business and lead to the demise of the industry. However, a study of the fleet uncovered the fact that fishermen were purchasing bigger, more versatile boats equipped with more sophisticated electronic gear. In addition, the number of ground fishing boats increased dramatically. Regulations were only one of a number of factors influencing the decisions of fishermen. The age of the fleet, increased catches and prices for fish, the increase in competition due to the quota regulations themselves, and the economic difficulties in other fisheries all played a role. The fact that regulation helped to produce a fleet with more capacity to exploit fish stocks raises some key questions about ways to generate effective, equitable resource management policies.

Adams, Charles M. (1984). "Price Dynamics in the U.S. Shrimp Market." Ph.D. dissertation, Department of Food and Resource Economics, University of Florida, Gainesville, FL.

Understanding the mechanism of price determination in a dynamic setting is imperative to formulating effective policy and assessing price impacts at each market level. This study examines the monthly and quarterly price determination process for raw-headless shrimp of the 31-40 and 21-25 size classes. Price response between market levels for both size classes was found to be symmetric. However, policy measures that alter the quantity or size distribution of shrimp through import quotas, tariffs, or seasonal restrictions, will have a greater price impact on the smaller shrimp. Increased supplies of maricultural shrimp will have a greater relative price impact on the 31-40 size class.

Adams, Charles M. (1985). "Selected Economics Research Needs of the Gulf and South Atlantic Shrimp Industry -- A Workshop." Summary of a workshop held September 12-13, 1985, Madeira Beach, Florida. Technical Paper No. 42, Project No. SGEP-8, Grant No. NA85AA-D-SG059, November, 55 pp.

The workshop report focuses on (1) the impact of the development of foreign shrimp mariculture on the various sectors (production, processing, wholesaling, etc.) of the domestic shrimp industry, (2) the impact of future development of seafood based analog products and surimi on the domestic shrimp industry, and (3) the status of and problems associated with the development and improvement of econometric and bioeconomic modeling efforts concerning the domestic shrimp industry.

Adams, Charles M. (1987). "Yellowfin Tuna: Trends in Production and Value." Staff Paper 308, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida, May, 20 pp.

The purpose of this paper is to briefly describe the trends in production, prices, and value of yellowfin tuna in the Gulf and south Atlantic region, virtually all of which is destined for the fresh market. Yellowfin production activities in the Gulf and south Atlantic region will be addressed with respect to world and total U.S. yellowfin landings. In addition, recent trends in fresh/frozen yellowfin tuna imports will be examined.

Adams, Charles M. (1993). "A Preliminary Assessment of Ex-vessel Price Movements in the South Atlantic Rock Shrimp Fishery." Report to the Staff of the South Atlantic Regional Fisheries Management Council, November 23, 13 pp.

The primary objective of this study is to examine the dockside pricing structure of rock shrimp and determine if dockside prices per pound are an increasing function of size of shrimp. Secondarily, the importance of demand shifters (income and availability of substitutes) in the determination of dockside prices is determined. The benefits of a closure that allows shrimp to grow into the larger size category is questionable because of the long life of the rock shrimp (20-22 months) and the common property nature of the fishery.

Adams, Chuck (1996). An Overview of the Commercial and Recreational Fisheries Industries Within the Gulf of Mexico. The Southern Business and Economics Journal, 19(4):246-260.

This paper provides a brief descriptive overview of the commercial and recreational fishing industries in the Gulf of Mexico. The importance of each industry within the Gulf region and relative to the U.S. is addressed. Trends in landings, effort, and participation are discussed. State specific data will be provided where possible. In addition, the current management structure which is charged with establishing policy and regulating the marine fisheries resources within the state and federal waters of the Gulf of Mexico is described. Finally, current problematic issues and opportunities concerning the commercial and recreational fisheries in the Gulf region are discussed.

Adams, Charles M. and Fred J. Prochaska (1985). "Principle Economic Factors Determining U.S. Shrimp Prices at Alternative Market Levels." Draft report, Tropical and Subtropical Fisheries Tech. Conf. Proceedings.

This paper (1) reviews trends in prices, margins, and market shares for 21-25 and 31-40 count (tails per pound) raw, headless shrimp, (2) determines the direction of price flows and the nature of upward and downward price response between ex-vessel, wholesale, and retail market levels, and (3) determines the factors affecting prices for the two size classes at the three market levels.

Adams, Charles M. and Frank J. Lawlor, III (1988). "Trends in the Importation of Selected Fresh and Frozen Seafood Products into the Southeastern United States." Draft report, Department of Food and Resource Economics, University of Florida, Gainesville, FL.

This paper describes the general trends in imports for selected seafood

products arriving at Southeastern U.S. ports of entry. These trends are discussed in terms of volumes, seasonality, fresh versus frozen, product form, and country of origin. The major ports of entry are identified.

Adams, Darius M., Richard W. Haynes, George F. Dutrow, Richard L. Barber, and Joseph M. Vasievich (1982). "Private Investment in Forest Management and the Long-Term Supply of Timber." American Journal of Agricultural Economics, 62(2):232-241.

Timber supply behavior of private forest owners is a major uncertainty in long-term forest product market projections. A model of private supply is developed that explains both harvest and forest management investment decisions. Comparison of two fifty year projections, one assuming constant management intensity and a second using the harvest investment model, indicates that projected levels of investment would have little impact on markets prior to the year 2000, stabilize real wood product prices after 2000, eliminate softwood lumber imports by 2030, and expand the dominant role of southern forest regions in wood product markets.

Adams, Douglas H., Michael E. Mitchell, and Glenn R. Parsons (1994). Seasonal Occurrence of the White Shark, Carcharodon carcharias, in Waters off the Florida West Coast, with Notes on its Life History. Marine Fisheries Review, 56(4):24-28.

The white shark, Carcharodon carcharias, is considered rare in the Gulf of Mexico; however, recent longline captures coupled with historical landings information suggest that the species occurs seasonally (winter-spring) within this region. We examined a total of seven adult and juvenile white sharks (185-472 cm total length) captured in waters off the west coast of Florida. Commercial longline fisheries were monitored for white sharks during all months (1981-94), but this species was captured only from January to April. All white sharks were captured in continental shelf waters from 37 to 222 km off the west coast of Florida when sea surface temperatures ranged from 18.7° to 21.6°C. Depths at capture locations ranged from 20 to 164 m. Fishing gear typically used in Gulf of Mexico offshore fisheries may not be effective at capturing this species, and the apparent rarity of white sharks in this area may be, in part, a function of gear bias.

Adasiak, A. (1979). "Alaska's Experience with Limited Entry." J. Fish. Res. Board Can., 36:770-782.

The goals and structure of the limited entry program in Alaska were defined by the political, social, economic, and biological climates in which the program was implemented. This paper outlines how these considerations formed the program and discusses the impacts of the program and the problems involved in its implementation. Other possible modes of approaching entry limitation are discussed in relation to the possibility of limiting some currently unlimited fisheries.

Addelman, Sidney (1962). "Orthogonal Main-Effect Plans for Asymmetrical Factorial Experiments." Technometrics, 4(1):21-46.

Plans for asymmetrical factorial experiments that permit uncorrelated estimates of all main effects when the interactions are negligible are described. The construction of these plans is based upon the principle of proportional frequencies of the factor levels. The possibilities of blocking these main effect plans, the randomization procedure and the method of analysis are presented.

Addelman, Sidney (1962). "Symmetrical and Asymmetrical Fractional Factorial Plans." Technometrics, 4(1):47-58.

Procedures for constructing plans that permit uncorrelated estimation of all main effects and some specified number of two factor interaction effects are developed for symmetrical factorial arrangements. These plans can then be adjusted to yield plans with similar properties for asymmetrical factorial experiments.

Adkins, Gerald (1990). "A Comprehensive Assessment of Bycatch in the Louisiana Shrimp Fishery." Final report, MARFIN Grant No. NA89WC-H-MF006, Louisiana Department of Wildlife and Fisheries, Office of Fisheries, Post Office Box 189, Bourg, Louisiana.

This project was designed to survey nearshore, inshore and wingnet shrimp fishermen in coastal Louisiana, and assess the number, species composition, and weight of all incidentally caught organisms. The project objective was to assess the groundfish bycatch of the Louisiana shrimp fishery, including effects of gear type, season, and location. In trawls, an average fish/shrimp ratio by weight was 3.21:1, yielding an estimated total annual bycatch of 228 million pounds. The report contains a review of previously conducted bycatch trawl survey results and suggestions for reducing bycatch discarding including utilization, reduced trawl time, and limited entry.

Agardy, M. Tundi (1994). Closed Areas: A Tool to Complement Other Forms of Fisheries Management. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

The use of closed areas in fisheries, also known as harvest refugia, presents an effective way to conserve stocks and habitats threatened by over exploitation, destructive fishing, and indirect degradation caused by pollution or the trickle down effects of poor resource management in the vicinity. Such area closures may be established as a fisheries management tool, or may be a component of a wider array of spatially defined management measures such as exist in a multiple use protected area, a biosphere reserve, or a coastal management plan. Among the benefits that the designation of closed areas accrue are conservation of stocks and species, maintenance of genetic diversity, protection of spawning stock biomass, reduction in growth overfishing, simplicity in being able to explain the management measure, relative ease of enforcement, provision of a baseline to monitor condition of stocks and the productivity or health of the ecosystem, and insurance against management failure. By providing a means to target differential pressures applied to different stocks and different age groups, the closed area designation comes closest to approximating ecosystem based, comprehensive management. However, the potential high costs relating to exclusion of certain users, the mechanics of boundary delineation, scientific uncertainties relating to identification of ecologically critical areas, lost opportunity, and the spill over of potentially increasing fishing pressure outside the limits of the closed area all necessitate that managers evaluate costs and benefits carefully before using closed areas to complement other forms of fisheries management.

Agnello, Richard J. and Lawrence P. Donnelley (1976). "Externalities and Property Rights in the Fisheries." Land Economics, 52(4):518-529.

In fisheries subject to a grounds quality externality, such as the oyster industry, the establishment of exclusive user rights may actually lead



to increases in employment. An econometric analysis demonstrates that productivity from the oyster grounds is larger under a property rights system relative to a common property resource, but no empirical evidence is offered that supports the theoretical conclusion that employment will increase.

Agnello, Richard J. and Lawrence P. Donnelley (1976). "Prices and Property Rights in the Fisheries." Southern Economic Journal, 42(Oct.):5253-262.

When fish harvesting is treated as a common property resource, distortions occur in the intraseasonal production patterns of the industry in the form of relatively large intraseasonal price variation with common property when no private property alternatives exist. When both private and common property supplies are present, common property price distortions take the form of lower ex-vessel prices.

Agnello, Richard J. and Yunqi Han (1993). "Substitute Site Measures in a Varying Parameter Model with Application to Recreational Fishing." Marine Resource Economics, 8(1):65-77.

This paper employs a varying parameter travel cost model to determine the economic valuation of fishing trips and catch for a sample of Long Island anglers. Substitution measures in the model are characterized in terms of the number and the quality of proximate alternative sites. This treatment of substitution as a site rather than an individual characteristic helps to define a site's uniqueness and in addition provides a feasible means of capturing substitution effects when measures of substitution at an individual level are not available. Per trip consumer surplus and changes in consumer surplus due to catch changes are computed and distinguished by controls for the availability and quality of substitute sites. Consumer surplus and the valuation of changes in catch are found to be substantially lower when controlling for substitution effects which is in agreement with most previous studies.

Aguirre International (1996). An Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in New England and the Mid-Atlantic Regions. Contract Number 50-DGNF-5-00008, National Oceanic and Atmospheric Administration, 1315 East-West Highway, Room 14529, Silver Spring, MD.

Aguirre International was engaged to report on the social and cultural aspects of the multispecies groundfish fishery (MGF) in New England and the Mid-Atlantic by ascertaining community dependence on the MGF, providing information on the demographics of the fishing industry, identifying social science data bases that could be used in subsequent studies and developing a classification system that will aid in predicting the social impacts of the changing fishery regulations on fishery dependent communities.

Ahsan, A.E., J.L. Ball, and J.R. Davidson (1972). Costs and earnings of Tuna Vessels in Hawaii. UNIHI-SEAGRANT-AR-72-01, University of Hawaii Sea Grant Program, July, 22 pp.

The study attempts to assess the cost-earnings situation of both the aku (skipjack tuna) and ahi (other tuna) fleets. Cost-earnings data were derived primarily from personal surveys of boat owners and fishermen. It is hoped that this study will throw light on some aspects vital to the improvement of the tuna industry in Hawaii.

Aillery, Marcel P., Paul Bertels, Joseph C. Cooper, Michael R. Moore, Stephen

J. Vogel, and Marca Weinberg (1994). Salmon Recovery in the Pacific Northwest, A Summary of Agricultural and Other Economic Effects. Agriculture Information Bulletin Number 699, Economic Research Service, United States Department of Agriculture, June.

Measures that will be taken in the Pacific Northwest to recover three Snake River wild salmon runs protected under the Endangered Species Act and to improve the Columbia River Basin salmon fishery as a whole will result in various benefits and costs to the Northwest economy. This report, which describes the principal findings of a larger USDA study, analyzes the effect of Snake River management alternatives on agricultural production, profit, and resource use in the Northwest. Measures examined include reservoir drawdown along the Lower Snake River and irrigation water supply reductions in the Upper Snake River Basin. For the Northwest region, adjustments in agricultural crop production cause producer profit to decrease by less than \$10 million per year (less than 1 percent in baseline profit) under five of the seven scenarios. Two scenarios would reduce profit \$30-35 million per year (2-3 percent of baseline). This report also examines secondary impacts on regional income and employment that result from the adjustments in agricultural production. Agricultural employment could decrease by 50 to 2,600 jobs, depending on the scenario, while total employment could decrease by 600 to 5,500 jobs. Finally, this report discusses selected economic benefits of salmon recovery, including improvements in commercial and sport fishing.

Ajuzie, Emmanuel I.S., Raymond J. Rhodes, James C. Hite, and Mark S. Henry (1989). "The Economic Impact of South Carolina's Commercial Shrimp Industry, 1987." Technical Report 70, Marine Resources Division, South Carolina Wildlife and Marine Resources Department, Charleston, South Carolina and the Department of Agricultural Economics and Rural Sociology, Clemson University, Clemson, South Carolina, June.

An input-output model is used to assess the economic impact of the commercial shrimp fishery on South Carolina and subregions within the state, specifically 1) output (\$31.4 million in sales), 2) total income (\$16.3 million), 3) value-added (\$17.8 million), and 4) employment (1,672 seasonal and full-time jobs).

Alberini, Anna (1995). Optimal Designs for Discrete Choice Contingent Valuation Surveys: Single-Bound, Double-Bound, and Bivariate Models. Journal of Environmental Economics and Management, 28:287-306.

This paper finds the designs for discrete choice contingent valuation surveys that maximize the precision of a statistic of interest about the public's willingness to pay (WTP) for a change in the environmental quality, such as median WTP. An optimization problem is set up, in which the efficiency of the estimate of median WTP (or a related concept) is the objective function to optimize with respect to the survey design (i.e., the set of bids offered to the respondents). In deriving the optimal designs, we consider alternative econometric models, such as the basic single-bound model that uses the responses to the first payment question, the traditional interval data (or double-bound) model for surveys with a follow-up payment question, and the recently proposed bivariate binary response model. Simulations are carried out to compare the alternative design principles and assess their performances with respect to the statistic of primary interest, median WTP, and other welfare measures, such as mean WTP. Other designs that are constructed ad hoc are also examined.

Alcala, A.C. and G.R. Russ (1990). A Direct Test of the Effects of Protective Management on Abundance and Yield of Tropical Marine Resources. J. Cons. Int. Explor. Mer., 46:40-47.

Despite a vast body of traditional knowledge on management of marine resources in the tropics, there are few direct tests utilizing manipulative or natural experiments of the effect of protective management on the abundance of marine resources and, more importantly, their yield. This paper reports on a natural experiment that makes such a direct test. Approximately 25% of the sub-tidal coral reef of Sumilon Island (total reef area to 30 m isobath = 0.5 square km) in the central Philippines was protected from all forms of exploitation from 1974 until May 1984. Cessation of protective management led to fishing of the entire coral reef. This resulted in a significant reduction in abundance within the previously protected area of the fishes which constituted the majority of the yield from the reef. Catch per unit effort measure over a one year period eighteen months after protective management ceased was significantly less than that measured over a one year period before protective management ceased. There was a decline of 54% in the total yield of reef fishes from Sumilon Island reef between 1983/1984 and 1985/1986 despite the fact that only 75% of the reef was fished in 1983/1984. The yield from traps and gill nets (approximately 64% of the total yield) from the whole reef in 1985/1986 was significantly less than the average yield of the nonreserve (75% of the reef) measured during three of the years of protection. Similarly, the yield from traps (approximately 45% of the total yield) in 1985/1986 was significantly less than the average yield of the nonreserve (75% of the reef) measured during six of the years of protection. Protective management maintained high abundances of fishes in the reserve and significantly higher yields to fishermen from areas adjacent to the reserve. Migration of adult fish from the reserve to the nonreserve area during protection is the simplest explanation of these results.

Aldenderfer, Mark S. and Roger K. Blashfield (1984). Cluster Analysis. Sage University Papers, Quantitative Applications in the Social Sciences, Sage Publications, Beverly Hills.

This is an introduction to Cluster Analysis for those with no background and for those who need an up to date and systematic guide through the maze of concepts, techniques, and algorithms associated with the clustering idea.

Aldrich, John H. and Forrest D. Nelson (1984). Linear Probability, Logit, and Probit Models. Sage University Papers, Quantitative Applications in the Social Sciences, Series/Number 07-045, Sage Publications, Beverly Hills.

The logit and probit models that analyze dichotomous and polytomous dependent variables are developed. Although a tendency to analysis dichotomous dependent variables with ordinary least squares regression techniques has existed, the authors demonstrate that this approach is not an appropriate strategy. Probit analysis is more ideally suited to such problems while logit ought to be the method of choice for polytomous dependent variables.

Allard, J., D. Errico, and W.J. Reed (1988). "Irreversible Investment and Optimal Forest Exploitation." Natural Resource Modeling, 2:581-597.

A forest harvest scheduling model that includes as activities the level of investment in harvest capacity and the accumulated harvest capacity in each period, is presented. The inclusion of these activities, in addition to the

harvest activities, allows for the removal of harvest flow constraints found in more typical Model II formulations of the harvest scheduling problem. The optimal harvest and investment policy can be determined by linear programming or quadratic programming methods, depending on whether prices are constant or supply dependent. The new model better reflects economic reality than existing models, and provides a method for determining the optimal economic development of a forest industry, and the optimal draw-down of old growth forest. Numerical examples are given.

Allen, Donald M. and Joseph E. Tashiro (1976). "Status of the U.S. Commercial Snapper-Grouper Fishery." Pages 41-76 in Harvey R. Bullis, Jr. and Albert C. Jones (eds.) (1976). "Proceedings: Colloquium on Snapper-Grouper Fishery Resources of the Western Central Atlantic Ocean. Report Number 17, Gulf States Marine Fisheries Commission, New Orleans, Louisiana, Texas A&M University Sea Grant College and Mississippi-Alabama Sea Grant Consortium, November, 333 pp.

Snappers and groupers have been fished commercially off the south Atlantic and Gulf states for over a century with portions of the fleet operating near foreign shores. At least 32 species of snappers and groupers are included in this diversified fishery. The 1974 commercial catch totaled 18.3 million pounds, valued at 9.5 million dollars. In 1970, 82.7 million pounds were reported caught by recreational fishermen. Analysis of the fishery is complicated by the lack of basic catch information.

Allen, Douglas W. and Dean Lueck (1993). "Transaction Costs and the Design of Cropshare Contracts." Rand Journal of Economics, 24(1):78-100.

Modern cropshare contracts are explained using a model in which agents are risk neutral and contract rules are chosen to maximize expected joint wealth. It is shown that the farmer either bears the entire cost of inputs or shares the costs with the landowner in the same proportion as the output. The incentives of altering the cropshare percentage are examined and are used to derive implications about the portion of the crop that will be owned by the farmer. The model is tested and supported using data from a 1986 survey of farmers and landowners in Nebraska and South Dakota.

Allen, P.M. and J. M. McGlade (1987). "Modeling Complex Human Systems: A Fisheries Example." European Journal of Operational Research, 30:147-167.

The basis of current models used in fishery management is briefly examined, and various shortcomings are discussed. Alternative, dynamic models are described that are based on the data available for the Nova Scotia Groundfish Fisheries. It is shown that human responses can amplify relatively small annual environmental fluctuations, leading to large, quasi-cyclic changes in catch and profit. In a detailed spatial model it is shown that stochastic behavior on the part of some fishermen is necessary for the survival of the fishery, and that the efficiency and size of the industry depends very much on the information flows concerning catch. A very general discussion is given that shows how these ideas are important in our understanding of innovation and discovery in general terms.

Allen, T.S. (1985). "Financial Services Program." A Presentation to the Louisiana Shrimp Association Annual Meeting, New Orleans, LA, March.

A presentation refuting the contention that the National Marine Fisheries Service financial services program has contributed substantially to the overcapitalization of the Gulf and south Atlantic shrimp fleets.

Allen, T.S. (1994). "Shrimp Data Trends." Financial Services Office, National Marine Fisheries Service, St. Petersburg, FL.

Collection of figures and charts concerning shrimp data trends based on government loan guarantee program information.

Allen, T.S. (1994). "Your S.W. McKeen Memorandum of May 4, 1994, REF: "ITQ's and Commercial Stability." Memorandum, Southeast Regional Office, Financial Services Branch, 9721 Executive Center Drive, St. Petersburg, FL, August.

A summary of a briefing to the Regional Directorate, Fisheries Management, and Economics Division from a banker's perspective on ITQ's and commercial stability. Support for the contention that ITQs reallocate rents from quasi-fixed factors of production to relative more fixed factors of production (ITQs). In this case, however, it is to the detriment of the financial community that provides loans and working capital to fishermen.

Alspach, Thomas T. (1998). Mid-Atlantic council Surf Clam/Quahog Quota Setting Policy. Letter, Law Offices of Thomas T. Alspach, 295 Bay Street, Suite One, Post Office box 1358, Easton, Maryland, March, 2 pp.

Economic models should not be developed for use in setting quota for the surf clam and ocean quahog ITQ fishery.

Altrogge, Phyllis D. (1976). "Further Analysis of the Estimated 1976 Financial Condition of the American Tuna Purse Seine Fleet." Division of Economic and Marketing Research, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, January, 26 pp.

This analysis updates the economic analysis in the Environmental Impact Statement using cost and earnings data provided by Virginia Flagg. The purpose is to present estimates of profitability of the tuna purse seine fleet in 1976 before allowance for any impact that porpoise kill-quotas or other regulatory measures may have on the fleet.

Alvarez, Jose, Chris O. Andrew, and Fred J. Prochaska (1976). "Dual Structural Equilibrium in the Florida Shrimp Processing Industry." Fishery Bulletin, 74(4):879-883.

Stability, entry, exit, and mobility patterns for six size categories of firms in the Florida shrimp processing industry for the 1959-71 period were studied by utilizing Markov Chain analysis. Forecasts over time predict that a structural equilibrium in the industry will be achieved by 1985. The forecasted changes in firm distribution suggest that Florida shrimp industry sales will become increasingly concentrated due to expansion in number of both small and large firms. A dual equilibrium, resulting in fewer medium size firms and more small and large size firms, can be explained by the tendency for small firms to develop a specialty product and/or services to differentiate their markets from those of the very large firms. Medium sized firms, then, tend to expand in size, or decline and either move to specialty products and services or exit from the industry.

Alvarez, Jose, Chris O. Andrew, and Fred J. Prochaska (1976). "Economic

Structure of the Florida Shrimp Processing Industry." Report No. 9, State University System of Florida, Sea Grant Program, February, 46 pp.

This report provides information about the Florida shrimp processing industry based on 1972 data including the raw product supply situation, marketing channels and market structure, and conduct and performance. Changes and trends are identified to assist firms and potential investors in planning future participation in the industry. Specifically, the objectives are (1) delineate the organization and behavior of firms in the Florida shrimp processing industry by studying entry and exit, market concentration, product differentiation, and vertical integration; (2) identify emerging changes and important trends in procurement, processing activities, and product markets that will influence the shrimp processing industry in Florida.

Alverson, D.L. and Steven E. Hughes (1997). Bycatch: From Emotion to Effective Natural Resource Management. In Solving Bycatch, Considerations for Today and Tomorrow, Alaskan Sea Grant College Program Report No. 96-03, University of Alaska, Fairbanks, Alaska, 322 pp.

Bycatch of discards is not a new fisheries management problem. Bycatch has been with us as an integral component of fishing since humans began to use the world seas, lakes, rivers, and streams as sources of food. What is new, however, is the explosive growth of bycatch as a major management issue over the past decade and the formal national and international recognition that bycatch in many world fisheries constitutes important waste and raises conservation, ecological, and economic issues requiring the priority attention of managers. This paper provides: (1) a cursory review of the recent development of bycatch policy, (2) presentation of bycatch as a problem in world fisheries, (3) discussion of bycatch as a component of fishing induced mortalities with examples of graphics and tabular presentations of information on fishery induced mortalities, and (4) reflections on issues of a philosophical nature.

Alverson, D.L., M.H. Freeberg, J.G. Pope, and S.A. Murawski (1994). A Global Assessment of Fisheries Bycatch and Discards. FAO Fisheries Technical Paper, No. 339, Rome, FAO, 233 pp.

An average of 27 million tons of fish are discarded each year in commercial fisheries. Of four major gear groups, shrimp trawls stand alone at the top of the list. The authors point to inadequate data to determine the biological, ecological, economic, and cultural impacts of discards although economic losses run to billions of dollars. However, it appears most likely that socio-cultural attitudes towards marine resources will guide international discard policies. Techniques to reduce bycatch levels including traditional net selectivity, fishing gear development and time/area restrictions are discussed. Effort reduction, incentive programmes and individual transferable quotas (that make the vessel responsible for bycatch reduction) are seen as promising avenues for the future. However, quick solutions to the problem are unlikely and much more information is required.

Amemiya, Takeshi, (1974). "Multivariate Regression and Simultaneous Equation Models when the Dependent Variables are Truncated Normal." Econometrica, 42(6):999-1012.

This paper extends the single equation regression model with the truncated dependent variable considered by Tobin and Amemiya to multivariate and simultaneous equation models and proposes a computationally simple consistent estimator.

Amemiya, Takeshi, (1978). "The Estimation of a Simultaneous Equation Generalized Probit Model." Econometrica, 46(5):1193-1205.

A class of generalized least squares estimators are proposed and their asymptotic variance-covariance matrices are obtained for a simultaneous two-equation model in which one of the dependent variables is completely observed and the other is observed only to the extent of whether or not it is positive.

Amemiya, Takeshi (1978). "On a Two-Step Estimation of a Multivariate Logit Model." Journal of Econometrics, 8:13-21.

In this article the author studies the properties of the two-step estimation method proposed by Domencich and McFadden (Urban Travel Demand, North-Holland, 1975) for a multivariate logit model and shows that it is consistent but asymptotically less efficient than the maximum likelihood estimator. Its computation, however, can be considerably simpler than that of the maximum likelihood estimator, especially in models involving several dependent variables.

Amemiya, Takeshi, (1981). "Qualitative Response Models: A Survey." Journal of Economic Literature 19(December):1483-1536.

Qualitative response (QR) models developed between 1970 and 1981 are reviewed in this article with special attention paid to (1) the specification of a model that is consistent with economic theory and is statistically manageable, (2) the estimation of model parameters and the hypothesis tests based on those estimated parameters, and (3) the criteria to use in choosing among competing models. First, univariate dichotomous dependent variable models are developed, such as the biometric applications of insect survival (survive = 1, death = 0) as a function of insecticide dosage. Next, multinomial or multi-response models are developed for the case of choice of occupation, housing, transportation choice, etc. Lastly, multivariate models are presented where more than one discrete dependent variable exists, e.g. determination of the probability of catching a fish given the probability that one takes a recreational fishing trip  $P(Y=1|X=1)$ . Since the same set of discrete data can be analyzed by many different QR models, this survey is most useful as a guide in choosing an appropriate QR model from an economic-theoretic and a statistical view point.

Amemiya, Takeshi (1985). Advanced Econometrics. Harvard University Press, Cambridge, Massachusetts.

This book is intended as a reference book for professional econometricians and as a graduate textbook. It contains an excellent review of qualitative response models.

American Fisheries Society (1995). Tampa AFS 1995 Abstracts. 125<sup>th</sup> Annual Meeting Tampa, Florida, August 27-31, 248 pp.

The annotated bibliography of papers presented at the 1995 annual meeting of the American Fisheries Society. Primarily fresh water species and problems are discussed, but fisheries management and marine fisheries are also included.

American Sportfishing Association (1995). An Economic Assessment of Marine recreational Fishing in Maine. Staff Report, ASA, 1033 N. Fairfax Street, Alexandria, VA, July, 7 pp.

The analysis in this report indicates the importance of marine

recreational fishing to the economy of Maine. An industry valued at over \$79 million supports about 200,000 anglers who make 576,000 trips seeking their favorite species. A large contingent of nonresident or tourist anglers are drawn to the quality fishing opportunities the state has to offer and bring over \$9 million new dollars into the state s economy each year.

American Sportfishing Association (1995). An Economic Assessment of Marine recreational Fishing in Massachusetts. Staff Report, ASA, 1033 N. Fairfax Street, Alexandria, VA, July, 12 pp.

The analysis in this report indicates the importance of marine recreational fishing to the economy of Massachusetts. An industry valued at over \$442 million supports about 600,000 anglers who make 2.5 million trips seeking their favorite species. A large contingent of nonresident or tourist anglers are drawn to the quality fishing opportunities the state has to offer and bring over \$50 million new dollars into the state s economy each year.

Andersen, Peder (1982). "Commercial Fisheries Under Price Uncertainty." Journal of Environmental Economics and Management, 9:11-28.

The deterministic models applied in economics of fisheries are extended to comprise price uncertainty and risk aversion among the fishing units. It is proved that in the open access fishery both the total fishing effort and the number of fishing units are reduced as the variance of the price increases; that the total fishing effort may be smaller in the open access fishery than in the optimal fishery at a high variance; that only a fixed producer price system can create a first best optimum, and that a tax on revenue is more efficient than both fishing unit quotas or tax on catch.

Andersen, Peder and Jon G. Sutinen (1984). "Stochastic Bioeconomics: A Review of Basic Methods and Results." Marine Resource Economics, 1(2):117-136.

Basic bioeconomic models that incorporate uncertainty are reviewed to show and compare the principal methods used and results reported in the literature. Beginning with a simple linear control model of stock uncertainty, we proceed to discuss more complex models that explicitly recognize risk preferences, firm and industry behavior, and market price effects. The effects of uncertainty on the results of bioeconomic analysis are rarely unambiguous, and in some instances differ little from corresponding deterministic results.

Andersen, Peder and Jon G. Sutinen (1985). "Open Access Exploitation of a Simple Fishery." Draft of Chapter 2 from Peder Andersen and Jon G. Sutinen, The Economics of Fisheries Exploitation, unpublished.

This chapter establishes the basic bioeconomic framework that is an extension of the conventional micro firm and industry framework to account for what most regard as the most fundamental aspects of the fishery. The first unique feature to account for is that production involves extraction or harvest of a renewable natural resource. The second unique feature is that most fisheries are under open access, that is property rights are not private and exclusive.

Andersen, Peder, Jon G. Sutinen, and Kathy Cochran (1998). "Paying for Fishery Management, Economic Implications of Alternative Methods of Financing Management." Prepared for presentation to the IXth Conference of the International Institute of Fisheries Economics and Trade, Tromso, Norway, 8-11 July, 1998.



This paper applies elementary public choice theory to explain failures of fishery management and investigates how alternative financing methods may be able to correct this form of governmental failure. We argue that who pays and how they pay for management services influences policies and the economic performance of a fishery. In most countries, the general treasury finances nearly 100 percent of the cost of fishery management. This financing method, we reason, encourages inefficient use of research, decision-making and enforcement resources and results in poor management of fisheries. Currently there is a modest trend on the part of a few countries to reduce such inefficiencies by implementing user charges to recover a significant portion of the cost of managing their fishery resources. We analyze the economic efficiency consequences of user charges and other financing methods, and review the methods of financing fishery management for Australia, Canada, Denmark, and the United States.

Andersen, Peder, Jon G. Sutinen, and Kathy Cochran (1998). "Paying for Fishery Management, Economic Implications of Alternative Methods of Financing Management." Prepared for presentation to the IXth Conference of the International Institute of Fisheries Economics and Trade, Tromso, Norway, 8-11 October (Revised).

This paper applies elementary public choice theory to explain failures of fishery management and investigates how alternative financing methods may be able to correct this form of governmental failure. We argue that who pays and how they pay for management services influences policies and the economic performance of a fishery. In most countries, the general treasury finances nearly 100 percent of the cost of fishery management. This financing method, we reason, encourages inefficient use of research, decision-making and enforcement resources and results in poor management of fisheries. Currently there is a modest trend on the part of a few countries to reduce such inefficiencies by implementing user charges to recover a significant portion of the cost of managing their fishery resources. We analyze the economic efficiency consequences of user charges and other financing methods, and review the methods of financing fishery management for Australia, Canada, Denmark, and the United States.

Anderson, E.D. (1980). "Analysis of Various Sources of Pelagic Shark Catches in the Northwest and Western Central Atlantic Ocean and Gulf of Mexico." Laboratory Reference Document No. 79-56, National Marine Fisheries Service, Northeast Fisheries Center, Woods Hole Laboratory, Woods Hole, MA, February, 37 pp.

The purpose of this paper is to present (1) reported commercial catches of pelagic sharks in the U.S. FCZ in the Atlantic and Gulf of Mexico, (2) estimates of U.S. recreational catch, (3) estimates of bycatch in the U.S. and Canadian swordfish longline fisheries, (4) estimates of bycatch in the foreign squid trawl fishery in the Northwest Atlantic, and (5) estimates of bycatch in the Japanese tuna longline fishery. Other possible sources of bycatch are mentioned and the general limitations and inadequacies of the entire data base are discussed.

Anderson, Eric E. (1986). "Taxes vs. Quotas for Regulating Fisheries Under Uncertainty: A Hybrid Discrete-Time Continuous-Time Model." Marine Resource Economics, 3(3):183-207.

There is a wide variety of regulatory instruments available for achieving economic efficiency in markets where externalities exist. All of them, when correctly designed, are equally effective, provided that complete information is available and that adjustments to the level of the instruments

can be made costlessly. However, with the presence of uncertainty, it is well known that one instrument or another may produce a higher expected present value of net social benefits than the others. How uncertainty affects the choice of instrument specifically in fishery management and in other dynamic optimization settings is less well known. A combination discrete time and continuous time stochastic model of a dynamic fishery is used to compare the relative performance of a per unit tax and quota in this paper. The analysis confirms the conclusion reached in the general literature on optimal instrument choice under uncertainty: which instrument performs most efficiently depends on the specific fishery being regulated.

Anderson, Eric E. (1988). "Relative Efficiency of Charges and Quantity Controls in Fisheries with Continuous Stock Growth and Periodically Fixed Instrument Levels." Marine Resource Economics, 5(3):215-230.

This article presents a simple combination discrete time/ continuous time model that incorporates continuous population dynamics and fishing activity together with periodic, rather than continuous, instrument adjustment into the decision process for choosing the optimal type and level of regulatory instrument. A per unit tax and an allocated instantaneous harvest rate quota each drive the system along different time paths, and each results in a different present value of the stream of net benefits generated by harvesting the resource. The choice of instruments is fishery specific; it depends on the parameter values of the fishery in question.

Anderson, F.J. (1979). "Ontario Reforestation Policy: Benefits and Costs." Canadian Public Policy - Analyse De Politiques, 3:336-347.

The paper concludes that the Ontario program to expand reforestation in the province with a view to ensuring expanded timber supplies in the 21<sup>st</sup> century does not meet the test of viability provided by tools of conventional benefit cost analysis. A more selective approach, possibly oriented to survival of particular communities, should be examined as an alternative.

Anderson, Glen D. (1984). "Participation in Voluntary Transfer of Development Rights Programs: Landowner Incentives and Design Issues." Draft Report, Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island, July, 29 pp.

This paper examines landowner incentives to supply development rights under transfer of development rights (TDR), identify a number of potential obstacles to the success of voluntary TDR and propose design options for enhancing participation.

Anderson, Glen D. and Richard C. Bishop (19??). "The Valuation Problem." Draft report, Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island.

A review of travel cost, hedonic price, and contingent valuation techniques is provided in this report.

Anderson, Glen D. and Steven F. Edwards (198?). "The Role of Amenity Valuation Techniques in the Assessment of Coastal Land Use Policies: Downzoning in Coastal Towns in Southern Rhode Island." Draft report, Department of Resource Economics, University of Rhode Island.

In this paper, the problem of valuing coastal amenities are examined and results from an empirical study in which the contingent valuation method and hedonic price-related technique were used are presented. How data on amenity values might be used to analyze alternative land initiatives are demonstrated.

Anderson, James E. (1974). "A Note on Welfare Surpluses and Gains From Trade in General Equilibrium." The American Economic Review, 64(4):758-762.

The author clarifies the concept of the impact of a tariff on consumer and producer surplus measures of gains from trade.

Anderson, James E. (1976). "The Social Cost of Input Distortions: A Comment and A Generalization." The American Economic Review, 66(1): 235-238.

Two recent papers on the social cost of input market distortions have committed an error in that measures of welfare loss due to an input price distortion depending upon whether the measure is in the output or input market. This is incorrect, as intuition surely argues, and the source of the error lies in improper use of the Taylor's series expansion. Correcting the error suggests a worthwhile generalization.

Anderson, James E. (1984). "Pricing Strategies for a Renewable Resource Industry Faced with Competing New Technology: The Case of Aquaculture and the Commercial Fishery." Agricultural Experiment Station Contribution #2286, Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island, December.

Technological change in the form of aquaculture is becoming an important factor in the market for several species of fish. In light of these changes, producers in some ocean based fisheries need to evaluate their production and pricing strategies relative to their emerging competitor aquaculture. This paper conceptually analyses the optimal pricing/production strategy for an ocean based fishery facing a lagged decreasing net demand resulting from the entry of competitive aquaculturalists.

The analysis indicates that the optimal strategy consists of initially raising price to a maximum level to earn some fast profits taking advantage of the lagged decline in net demand. After the demand declines and natural fish stocks are reduced such that the singular arc is reached, price is adjusted downward to maintain the singular arc approach to the long run equilibrium. In the long run, price will be lower, natural fish stocks will be higher, and natural fish supply may either be lower or higher depending on the initial position of the system and the magnitude of the net demand shift.

Anderson, James L. (1985). "Market Interactions Between Aquaculture and the Common-Property Commercial Fishery." Marine Resource Economics, 2(1):1-24.

Market interactions between the common property commercial fishery and (1) competitive aquaculturists and (2) a dominant firm aquaculturist are modeled. It is found that the entry of an competitive aquaculturist increases natural fish stocks, reduces price, and increases total supply. If initially the natural fish sock is at a level below maximum sustainable yield, entry of the aquaculturist results in an increase in supply from the commercial fishery. In the second part, the aquaculturist is modeled as a dominant firm. In some situations, the aquaculturist behaves in a manner similar to the competitive case, but impacts on price, fish stock, and efficiency will not be as large. It is shown that there also exists cases where the dominant

aquaculturist will desire to promote overexploitation of the natural fish stock.

Anderson, James L. (1985). "Strategic Design and Marketing of Aquacultured Salmon." Presented at the Symposium on Markets for Seafood and Aquacultural Products, Charleston, South Carolina, August 19-21.

This research uses conjoint analysis to quantitatively evaluate buyer trade off for aquacultured salmon products. Attributes evaluated include species, country of origin, shelf life, fresh versus frozen, product size, product cut, year round versus seasonal availability, consistency of supply, wild caught versus aquacultured, flesh color, delivery time, and price. The results are employed to suggest optimal product design and strategies to maximize market share.

Anderson, James L. (1987). "Allocating Harvests Between Competing Users in Fishery Management Decisions: Appropriate Economic Measures for Valuation. Discussion." Marine Fisheries Review, 49(3):34-35.

A discussion of J.E. Easley Jr. and Fred J. Prochaska (1987). "Allocating Harvests Between Competing Users in Fishery Management Decisions: Appropriate Economic Measures for Valuation." Marine Fisheries Review, 49(3):29-33.

Anderson, James L. (1988). "Analysis of the U.S. Market for Fresh and Frozen Salmon." Staff Papers Series 88-07, College of Resource Development, Agricultural Experiment Station, Contribution Number 22446, University of Rhode Island, Kingston, R.I., May, 65 pp.

The objectives of this paper are to 1) determine the degree of substitutability between fresh/frozen wild caught salmon and pen raised farm salmon; 2) determine potential demand for salmon currently, in 1990 and 1995; and 3) evaluate the impact of an increase in farmed salmon. Several methods we've utilized in the work include conjoint analysis, self explicated utility techniques and demand analysis. Data were collected from interviews of 143 salmon buyers in the U.S. Northeast and Pacific Northwest.

Anderson, J.L. and Sofia U. Bettencourt (1992). "Constraints and Opportunities for Salmon Aquaculture in the United States." Draft submitted to the Marine Fisheries Review.

This paper provides an updated analysis of the major factors constraining the development of salmon aquaculture in the United States. A brief outlook on recent macroeconomic factors contributing to the industry's recent growth is offered, and the present status of the major producing regions delineated. The major constraints affecting the industry are then discussed, followed by a summary of recommendations aimed at improving the present climate surrounding the industry's development.

Anderson, J.L. and Sofia U. Bettencourt (1993). "A Conjoint Approach to Model Product Preferences: The New England Market for Fresh and Frozen Salmon." Marine Resource Economics, 8(1):31-49.

This paper illustrates how conjoint analysis can be used to model preference for food products, and applies the technique to the study of fresh and frozen salmon preference among buyers from two intermediary wholesale levels in New England. The degree of preference for specific attributes and levels of the products is compared. The paper also evaluates the performance and predictive

validity of a traditional additive conjoint model a hybrid model estimated using both ordinary least squares, and a maximum likelihood hybrid two-limit Tobit model.

Anderson, James L. and Cathy R. Wessells (1996). Assessment of Asian Shark Fin Trade and Implications for Shark and Dogfish Management. A Proposal submitted to the National Marine Fisheries Service, Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, Rhode Island, May, 18 pp.

A proposal to preform a conjoint analysis on the wholesale market for dogfish and shark fins. It focuses on the product characteristics the fin buyers search for and the impacts they have on shark harvest by age, comparisons of dogfish fin products to other shark fin products, and the incorporation of this information into shark harvest management to insure sustainable management.

Anderson, James L. and Michael Carroll (1997). An Assessment of the Atlantic Bluefin Tuna Market: The Economic Implications for Management Plans. A Proposal submitted to the National Marine Fisheries Service by the Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, Rhode Island, June, 11 pp.

The present management plan for the harvest of U.S. Atlantic bluefin tuna does not account for market factors that influence price. For efficient management, it is essential that these market implications be taken into consideration. This study will examine factors which influence the Japanese wholesale market for Atlantic bluefin tuna and implications for management. The goals are: (1) Evaluate how factors such as: quantity supplied, time of harvest, and quality characteristics influence the price of U.S. Atlantic bluefin tuna sold on the Japanese wholesale market. (2) Determine the relationship between prices in Japan and ex-vessel prices received by U.S. fishermen. (3) Determine how different fishery management options will influence gross revenues received by U.S. fishermen.

Anderson, James L. and James E. Wilen (1985). "Estimating the Population Dynamics of Coho Salmon (*Oncorhynchus kisutch*) Using Pooled Time-Series and Cross-Sectional Data." Canadian Journal of Fisheries and Aquatic Sciences, 42(3):459-467.

The population dynamics of natural and hatchery coho salmon (*Oncorhynchus kisutch*) were estimated for three regions, (1) Washington coastal, (2) Columbia River region, and (3) Oregon/California coastal, using pooled time series and cross sectional data. Two functional forms were compared: the Beverton- Holt and Ricker models. Both models yielded very similar results. In both cases, we found that the natural coho stock recruitment is significantly affected by parent stock level (positive), parent stock density (negative), river flow (positive), and hatchery smolt release (negative). The significant factors affecting hatchery coho salmon were smolt release level (positive), smolt release density (negative), and upwelling (positive).

Anderson, James L. and James E. Wilen (1986). "Implications of Private Salmon Aquaculture on Prices, Production, and Management of Salmon Resources." American Journal of Agricultural Economics, 68(4):866-879.

The emergence of large scale salmon ranching in the Pacific Northwest has led to significant controversy over the potential impact of salmon

ranching on market structure, salmon prices, ocean and aquacultural production, and salmon fishing regulation. This paper models the behavior of a dominant salmon rancher facing a competitive open access fishery using a dynamic nonlinear programming model. Primary attention is given to production and regulation influencing strategies of an optimally managed salmon ranch under selected institutional and biological constraints. The effect of such behavior is evaluated with regard to salmon prices, natural salmon stocks, ocean fishing effort, and ocean fishery productivity.

Anderson, Lee G. (1973). "Optimum Economic Yield of a Fishery Given a Variable Price of Output." J. Fish. Res. Board Can., 30:509-518.

The majority of work done in the economics of fisheries uses the assumption of a fixed price of output. This paper describes the effects on the traditional fisheries model of relaxing this assumption, the most important of which, as far as regulation agencies are concerned, are the negation of marginal cost of effort equaling marginal revenue of effort as the criterion for a social optimum, and the introduction of the possibility of multiple equilibria and multiple industry profit maxima. Also, some new insights on fishery management with variable price and different assumptions about the number of fisheries and the number of countries involved are pointed out.

Anderson, Lee G. (1975). "Analysis of Open-Access Commercial Exploitation and Maximum Economic Yield in Biologically and Technologically Interdependent Fisheries." Journal of the Fisheries Research Board of Canada, 32:1825-1842.

Fisheries may be interdependent because of biological relationships that exist between their stocks or because the gear of one affects mortality in the stock of the other. The problems of defining a maximum sustainable yield in these cases are discussed. A graphical analysis is used to describe the combinations of effort from both fisheries where concurrent exploitation is possible and which of these combinations will result in a simultaneous equilibrium. Finally the conditions for a combined maximum economic yield (MEY) are presented and it is shown that they will not hold if each fishery is managed to obtain an individual MEY.

Anderson, Lee G. (1980). "A Comparison of Limited Entry Fishery Management Schemes." Draft report, College of Marine Studies and Department of Economics, University of Delaware, January, pp. 65.

This paper compares and contrasts four different types of limited entry management schemes on the basis of specified criteria. This framework consists of a set of problems that must be addressed to one degree or another in the implementation and operation of any type of fishery management scheme. The goal is to describe the best possible adaptation of each of the schemes so that meaningful comparisons can be made. The final objective will be to specify under what conditions each of the schemes will be most useful.

Anderson, Lee G. (ed.) (1981). Economic Analysis for Fisheries Management Plans. Ann Arbor Science, Ann Arbor, Michigan.

The results of a workshop at the University of Delaware to address the level of economic analysis required to institute a fishery management plan.

Anderson, Lee G. (1982). "The Share System in Open-Access and Optimally Regulated Fisheries." Land Economics, 58(4):435-449.

This paper introduces the share system into the traditional static deterministic model of an exploited fishery. The model is used to answer the questions (1) How is the share rate determined and how will it affect open access fishing and the rents earned by boat owners and crew? (2) How will imperfect competition in the determination of the share rate affect open access fishing and rent distribution? (3) What are the implications of the share system for management, and do they differ depending on how the share rate is determined.?

Anderson, Lee G. (1983). "The Demand Curve for Recreational Fishing with an Application to Stock Enhancement Activities." Land Economics, 59(3):279-286.

This model extends the McConnell and Sutinen (1979) and Bishop and Samples (1980) models of recreational fishing with and without joint commercial harvest by incorporating a stock externality in the form of a demand curve for recreational fishing. The effect each participant has on others, in terms of quality and quantity, is central to an intuitive understanding of recreational fisheries management and it can be clearly demonstrated in the demand curve model presented in the paper. The model is applicable to a number of relevant problems, including joint recreation-commercial exploitation, but here it is only applied to the optimization of enhancement, a topic that has not been treated previously.

Anderson, Lee G. (1984). "Uncertainty in the Fisheries Management Process." Marine Resource Economics, 1(1):77-87.

The traditional bionomic fisheries model is expanded to a "bioregonomic" model by including as an independent part of the system those regulation agencies and institutions that grant authority to manage and that use that authority to devise, implement, and enforce specific regulations. In this approach, the type of regulation used is endogenous to the model. Several examples of these models are introduced to show the difference between a bioregonomic yield and either open access or maximum economic yield. Special emphasis is given to the ways in which the regulatory process can add uncertainty to fisheries utilization.

Anderson, Lee G. (1986). The Economics of Fisheries Management. 2<sup>nd</sup> edition. The Johns Hopkins University Press, Baltimore.

An excellent introductory text on the management of fisheries using biological and economic models. The chapter on applied economics is particularly useful in demonstrating the value of economics to managers.

Anderson, Lee G. (1987). "Bridging the Gap Between Economic Theory and Fisheries Management: Can the MFCMA Produce Economically Rational Management?" Marine Fisheries Review, 49(3):13-25.

The paper analyzes the possibility and the probability of appropriate use of fundamental economic principles in the fishery management plans developed under the Magnuson Fishery Conservation and Management Act. After reviewing the resource, industry, and government aspects of the fishery management development process and some of the important aspects of both the existing law and suggested changes, it is concluded that while the possibility exists, the probability is quite low. Discussion by James E. Kirkley.

Anderson, Lee G. (1987). "A Management Agency Perspective of the Economics of Fisheries Regulation." Marine Resource Economics, 4:123-131.

The problem of selecting and optimally implementing a management regime taking into account limited agency budgets is analyzed. First, the management problem from the agency's perspective is discussed by describing the actual types of control variables. Then the less than direct relationship between agency control variables and fishing industry behavior and its importance in practical policy is described. Finally, the economic problem of running a fishing agency is analyzed.

Anderson, Lee G. (1988). "An Individual Transferable Quota Program for the Southeast Trawl Fishery, Part II, A Proposed System." Draft report, College of Marine Studies and Department of Economics, University of Delaware, May, pp. 28.

This report provides a conceptual model of ITQ management of multispecies fisheries and to use the conclusions from the model, along with more general principles of basic fisheries economics and observations of real world management, as the basis for formulating an ITQ program for the southeast trawl fishery. The conceptual modeling is provided in part 1 while recommendations for implementation are contained in this second part.

Anderson, Lee G. (1989). "Optimal Intra- and Interseasonal Harvesting Strategies when Price Varies with Individual Size." Marine Resource Economics, 6(2):145-162.

A major concept in fisheries management is the optimal age for first capture. Because there can be separate market categories for fish of different sizes and different costs for their harvest, a more rational statement of the problem would be to find the optimal range of harvest sizes in any given year. Two models for solving this problem are presented. The shrimp model discusses optimal harvest of a single cohort of shrimp as it grows through a season. The lobster model discusses optimal simultaneous harvest of several cohorts over several seasons. The difficulty of defining a cost per fish in the lobster model makes it a much more complex undertaking.

Anderson, Lee G. (1989). "Enforcement Issues in Selecting Fisheries Management Policy." Marine Resource Economics, 6(3): 261-277.

The purpose of this article is to present a frame of reference in which to compare fisheries regulations and to identify enforcement issues that can be important in practical policy application. The issues discussed include dockside versus at-sea monitoring; ease of government implementation; period at risk when in noncompliance; ease and cost with which industry participants can achieve ability to comply; ease of distinction between honest mistakes, sloppy practices, and deliberate cheating; initial versus continued compliance; ease with which requirements can be communicated; ease with which noncompliance can be disguised; ease with which agents can detect noncompliance such that it is admissible as evidence; degree to which personal or social benefits from compliance can be demonstrated; potential for citizen cooperation identifying offenders; likelihood of encouraging rent seeking behavior by industry and of administrators being susceptible to it; ease with which illegal activities can be detected under various conditions; relative ability to which enforcement is efficacious with respect to different management objectives; and ease with which benefit-based priorities for enforcement can be identified.

Anderson, Lee G. (1989). "Property Rights in Fisheries: Lessons from the New Zealand Experience." Draft report, College of Marine Studies, University of Delaware, Newark, DE, pp. 53.



This paper evaluates the actual operation of an ITQ program in New Zealand, identify problems that have caused difficulties in the actual operation of the program, to assess their potential seriousness, and where possible to suggest possible remedies. This program is one of the first in the world and it is the only one that encompasses essentially all of a nation's marine fisheries. The theoretical advantages of ITQs are easy to see. However, it is difficult to design an actual program that will actually achieve these benefits in a world of less than perfect information and costly and sometimes cumbersome implementation and enforcement.

Anderson, Lee G. (1989). "Conceptual Constructs for Practical ITQ Management Policies." In P.A. Neher et al. (eds.) (1989). Rights Based Fishing, Kluwer Academic Publishers, pp. 191-209.

This report builds a conceptual model in which any number of practical management issues in an individual transferable quota program (ITQ) can be discussed. The topics that are given specific attention, however, are the nature of management rent, the workings of the market for ITQs, resource rentals, and problems with bycatch.

Anderson, Lee G. (1991). "Note: A Note of Market Power in ITQ Fisheries." Journal of Environmental Economics and Management, 21:291-296.

Individual transferable quotas, ITQs, in fisheries are analogous to transferable pollution permits in environmental policy. However, they are different in that the right to produce is for the final product, the fish, whereas pollution permits are for a nonmarket joint product (i.e., sulfur dioxide) of the good produced for sale. In both cases, the actual economic efficiency effects of creating the property rights depend upon the workings of the market for both the final product and the rights. There has been considerable work on market failures for pollution permits, and this paper extends the analysis to ITQs. It is shown that the difference between pollution permits and ITQs can change the type and occurrence of failure in the market for the final product, but it does not affect the potential for failure in the market for permits.

Anderson, Lee G. (1991). "Efficient Policies to Maintain Total Allowable Catches in ITQ Fisheries with At-Sea Processing." Land Economics, 67(2):141-57.

This paper discusses the economic aspects of determining a conversion factor program that will maintain the total allowable catch in an individual transferable quota program. Since TACs are denominated in terms of total biomass but fish are often landed after at sea processing, provision must be made to convert the landed weight to a green weight. The conversion factor is a serious problem in the New Zealand ITQ program.

Anderson, Lee G. (1992). "Consideration of the Potential Use of Individual Transferable Quotas in U.S. Fisheries." Vol 1-5. Final Report, NOAA Contract No. 40AANF101849.

Using four different U.S. fisheries as examples spanning a wide range of situations from those which are conducive to ITQs to those which are problematic for ITQs, this report explains the general principles of ITQs and shows how they might be applied to specific fisheries.

Anderson, Lee G. (1992). "Consideration of the Potential Use of Individual Transferable Quotas in U.S. Fisheries." Vol 1-5.

Draft Report, NOAA Contract No. 40AANF101849.

A draft report of the above cited study.

Anderson, Lee G. (1993). "Toward a Complete Economic Theory of the Utilization and Management of Recreational Fisheries." Journal of Environmental Economics and Management, 24: 272-295.

A model of individual behavior for recreational fisheries that considers both the participation decision and the activity level decision is developed. The model also distinguishes between the catch rate, that is a biologically determined parameter, and the landings rate, that is a control variable. Individual and fishery wide equilibria under open access are described for both homogeneous and heterogeneous participants. Optimal utilization is also described. Optimal utilization differs from open access in terms of activity levels of participants and number and type of participants. Regulations to achieve optimal utilization are described.

Anderson, Lee G. (1993). "Some Preliminary Thoughts on Discards, By-catch, and Highgrading." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

A bioeconomic model of a fishery is developed that accounts for the discarding of a lower valued component of the catch due to high grading, low grading, and hold capacity. Hold capacity is based on a model of a fishing trip. Highgrading is a problem only when the value of the higher priced species exceeds the costs of harvesting it and the costs of discarding the lower priced species.

Anderson, Lee G. (1993). "Enhancing Economic Analysis for Fishery Management: Discussion." American Journal of Agricultural Economics, 75(5):1194-1195.

A discussion of Jon Sutinen's paper on "Recreational and Commercial Fisheries Allocation with Costly Enforcement" and J. Walter Milon's paper on "U.S. Fisheries Management and Economic Analysis: Implications of the Alaskan Groundfish Controversy."

Anderson, Lee G. (1994). "An Economic Analysis of Highgrading in ITQ Fisheries Regulation Programs." Marine Resource Economics, 9(3):209-226.

ITQ management programs can provide incentives to discard low valued fish so that individual quota can be used for relatively more valuable fish. Such "highgrading" can also occur where there are other constraints on harvest, such as hold capacity. This paper compares and contrasts the exact conditions under which highgrading will occur with ITQ and other harvest constraints. Considering all costs, highgrading can be efficient with physical constraints but it is an unfortunate artifact of ITQs. Whether or not highgrading will occur depends upon the price differential between high and low valued fish, the cost of sorting and discarding, and the cost of re-harvest. Policies for correcting or reducing ITQ highgrading should it occur are described.

Anderson, Lee G. (1994). "A Note on the Economics of Discards." Marine Resource Economics, 9(2):183-186.

This paper discusses the basic economic principles of the utilization of fisheries where it may be optimal to discard some portion of the catch. The

analysis is in terms of a very simple biological model and the discussion is biased towards issues which are discussed most frequently in public forum, often in ways that ignore simple economic principles.

Anderson, Lee G. (1994). What is Controlled or Limited Access? In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

The paper will compare and contrast open access with controlled access modes of fisheries regulation. While some of the differences can be quite subtle, for purposes of discussion they can be distinguished as follows. The former controls the activities of participants but does not explicitly control their number. The latter controls the number of participants or in some cases the number of fishing units (i.e., boats, traps, or the amount of tonnage). A controlled access program may also control the activities of the restricted number of participants.

It will be demonstrated that regulations used under open access are often biologically ineffective in the long run due to technological innovation and industry growth. In addition, they can lead to economic inefficiencies in harvest and processing. A prime motivation for the development of controlled access regulations was to correct for these two potential problems. Depending upon how they are formulated and upon the nature of the particular fishery to be managed, controlled access regulations can be successful in this regard.

One way of comparing open access and controlled access management is to see how each of them can address important issues of different fisheries. Controlling discards, bycatch, mortality in nursery areas, and maintaining product quality and industry viability are just a few of the many problems that must be addressed. It is frequently the case that potential management tools are dismissed because of a perceived weakness in addressing one of these issues. Since there is no perfect management tool, the important question in comparing open access to controlled access management techniques is not which one has weaknesses, but which one can be adopted, implemented and enforced such that the stated management objectives can be most nearly achieved.

Anderson, Lee G. (1995). "A Commentary on the Views of Environmental Groups on Access Control in Fisheries." Ocean and Coastal Management, 28(1-3):165-188.

This paper assesses the views of various environmental groups on access control in fisheries, as stated in documents prepared by these groups. The views range from outright opposition to tentative promotion. Differing views on the definition of conservation, the appropriate make-up of the fishing industry and the likely make-up with and without access control, and the appropriate nature of property rights for fisheries are highlighted. An important aspect of the last issue is the concern over potential takings problems under the Fifth Amendment to the U.S. Constitution when management is imposed in rights-based fisheries regimes.

Anderson, Lee G. (1997). Open Access Fisheries Utilization with an Endogenous Regulatory Structure: An Expanded Analysis. Draft report, College of Marine Studies and Department of Economics, University of Delaware, Newark, DE, 15 pp.

Homans and Wilen (1997) develop a model of a commercial fishery in which management decisions are endogenously determined. This study expands on this approach by assuming that both entry and exit of fishing vessels can occur using the model proposed by Smith (1969) in which a disaggregated model of independent vessel behavior is employed. In addition, the nature of the

regulatory agency is expanded to consider the possibility of political interventions based on the current economic conditions of existing participants.

Anderson, Lee G. (1997). Towards A Complete Model of Regulated Commercial Fishing: Comparison of ITQs and Traditional Regulation. Draft report, College of Marine Studies and Department of Economics, University of Delaware, Newark, DE, May, 36 pp.

The purpose of this paper is to describe the efficiency and distribution effects which will occur during the transition to ITQ management following a mode of analysis developed by Smith (1968).

Anderson, Lee G. and Dwight R. Lee (1986). "Optimal Governing Instrument, Operation Level, and Enforcement in Natural Resource Regulation: The Case of the Fishery." American Journal of Agricultural Economics, 68(3):678-690.

Most regulation studies have used industry output or inputs as the control variable(s), but these are only indirectly controlled by government action through its choice of governing instrument, enforcement procedure, and penalty structure and the operational level of each. A model is developed that demonstrates how profit-maximizing firms will react to these control variables taking into account the benefits (extra production) and costs (possible penalties) of noncompliance and the ability to avoid detection on noncompliance. The optimal operation level for two sets of control variables is derived and discussed.

Anderson, Lee G., Emiko Maruyama, and Maryjane Middelkoop (1999). The LEM Fishery Simulation Model. Presentation to the Office of Science and Technology, University of Delaware, Newark, Delaware, December.

Foundation of the Excel computer simulation model of a commercial and recreational fishery using a multi-cohort biological constraint where fishing effort enters the model linearly. A copy of the computer program is available on disk.

Anderson, Lee G., Emiko Maruyama, and Maryjane Middelkoop (2000). The LEM Fishery Simulation Model. Draft Users Guide, University of Delaware, Newark, Delaware, February, 17 pp.

Foundation of the Excel computer simulation model of a commercial and recreational fishery using a multi-cohort biological constraint where fishing effort enters the model linearly. A copy of the computer program is available on disk.

Anderson, Robert C., Lisa A. Hofmann, and Michael Rusin (1990). "The Use of Economic Incentive Mechanisms in Environmental Management." Research Paper #051, American Petroleum Institute, 1220 L Street, Northwest, Washington, D.C. 20005, June, pp. 73.

The principal alternative to direct regulation uses market forces in the form of economic incentives to reduce pollution. This paper examines the existing record on the use of incentive mechanisms for evidence on whether they have improved the effectiveness and efficiency of environmental regulation.

Anderson, Robert J., Jr. and Thomas D. Crocker (1971). "Air Pollution

and Residential Property Values." Urban Studies, 8:171-180.

The fundamental hypothesis of the relationship between air pollution dosages and real estate values for measuring the benefits of air pollution control is that a portion of air pollution damage to artifacts and organisms is capitalised negatively into the value of land and immobile durable improvements thereon causing land rents to vary inversely with air pollutant dosages. This paper (1) examines the theoretical underpinnings of cross-section studies of demand in which characteristics of goods are used as explanatory variables, and (2) to apply that rationale to the study of air pollution and residential property values.

Anderson, Robert J., Jr. and Thomas D. Crocker (1972). "Air Pollution and Property Values: a Reply." The Review of Economics and Statistics, 54(4):470-473.

A reply to Freeman, A.M. III (1971). "Air Pollution and Property Values: A Methodological Comment." The Review of Economics and Statistics, 53(Nov.):415-416 contention that only after a general equilibrium model including the spatial pattern of air quality as a parameter is constructed may one appropriately infer relationships between air quality and equilibrium land values.

Anderson, Ronald W. (1980). "Some Theory of Inverse Demand for Applied Demand Analysis." European Economic Review, 14:281-290.

Inverse demand functions are often useful econometric representations of consumer behavior. This paper establishes some theoretical properties of inverse demands that aid their interpretation and facilitate calculations related to them. We introduce the notion of scale elasticity that is shown to play for inverse demands much the same role that income elasticity does for direct demands. It is used in a decomposition of Antonelli effects that is analogous to the Slutsky equation for direct demands.

Anderson, Terry L. (1982). "The New Resource Economics: Old Ideas and New Applications." American Journal of Agricultural Economics, December: 928-946.

The purpose of this paper is to lay out the basic elements of the emerging new resource economics (NRE) paradigm. The scholars involved in the development of this new approach have simply applied the foundational contributions to a particular subset of economic problems. The integration of these ideas and their application to resource and environmental problems is quite new. In this paper, I will first argue why the existing way of thinking would benefit from reform. Following this I will integrate property rights, public choice, and Austrian economics with the standard neoclassical paradigm thereby identifying the salient components of NRE. Finally, evidence will be presented to support why NRE is gaining support.

Anderson, William W. (1970). "Contributions to the Life Histories of Several Penaeid Shrimps (Penaeidae) Along the south Atlantic Coast of the United States." U.S. Fish and Wildlife Service, Special Scientific Report-Fisheries No. 605, May, iii + 24 pp., 15 figs, 12 tables.

Shrimp, the most valuable fishery resource of the south Atlantic coast of the United States, contributed about 40 percent of the \$27 million ex-vessel value of all fishery landings in the area in 1966. Three species of shallow water penaeid shrimps are of greatest commercial importance: white

shrimp, Penaeus setiferus; brown shrimp, P. aztecus; and pink shrimp, P. duorarum. The shrimp fishery is reviewed for trends in yield for the area as a unit, by State, and by species, for the ten year period 1958-67. A trend toward steady decline in total shrimp landings is indicated. During studies on the white shrimp along the south Atlantic coast of the United States in 1931-1935, data were obtained on the brown shrimp; the sea bob, Xiphopeneus kroyeri; and Trachypeneus constrictus. Observations were also made on the pink shrimp from operations of the Bureau of Commercial Fisheries R/V Oregon of northeast Florida near Cape Kennedy in 1965-67. This report presents size distribution, ovary development, and sex ratios of the several species of shrimp, and includes limited information on spawning season.

Anderson, William W. and G. Robert Lunz (1965). "Southern Shrimp...A Valuable Regional Resource." Marine Resources of the Atlantic Coast, Leaflet Number 4, Atlantic States Marine Fisheries Commission, P.O. 2784, Tallahassee, Florida, October, 6 pp.

An overview of the south Atlantic shrimp fishery including the species of shrimp, management, and existing and on-going research.

Andrade, Roberto R. Enriquez (1992). "A Multiobjective Model of the Pacific Whiting Fishery in the United States." Dissertation, Department of Agricultural and Resource Economics, Oregon State University, Corvallis, OR.

This dissertation develops a multiobjective bioeconomic policy model of the Pacific whiting fishery in the U.S. The purpose of the model is to analyze the implications (trade-offs) of resource allocation alternatives on the level of three policy objectives: present value of net revenue, production, and female spawning biomass. Pareto optimal solutions for the three policy objectives were generated under various specifications of the model by means of generating techniques. Three policy instruments were considered: harvest quotas, fleet/processing capacity limits, and allocation between the shore-based and offshore fisheries. Results were presented in the form of trade-off curves.

Andrew, Chris O., Fred J. Prochaska, Jose Alvarez (1975). "Florida Shrimp: From the Sea Through the Market." SUSF-SG-75-005, Department of Food and Resource Economics, Florida Agricultural Experiment Station, Florida Sea Grant Program, Marine Advisory Program, May, 15 pp.

Even though shrimp are the most valuable seafood species landed in Florida, landings have not kept pace with growth of the shrimp processing industry. Landings from Florida waters have remained constant over time, but has declined as a share of total shrimp processed due to increased imports and the decline in Florida landings from Campeche and the Caribbean.

Andrews, Elizabeth J. and James E. Wilen (1988). "Angler Response to Success in the California Salmon Sportfishery: Evidence and Management Implications." Marine Resource Economics, 5(2):125-138.

This paper examines effort responsiveness to success in the California salmon partyboat sport fishery. The management process in this important fishery involves setting target harvest levels for both commercial and sportfishing groups and then using closed seasons, restricted gear, and possession limits to dampen effective effort. An important component of the management process involves forecasting sportfishing effort and its effect on

catch to advance-plan management actions. For want of better information, simple proportionality rules-of-thumb are used currently and this paper examines the plausibility of these. Some simple models forecasting aggregate angler participation and aggregate partyboat catch on a weekly basis are estimated across several different ports. Our findings suggest that anglers are responsive to recent success in several ports (elasticities up to +.5) and that angler participation affects catch with an elasticity exceeding unity. These results indicate that the simple rules of thumb currently in use could be in substantial error.

Androkovich, Robert A. and Kenneth R. Stollery (1994). "A Stochastic Dynamic Programming Model of Bycatch Control in Fisheries." Marine Resource Economics, 9(1):19-30.

This paper builds a model of fishery regulation with incidental catch or bycatch and simulates it with parameters from the Nova Scotia cod and haddock fisheries. When comparing optimal coordinated taxation with the independent taxation of each fishery separately, we find that independent taxation requires significantly higher tax rates to control the stock externality associated with competitive behavior. Quotas are found to be suboptimal relative to any form of taxation, because of their inflexibility in the presence of uncertainty, and because they can control bycatch only indirectly.

Anonymous (19??). "Feasibility Study of Mariscos Del Carmen, S.A. and Pescadores De Mariscos Del Carmen, S.A." A prospectus prepared for a Mexican fishing firm.

A description of the plant, boatyard, and trawlers of a Mexican shrimp fishing firm with a statement of the net worth of the company and potential for future earnings.

Anonymous (19??). "Fin Fishes Caught Incidental to Shrimp Trawling in the Western Gulf of Mexico." Draft report.

A discussion of the shrimp trawl bycatch of finfish and potential markets for the discarded catch.

Anonymous (19??). "Fishery Management A Neo-Institutional Approach." Draft report.

This paper is an attempt to combine neoclassical economic theory with institutionalism. The neo-institutional approach is applied to fishery management problems.

Anonymous (19??). "Fishing Capacity and Subsidies." Draft report.

Discussion of fishing capacity, subsidies, and international agreements covering trade, fisheries, and the environment. Provides legal grounds for pursuing a fishing capacity reduction program.

Anonymous (19??). "A Plan for the Economic Assessment of Import Restrictions Related to Sea Turtle Protection." NMFS, Washington, D.C.

An outline of a proposed plan to determine the impacts of shrimp import restrictions for countries that do not comply with U.S. regulations for the protection of marine turtles by their shrimp fishing fleet.

Anonymous (19??). "Principles and Practices of Limited Entry System."

Appendix, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, April.

This report, based on the Ad Hoc Limited Entry Committee meeting in New Orleans, discusses the general nature of a limited entry system, relates experiences with the system in certain fisheries in the U.S. and other countries, and describes certain Gulf fisheries that may be amenable to and benefitted by a limited entry management system should the Council pursue the idea of using limited entry as an alternative management system.

Anonymous (19??). "Unknown Title." Source: James Opaluch, Department of Natural Resource Economics, University of Rhode Island, Kingston, RI.

Population dynamics for fish and bird populations.

Anonymous (19??). "The Use of Underages/Overages in the Atlantic Swordfish Fishery." Concept Paper, Highly Migratory Management Division, National Marine Fisheries Service, Silver Spring Maryland.

Presents the concept of annual carryover of overages/underages for the bluefin tuna quota. It suggests that the approach should be thoroughly studied and reviewed by NMFS and the ICCAT Advisory Committee before presentation at the ICCAT meeting.

Anonymous (1972). "Report of the National Marine Fisheries Service Gulf Coastal Fisheries Center, Fiscal Years 1970 and 1971." NOAA Technical Memorandum NMFS SER-1, July, iii + 26 pp., 14 figs., 4 tables.

Progress is reported at the NMFS Gulf Coastal Fisheries Center (formerly the Biological Laboratory, Galveston, Texas). Emphasis is placed on shrimp, and the research involves the fields of mariculture, population dynamics, ecology, and oceanography.

Anonymous (1981). "Estimated Potential Socioeconomic Impacts of a Purse Seine Fleet on the Existing Mackerel Fisheries." Draft report.

A study was conducted to estimate potential social and economic impacts on existing fisheries from the introduction of a new gear, the purse seine, for harvesting king and Spanish mackerel in the southeast region, principally Florida.

Anonymous (1982). "Shrimp 1981." Marine Fisheries Review, 44(9-10):58-59.

A review of the 1981 shrimp fishery, harvesting sector to final consumer with emphasis on prices, imports and inventory levels, and landings in the United States.

Anonymous (1985). "A Probable Scenario for International and Domestic Tuna Fisheries to the Year 1995." White paper, National Marine Fisheries Service.

The scenario presented is considered likely to happen if the forces put into effect by the status quo were allowed to continue unabated until 1995.



Anonymous (1985). "Foreign Trade: Meaning Imports Take 69 Percent of the Market." The Fish Boat, August, 3 pp.

United States imports of shrimp in 1984 set a record at 422.3 million pounds.

Anonymous (1985). "Less Exports From Ecuador." The Fish Boat, August, 2 pp.

Ecuador shrimp exports declined primarily due to a reduced wild harvest of shrimp.

Anonymous (1985). "Shrimping '84: A Matter of More Shrimp Less Money." The Fish Boat, August, 4 pp.

A review of domestic production and consumer demand for shrimp.

Anonymous (1986). "Shrimping '85." The Fish Boat, August: 17-21.

A review of price declines as domestic production and consumer demand for shrimp increase.

Anonymous (1986). "Foreign Trade." The Fish Boat, August: 22-49.

A review of shrimp imports including country of origin and trends over time.

Anonymous (1987). "Philippine Shrimp Culture." Draft report, Office of International Fisheries, Foreign Fisheries Analysis Branch, National Marine Fisheries Service, Washington, D.C. 11 pp.

Shrimp imports have recently become an important source of foreign exchange for the Philippines. An unstable wild catch makes increasing production from aquaculture essential in maintaining these exports. While most sectors of the Philippine economy have shown little or no growth in recent years because of political instability, the shrimp culture industry has grown steadily, more than enough to offset recent fluctuations in the wild shrimp catch. Strong government and official international support, along with active private investment, has contributed much to this growth, and this support is expected to continue.

Anonymous (1987). "United States-Spain Fisheries Trade, 1980-85." Marine Fisheries Review, 49(3):91-96.

A review of the U.S. - Spain trade in fishery products that indicates that U.S. exports to Spain are declining and Spain's exports to the U.S. are on the increase; contrary to what was expected when the 200 mile exclusive economic zone was enacted.

Anonymous (1988). Shrimp Farming in the United States. Aquaculture Digest, San Diego, CA.

The latest information on the major players in United States shrimp farming and a brief overview of the industry.

Anonymous (199?). Economic and Biological Interactions Between the Shrimp and Reef Fisheries in the U.S. Gulf of Mexico. Draft report.

Biologists have determined that the red snapper resource in the Gulf of

Mexico is depleted for several reasons, including the application of too much fishing effort by commercial and recreational red snapper fishermen and the incidental bycatch and discard of juvenile red snapper by the shrimp trawl fleet. The ensuing debate about how best to restore the red snapper population to desirable levels has involved numerous technological, political and economic facets. Among them are: technological interaction in which shrimping gear inadvertently harvests other species, including juvenile red snapper; management interaction between fishery management plans; competition between commercial and recreational fishermen and among fishermen with different gear types within each group; and economic trade-offs over time, among various harvesting groups and between different groups of consumers. It constitutes a management problem that is controversial, challenging, and, as yet, unresolved.

Anonymous (199?). Norway. Draft report.

A review of the groundfish industry in Norway including supply, resource management, bilateral arrangements, and fishing industry.

Anonymous (1992). "King and Spanish Mackerel Prices by Gear." Report, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, June.

King and Spanish mackerel price differentials by gear type exist in two areas in the southeast region. However, data prevents more than a qualitative discussion of the causes.

Anonymous (1993). "The Italian Case." Paper presented at the Workshop on Enforcement Measures, Organization for Economic Co-Operation and Development, Directorate for Food, Agriculture, and Fisheries, Committee for Fisheries, Paris, September 21-22.

In Italy, enforcement measures depend on the management scheme adopted by government policy and on the operating condition of the fishing industry. In particular, biological, technical, economic, social, commercial, and financial features are all considered as constraints in a unique planning exercise when drawing up the management policy to be implemented every three years. The actual conservationist policy, that is part of the whole fisheries management plan, started in 1982 when a licensing scheme was introduced. Since then the decision framework of public administration was centralized and measures have been taken within a triennial planning document approved by the government.

Anonymous (1994). "The Catch About Fish." The Economist, March 19<sup>th</sup>, pp. 13-14.

Overfishing.

Anonymous (1994). "Status of International Trade in Shark Species. Convention on International Trade in Endangered Species of Wild Fauna and Flora, Draft Resolution of the Conference of the Parties, November, 7-18, 2 pp.

A resolution to request data on the international trade in shark products to determine its impact on shark populations world wide.

Anonymous (1994). "An Empirical Model of Pricing in the Catfish Industry." Draft report submitted to Marine Resource Economics.

The adoption of aquacultural products has extended the effects of market forces, creating an imbalance of market power between catfish producers and the processing sector that had exerted a monopsonistic power in certain region such as west Alabama. However, because of the recent changes caused by vertical integration of the catfish industry, the existence of an oligopolistic power has been identified in the catfish industry. An empirical model of pricing in the catfish industry was developed using a theoretical model proposed by Appelbaum. An analysis of the market structure was conducted to provide estimates of conjectural elasticities over time. Conjectural elasticities were used to construct the oligopoly power index. Results show some evidence of the existence of oligopolistic power in the catfish industry that further suggests some degree of price enhancement.

Anonymous (1994). "Management Options for the Royal Red Shrimp Fishery in the Gulf of Mexico." Draft report, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL, July, 13 pp.

A review of the existing data for the royal red shrimp fishery in the Gulf of Mexico. This paper on Phase 1 of the management approach is prepared by NMFS at the request of the Council to provide scientific information and advice and fishery management options for the royal red shrimp fishery resource. Phase 1 is the first step in a series of four steps that are intended to provide the Council with the material for a management plan for this species.

Anonymous (1994). "Options for Reduction of Bycatch in Shrimp Trawls." Tab D, No. 3, Gulf of Mexico Fishery Management Council Briefing Book for the New Orleans Meeting, November, 19 pp.

Briefly discusses the trends in finfish bycatch in the shrimp fishery and proposes bycatch reduction device management regulations to control and reduce the level of finfish bycatch in the fishery. Alternative management measures such as individual transferable quotas for shrimp or license limitation programs to directly control effort or correct the market failure are not presented or discussed.

Anonymous (1994). "Preliminary Alternatives for Management of the Royal Red Shrimp Fishery in the Gulf of Mexico." Preliminary draft report, December, 13 pp.

This amendment provides for management of the fishery for royal red shrimp in the U.S. Gulf of Mexico. Management alternatives include respecification of maximum sustainable yield (MSY), setting total allowable catch (TAC), restricting participation in the fishery, and establishing reporting requirements.

Anonymous (1994). "The Tragedy of the Oceans." The Economist, March 19<sup>th</sup>, pp. 21-24.

Overfishing and pollution are exhausting the seas. The decline will be reversed only if governments stop subsidies to fishing fleets, police their waters well, and hardest of all, persuade fishermen to trust them.

Anonymous (1995). Bio-Economic Modelling in the EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 148-158.

Proceedings of a workshop on bioeconomic modeling in the European Union.

Anonymous (1995). Demand for Imported Shrimp in U.S.: An Application of Transcendental Logarithmic Demand System. Draft report.

Since the early 1980's, U.S. shrimp imports have been experiencing a transition from wild-caught shrimp to farm-raised products. This paper sought to analyze the U.S. demand for shrimp products. Using the Transcendental Logarithmic Demand System (TL), the findings show that demand is inelastic for all shrimp products. Nonlinear impacts and joint impacts of expenditures are significant. No significant shifts in preferences for the U.S. shrimp consumers have happened.

Anonymous (1995). The Dynamics of Regulated Open Access Resource Use. Draft report.

This paper models interaction between a regulatory agency and an open access industry exploiting a resource. Both groups are modeled with plausible behavioral assumptions and the joint dynamics of their interaction are examined. The qualitative nature of the interaction depends upon relative response speeds as well as other structural parameters.

Anonymous (1995). Individual Transferable Quotas: Modeling Participation and Exit Decisions. Draft report.

This paper analyzes labor/leisure choices for individual fishermen jointly with their quota demands. The model is suitable for analyzing some important issues in ITQ design, particularly determinants of exit/participation decisions. The model suggests how personal characteristics interact with market variables to influence the exit/stay decision and participation.

Anonymous (1995). "Possible Options for Controlled Access to the Spanish Mackerel Fishery Under the Jurisdiction of the South Atlantic Fishery Management Council." Draft NEPA Scoping Document.

This paper discusses various options for managing the Spanish mackerel fishery under controlled access. A brief description of the fishery is presented, followed by a discussion of the problems in the fishery that could be solved by a controlled access regime. A number of instruments that could be utilized under controlled access are discussed. These range from what could be considered as the most free market situation, to instruments that could impose certain restrictions, and finally to a no action situation. Some comments are provided on deciding the process of how to decide on initial eligibility, and how to set the initial TAC. The discussions are broad based enough to give the public an opportunity to evaluate the different options.

Anonymous (1995). "Rent and Development Issues in the Pacific Islands Tuna Fishery." Draft Working Paper IV, The World Bank, Washington, D.C.

The potential rents that could be generated by the tuna fisheries in the south Pacific under proper management are estimated. While it is recognized that optimal rents generated by the fishery cannot be accurately estimated based simply on summaries of observed data, an in-depth analysis to determine the level of rents generated by the fishery was not conducted. Rents were estimated to be between 10% and 15% of the value of the resource with current fishing fees averaging 4% to 5%. The implication is that increases in fees to nations controlling the fishing grounds would be appropriate.

Anonymous (1995). "Rents and Taxes in an Individual Transferable Quota Fishery." Draft manuscript, Marine Resource Economics.

Taxing pure rents is usually considered the least distortionary method for raising revenues. In the literature on fishery economics, the term "rent" is regularly employed, suggesting that pure rents exist in that sector. Indeed, with the recent development of individual transferable quotas, the resulting market value of quota has been treated as reflecting pure resource rents. In this paper, the view that the market value of quota represents a pure rent that can be readily extracted in a nondistortionary manner by the taxing authority is challenged.

Anonymous (1995). "Shrimp License Management." In An Act Relating to the Authority to Establish License Management Programs for Commercial Fishing, Section 1, Chapter 77, Parks and Wildlife Code, Subchapter F, January.

A law proposed by the Texas State Legislature requiring transferable licenses for inshore, commercial bay and bait shrimp boats.

Anonymous (1995). Spatial Modeling Environment References. Unknown source.

A list of references to aid in the development of ecological and economic systems models using spatial modeling techniques.

Anonymous (1996). Coordination of United States and International Efforts to Improve the Management of Fishing Capacity. Proposal, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD.

This paper identifies and suggests coordination for U.S. and international efforts planned or in process to improve the management of fishing capacity.

Anonymous (1996). "Economics Without Free-Disposal: The Problem of Quota-Induced Discarding in Heterogenous Fisheries." Draft manuscript, Journal of Environmental Economics and Management.

Individual quota (IQ) programs are a promising and increasingly common means of regulating fisheries. This paper examines how profit maximizing fishers respond to different types of IQ programs in fisheries where many types of fish are harvested simultaneously. The paper first specifies a joint production function for the fishery. Using this technology, the responses of profit maximizing fishers to different IQ programs are analyzed. This analysis shows first that the most common types of individual quota program can induce discarding, and second that of all possible individual quota programs, only those that regulate the value of harvest never induce discarding. Since discarded fish have a high mortality rate, value-based individual quota programs are superior to their more conventional counterparts in that they waste fewer fish. These results are driven by the fact that the fishing technology examined here does not satisfy a free-disposal assumption. Since this free disposal assumption is ubiquitous in production theory, and not obviously true, the framework developed herein is useful for analyzing a broad class of problems involving joint production.

Anonymous (1996). An Overview of the Impacts on the Biological Status of Sharks. Draft Animals Committee Discussion Paper Pursuant to Cites Resolution Conf. 9.17, August, 7 pp.

The executive summary from a paper that provides an overview of the

impacts on the biological status of shark populations worldwide. The biological characteristics of sharks are reviewed along with the analytical problems deriving from the limited available data on sharks worldwide. Current or potentially negative influences on shark populations are outlined, including directed commercial and recreational fisheries, bycatch and discards of sharks, overexploitation of prey species, habitat degradation in pupping and nursery areas, and beach netting. An overview of these impacts is provided by region and country. Methods currently employed to address these impacts are discussed as well as actions taken to date by international scientific and fishery organizations. The conclusions address issues required to develop a more complete understanding of the biological status of sharks worldwide.

Anonymous (1996). Summary of State Regulations Affecting Shark Resources By States Maine Through Texas. Meeting of the Shark Operations Team, Highly Migratory Species Management Division, National Marine Fisheries Service, Silver Spring, MD, August 27-28, 2 pp.

The states from Maine through Texas were surveyed during June 1996 to determine what regulations exist that either directly or indirectly affected the harvest of shark resources. These regulations are summarized in this document.

Anonymous (1997). Coordination of United States and International Efforts to Improve the Management of Fishing Capacity. Proposal, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD.

This paper identifies and suggests coordination for U.S. and international efforts planned or in process to improve the management of fishing capacity.

Anonymous (1997). Discussion Paper on Supply and Demand Projections for Fish and Fisheries Products. Submitted by Japan for the Eighth FWG, APEC.

A proposal to conduct supply and demand analysis for fishery products in the APEC region.

Anonymous (1997). MRFSS Economic Add-On Survey. Version May 3, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL.

Add on intercept survey instrument for recreational valuation study.

Anonymous (1997). Untitled. Draft report, National Marine Fisheries Service.

Quota monitoring report that reviews the current status of red snapper landings in the Gulf of Mexico.

Anonymous (1997). Bibliography for the Florida Keys National Marine Sanctuary Socioeconomic Monitoring Plan. National Oceanic and Atmospheric Administration, Silver Spring, MD.

A set of references on the economics related to marine sanctuaries in the Florida Keys.

Anonymous (1998). A Brief Summary of Existing Situation of Relevant High Sea Stock, in Particular for Highly Migratory Species. Japan, Technical Working Group on the Management of Fishing Capacity, La Jolla California, U.S.A., April 15-18, 3 pp.

This paper is intended to review the situation of high seas resources and fisheries targeting at them in the hope to contribute to the discussion at the Expert Meeting on management of Fishing Capacity to be held in April this year. In assessing the degrees of fishing capacity, the starting point should be clarification of the present state of resources and fisheries. The fishery resources dealt in this paper include tuna, bottom fishes and salmon. This paper utilizes to the fullest extent the present knowledge available on the state of many of the high seas resources and fisheries shared by regional fisheries management organizations.

Anonymous (1998). Broader Policy and Institutional Considerations. Draft Report, Working Group 4, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 5 pp.

A series of recommendations on policy issues related to the management of capacity on a national and international basis are presented. Institutional requirements include the establishment of a registry of vessels and boats in the fishing industry and the collection of economic data necessary to study the dynamics of entry and exit behavior in the fishing fleet. Co-management was strongly recommended as a means of controlling excess capacity and subsidies were discouraged.

Anonymous (1998). The Deep Green Sea. The Economist, May, 23.

A survey of issues concerning the use of the oceans as a commons.

Anonymous (1998). FAO Consultation on Fishing Capacity. Draft Report, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 1 pp.

Proposal for working definitions of key terms to be adopted by the Technical Working Group.

Anonymous (1998). Incentive Blocking Control Methods: Preparation of Guidelines. Day 1 Report, Working Group 2, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18.

Whilst incentive blocking methods are frequently seen as problematical, there are many fisheries in both developed and developing situations where they offer a viable (and often the only alternative) to managing capacity. It is considered that in general the well known shortcomings associated with incentive blocking mechanisms have been managed poorly, and in the light of experience, such measures can be and are used successfully in certain circumstances.

Anonymous (1998). Incentive Blocking Control Methods & High Seas. Working Group 2, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18.

An agenda to facilitate discussion of incentive blocking methods to control fishing capacity in high seas.

Anonymous (1998). Issues in the Management of Capacity. Draft Report, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 3 pp.

An issue paper raising concerns and opinions for discussion at the Technical Working Group.

Anonymous (1998). Management of Fishing Capacity. U.S. Position Paper, October 26-30, FAO Consultations.

The U.S. position on adopting a global plan of action for the management of fishing capacity.

Anonymous (1998). Measurement & Monitoring of Fishing Capacity. Working Group 1, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18.

An agenda to facilitate discussion of incentive blocking methods to control fishing capacity in high seas.

Anonymous (1998). Recreational Value of Sport-Boat Fishing: Corpus Christi Bay, Texas. Draft.

This study applies the travel cost model using survey data collected by the Texas Parks and Wildlife. The demand model for sport-boat fishing was estimated empirically using a Maximum Likelihood approach, which recognizes that the travel cost data are of a discrete nature and subject to systematic truncation. The estimates generated in this study validate the notion that the sport-boat fishing services provided by the Corpus Christi Bays are significant, and that improvements in habitat and water quality could result in significant gains in economic value.

Anonymous (1998). Report of Working Group 3 on Incentive Adjusting Control Methods and Reduction of Capacity. Draft Report, Working Group 3, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 5 pp.

Incentive adjusting control methods include individual quotas, taxes, group fishing rights, and individual effort quotas because they tend to improve or tighten the connection between those persons making fishery management and capacity decisions and the persons bearing the full consequences of those decisions. If the consequences are entirely borne by the decision maker, there are no external effects of the decision and the decision-maker tends to act in the social interest when serving his self-interest. It is important to realize that the different incentive adjusting control methods have widely different implications in terms of wealth generation and, in particular, its distribution. These methods potentially could lead to reductions in fishing capacity if properly applied in certain fisheries.

Anonymous (1998). Surf Clam Advisory Report. Report to the Mid-Atlantic Fishery Management Council, Annapolis, MD, March.

Report on the biological status of the surf clam and ocean quahog fishery in the mid-Atlantic ocean.

Anthony, Vaughn C. (1990). Fundamentals of Fisheries Management -- The Resource. National Marine Fisheries Service, Northeast Fisheries Center, Woods Hole, MA, October, 88 pp.

An explanation of the assessment of single species fish stocks, their fisheries, and an explanation of the procedures, advantages, and problems of different management techniques is provided. The multispecies problem, environmental effects, and the very important subject of risk are touched on in the paper. The social and economic options that are so very important in adjusting the optimum biological yields are not discussed.



Antozzi, William O. (1993). "Import and Export Trends for Selected Seafood Products of Interest to the Southeast, January to June, 1993." Draft report, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL.

This report is a six month update to the annual report on import and export trends. Products and countries were selected based on relevance to current trade negotiations. Original trade data has been compiled by the Bureau of the Census and the National Marine Fisheries Service. Sources of explanatory information include U.S. foreign embassy reports and U.S. seafood product exporters and importers.

Appeldoorn, R., J. Beets, J. Bohnsack, S. Bolden, D. Matos, S. Meyers, A. Rosario, Y. Sadovy, and W. Tobias (1992). "Shallow Water Reef Fish Stock Assessment for the U.S. Caribbean." NOAA Technical Memorandum, NMFS-SEFSC-304, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Miami, Florida, March, 70 pp.

A stock assessment workshop examined fishery trends for shallow water reef fishes in the U.S. Caribbean based on available fishery landings and biostatistical data. Puerto Rico, St. Croix, and the combined St. Thomas/St. John areas were chosen as appropriate geographical units for analysis. The workshop focused on comparing 1985 with 1990 because the data for these years were nearly complete. Trends in catch per unit effort were examined using data from other years when sufficient data were available. Deep water reef fishes, although technically not included in the Shallow Water Reef Fish Fishery Management Plan, were also examined because of their importance to the reef fish fishery.

Aquatic Farms, Ltd (1989). "Asia-Wide Shrimp Agro-Industry Sector Study." "Final report submitted to The World Bank, 1818 H Street, N.W., Washington, D.C. 20433, June, 283 pp.

This study provides an analysis of global marketing trends in demand and supply for shrimp exports including price and volume projections; and a review of the shrimp subsector in seven Asian countries (India, Bangladesh, Thailand, Malaysia, Indonesia, Philippines, and China), indicating potential areas of financial and technical assistance in the development of shrimp agro-industries. The study assesses the scope for the expansion of shrimp exports from the seven countries and determines assistance needs in the development of shrimp aquaculture.

Araujo, A. and J.A. Scheinkman (1983). "Maximum Principle and Transversality Condition for Concave Infinite Horizon Economic Models." Journal of Economic Theory, 30:1-16.

Necessary conditions for optimality in infinite horizon concave maximization problems, that include a generalized "Euler Equation" and a transversality condition at infinity, are established. The formulation admits implicit state constraints and utility functions with infinite steepness at the boundary. For these reasons support prices present discontinuities and a theorem characterizing such discontinuities is present.

Armstrong, C.W. (1994). "Cooperative Solutions in a Transboundary Fishery: The Russian-Norwegian Co-Management of the Arcto-Norwegian Cod Stock." Marine Resource Economics, 9(4):329-351.

To focus on the necessity of justifying a specific choice of cooperative solution for applied analysis, a cooperative game theoretic setting is used to describe possible solutions for the Russian-Norwegian joint management of the migratory Arcto-Norwegian cod stock. Three different cooperative solutions, as well as cooperative compensated solutions to the problem, are introduced and discussed. The cooperative solutions are compared to one another in terms of the parties' preferences, threats and maximum points, and further set into a context of compensated exchange. Based on the cooperative and compensated solutions discussed, a negotiation framework is established in which four distinct stages of decision making can be identified. Finally, the different solutions are discussed in the setting of Norway and Russia's current political and economic environment. The so called Salukvadze solution, compensated or not, can be seen to be an appropriate solution to the fisheries problem. The compensation must be paid over time to Russia.

Arnarson, Ingolfur (199?). A Fishery Management Model. The Case of the Olympic System with an Application to Alaska. Working Paper, Oregon State University, Oregon, 34 pp.

This model of an Olympic System fishery treats biological factors as exogenous variables and emphasizes the capture of economic and institutional change under different fishery management schemes. The model works on a multi-product, multi-sector, and multi-species basis either seasonally or annually. The model does not include capital flow in the sector and as such is a short term model.

Arnarson, Ingolfur and Pall Jensson (199?). The Impact of Product Mix on Optimal Fishing Quota. Working Paper, Oregon State University, Oregon and University of Iceland, 15 pp.

In this paper, we focus on the impact of product mix decisions made by operators in the fisheries on the sales prices and on the optimal individual fishing quota allocated to each vessel. It is shown that an optimal fisheries management scheme cannot be determined without considering the market prices and the production attributes of the fish products. Also, contrary to the results of fisheries economic models to now, it is not necessarily optimal to give as high a quota as possible to each vessel, and thus to operate as few vessels as possible.

Arnarson, Ingolfur and Pall Jensson (199?). Simulation Model of Factory Trawler Operation. Working Paper, Oregon State University, Oregon and University of Iceland, 19 pp.

The paper describes a model with simulates a factory trawler, haul by haul and trip by trip. The case of a factory trawler is chosen because it has both the catching and the processing operations. A LP model is embedded to plan the processing of each haul s catch. Among the many potential applications of the model, the two discussed in the paper are the testing of decision support systems and an analysis of the impacts of different fisheries management schemes on the individual firms.

Arnarson, Ingolfur and Richard S. Johnston (199?). A New Approach to Fishery Management with a Application to the Fisheries in Gulf of Alaska and Bering Sea. Working Paper, Norwegian College of Fishery Science, University of Tromsøe, Norway and Department of Agricultural and Resource Economics, Oregon State University, Oregon, 34 pp.

A linear programming approach to multi-species, multi-product fishery management based on an institutional analysis of weak and strong ownership of

living marine resources is proposed for the Alaskan groundfish fishery.

Arnason, Ragnar (1989). "Minimum Information Management with the Help of Catch Quotas." In P.A. Neher et al (eds.) Rights Based Fishing, p. 215-241.

This paper argues that in most ocean fisheries the data requirements for the calculation of optimal tax rates, catch quotas, etc. greatly exceed the capacity of any resource manager. It follows that management systems based on such approaches are of little practical use. On the other hand, there appear to exist institutional arrangements that allow the resource manager to take advantage of the market mechanism to solve the management problem. This paper addresses this issue. It attempts to specify institutional arrangements of the fisheries and management procedures that permit optimal management with minimal use of extraneous information. This is referred to in the paper as minimum information management schemes (MIMS).

Arnason, Ragnar (1993). "On Catch Discarding in Fisheries." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

This paper finds that the imposition of an ITQ program on a fishery in which differential market grades exist will lead to increased discarding of the smaller fish.

Arnason, Ragnar (1993). "The Icelandic Individual Transferable Quota System: A Descriptive Account." Marine Resource Economics, 8(3):201-218.

This paper provides a brief description of the evolution and current structure of the individual quota system (IQ) in the Icelandic fisheries. This particular fisheries management system was introduced at different times in different fisheries-in the herring fisheries in 1976, in the capelin fishery in 1980, and the demersal fisheries in 1984. Since 1990 all Icelandic fisheries have been subject to a uniform system of individual transferable quotas (ITQs).

The paper discusses the social and economic impetus for the initial adoption of the ITQ fisheries system in the various fisheries, sketches its subsequent development and describes the key elements of the current system. Assessments of the economic impact of the ITQ system are presented in the last part of the paper. Although a definitive study of this impact is not available, the various indicators presented generally indicate an improvement, sometimes substantial one, in the economic efficiency of the fisheries in question.

Arnason, Ragnar (1994). "On Catch Discarding in Fisheries." Marine Resource Economics, 9(3):189-207.

This paper examines the economics of catch discarding in fisheries. To study this issue a simple dynamic fisheries model is constructed. On the basis of this model, it is demonstrated that in a differentiated fishery discarding of catch may be socially optimal. The paper goes on to show that individual firms in a free access, competitive fishery employ the socially optimal discarding rule. In contrast, the individual transferable quota (ITQ) fisheries management regime tends to generate an excessive incentive for discarding catch. The problem, however, does not appear to derive from the ITQ system as such. Rather, it seems to depend on the imperfect application of the system to real fisheries. The concept of a discarding function is defined and it is shown that at least within the framework of the model

employed the discarding function for an ITQ fishery dominates the one for free access, competitive fisheries. Numerical examples are provided. Finally, possible remedies of the discarding problem are briefly discussed.

Arnason, Ragnar (1995). On Selectivity and Discarding in an ITQ Fishery. In, Bio-Economic Modelling in the EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 92-99.

The theory on discarding of catch at sea demonstrates that an unmodified application of the ITQ fisheries management system induces an incentive for discarding of fish in excess of what is socially optimal. In fact, the basic result is that there is no simple relationship between discards and the two management systems of ITQ fisheries management and an unmanaged fishery. Discards may either increase or decrease as a consequence of the introduction of an ITQ management system depending upon the fishing gear selectivity and fishing ground choice made by the participants. Although the tendency to discard harvested fish may increase under an ITQ fisheries management system, the impact of the same system on harvesting selectivity may actually lead to a reduction in the total volume of discards.

Arnason, Ragnar (1998). Ocean Fisheries Management: Implications for the Volume and Quality of Fish Supply. Fisheries Research, 34: 215-225.

This paper considers the probable impact of improved fisheries management on the volume and quality of fish supply. It is shown that the transition from a rent dissipation equilibrium (where most open access fisheries find themselves) to an economically efficient equilibrium may just as easily entail a decrease as an increase in the volume of harvest. Indeed, given the current level of the world's fish stocks, it appears unlikely that the current trend toward economically efficient fisheries management regimes will result in a significant increase in the worldwide supply of marine catches. Therefore, it seems that a sustained increase in the future volume of fish supply must continue to come from fish farming. The movement toward more efficient fisheries management regimes is, on the other hand, likely to substantially enhance the quality of landed catch. Due to fish stock and fishing capital dynamics, however, this effect is likely to be stronger in the short rather than the long run.

Arnason, Ragnar (1998). Notes on the Impact of ITQs in Iceland. Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 5 pp.

The individual vessel quota system in Iceland seems to have yielded considerable economic benefits. New investment in fishing capital has been reduced and the fishing fleet has contracted. In some fisheries, the number of operating units has dropped significantly. Fishing effort has also been significantly reduced. Finally, estimates of the actual economic rents generated by the system as well as analysis of quota values strongly indicate that very substantial economic benefits are already being generated by this management system.

Arndorfer, David J. and Nancy Bockstael (1986). "Estimating the Effects of King Mackerel Bag Limits on Charter Boat Captains and Anglers." Prepared under contract for the National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149 by Environmental Resources Management-North Central, Inc., Suite 200, 835 Sterling Avenue, Palatine, Illinois 60067.

This report researches techniques for estimating the effects of bag limits on recreational anglers, and provides preliminary estimates for the recreational anglers in Panama City Beach and Destin, Florida as part of a pilot study of the charter boat industry in northwestern Florida.

Arnold, Vic (196?). "Shrimp." Unpublished working paper.

In this study, vessels from 13 major Gulf of Mexico shrimp ports were surveyed to determine their cost and earning structure. This information was combined with effort data for a sample of vessels spending 50 percent or more of their time on the Tortugas shrimp grounds. Using both these series of data, broken down into vessel size categories and specifying the distribution of landings between three Florida ports, a linear programming model was developed for the expressed purpose of determining the optimal patterns, the distribution of species and the cost components of vessel operations. Using constraints based on various assumptions, results were derived that suggested considerable differences from current port use patterns. Social benefits derived from their application demonstrate the value of this technique.

Arnott, Richard J. and Joseph E. Stiglitz (1979). "Aggregate Land Rents, Expenditure on Public Goods, and Optimal City Size." The Quarterly Journal of Economics, 43(4):471-500.

This paper explores the relationship between aggregate land rents and public expenditure in a residential urban economy.

Arrow, Kenneth J. (1964). "Optimal Capital Policy, the Cost of Capital, and Myopic Decision Rules." Annals of the Institute of Statistical Mathematics, 16:21-30.

The rule for an optimal investment policy requires equating at any moment of time, the instantaneous marginal productivity of capital to  $C(t)$  which is determined by depreciation conditions and the future course of the rate of interest and is independent of the profit function. This rule is myopic in that the future movements of the profit function play no role in the determination of the current stock of capital and therefore of current investment. The rate of interest in question is the instantaneous or short-term rate, not as usually assumed a long-term rate and the depreciation (replacement) component is not purely technological but in general depends on future interest rates.

Arrow, Kenneth J. and Sheldon Chang (1982). "Optimal Pricing, Use, and Exploration of Uncertain Natural Resource Stocks." Journal of Environmental Economics and Management, 9:1-10.

Units of natural resources to be called "mines" are assumed distributed over an unexplored territory according to a Poisson process in space. At any moment, total reserves and unexplored land are given. Society can determine the rate of consumption and the rate of exploration. Reserves are drawn down by consumption and increased by discoveries made during exploration; the amount of unexplored land is decreased by exploration. At any moment, the payoff of society is a concave function of consumption less a linear function of exploration with future payoffs discounted. Optimal policies are considered and, in particular, it is shown for a large amount of unexplored land the shadow prices of reserves and of unexplored land move in random cycles but show only a slight upward trend, thereby casting some light on the failure of mineral prices to rise at the market rate of interest.

Arrow, Kenneth J. and Mordecai Kurz (1970). Public Investment, The Rate

of Return, and Optimal Fiscal Policy. Resources for the Future, Inc., The Johns Hopkins Press, Baltimore.

A path breaking formulation of the problems of public expenditure in the context of modern economic growth theory has been produced in this book. The authors tie the determination of the allocation of resources between public and private sectors to the goal of getting the economic system onto an efficient growth path. While the models utilized are highly abstract, there are provocative implications for the determination of the appropriate discount rate and the entire process of economic planning.

Arrow, Kenneth, Robert Solow, Paul R. Portney, Edward E. Leamer, Roy Radner, and Howard Schuman (1993). "Report of the NOAA Panel on Contingent Valuation." Panel report, National Oceanic and Atmospheric Administration, Washington, D.C.

Following the introduction, the drawbacks to the CV technique are discussed in Section II. Section III discusses several key issues concerning the design of CV surveys, including use of the referendum format to elicit individual values, ways of addressing the so-called "embedding" problem, and the evaluation of damages that last for some period but not forever. Section IV presents guidelines to which the Panel believes any CV study should adhere if the study is to produce information useful in natural resource damage assessment. In Section V a research agenda is described; it is the Panel's belief that future applications of the CV technique may be less time consuming and contentious if the research described in the agenda is carried out. Section VI presents the Panel's conclusions.

Asche, Frank (1997). Trade Disputes and Productivity Gains: The Curse of Farmed Salmon Production? Marine Resource Economics, 12(1):67-73.

The relationship between productivity developments and price declines in salmon farming using Norwegian data is the focus of this paper. This is of interest because international trade conflicts in relation to farmed salmon between Norway, the largest producer, and the producer nations with poor profitability have resulted in trade restrictions on several occasions.

Ashford, Lori S. and Jeanne A. Noble (1996). Population Policy: Consensus and Challenges. Consequences, 2(2):24-36.

A consensus was developed at the International Conference on Population and Development held in Cairo in 1994 that recognizes that consumption in wealthy countries and rapid population growth in poor countries put pressure on the natural environment, both locally and globally. Yet, rather than simply equating population policy with family planning, the new thinking is that population growth should be stabilized by attacking some of the roots of the problem: by improving women's access to education, health care, and economic and political decisions. How the consensus emerged, what it will cost to implement a world program of action, and the challenges that governments in rich and poor countries face in addressing these issues is reviewed here.

Asian Pacific Economics Committee Fisheries Working Group (1997). Trade and Investment Liberalization in Fisheries, Phase I: Tariffs. Draft Report, Los Cabos, Mexico, June 11-12.

This report on tariffs is the first of a four part fisheries sector trade study program aimed at providing a better understanding of the fisheries tariffs among the APEC economies. High tariffs that serve as an impediment to

trade, are highlighted in the report.

Asian Pacific Economics Cooperation (1997). Inventory of Fisheries Administrations and Organizations in APEC Member. Fisheries Working Group, Singapore.

This inventory provides basic information on fishery administrations and organizations of APEC members to improve understanding among APEC members and facilitate coordination and cooperation among the relevant fishery agencies and organizations of APEC members.

Assaf, George B., Brent G. Kroetch, and Subodh C. Mathur (1986). Nonmarket Valuations of Accidental Oil Spills: A Survey of Economic and Legal Principles. Marine Resource Economics, 2(3):211-237.

This paper presents an overview of legal and economic theories used to assess liability and damages for loss of nonmarket goods arising from an accidental oil spill. Several different economic methods used for quantifying values are discussed and critiqued. Also reviewed are the fundamental legal doctrines that permit individuals and public agencies to seek compensation for these damages. To illustrate the applicability of these economic and legal theories, two case studies are presented and evaluated in terms of the principles presented earlier.

Atkinson, Scott E. (1983). "Marketable Pollution Permits and Acid Rain Externalities." Canadian Journal of Economics, 16:704-722.

This paper examines the economic implications of currently proposed marketable pollution right (MPR) systems for attaining ambient air quality standards in local airsheds. We show that (1) the magnitude of local control costs for one MPR system must be less than or equal to that under the current pollution control system and (2) if this MPR system significantly reduces local costs of control, it must significantly increase local ambient degradation and, with high probability, the extent of long range sulfate deposition. A simulation for a region of the Ohio River Basin indicates that the cost saving and increased ambient degradation and sulfate deposition in the Northeast and Canada should be large.

Atkinson, Scott E. and T.H. Tietenberg (1982). "The Empirical Properties of Two Classes of Designs for Transferable Discharge Permit Markets." Journal of Environmental Economics and Management, 9:101-121.

Previous work by Atkinson and Lewis and Anderson et al. has indicated the tremendous cost advantages to be achieved by moving from a policy based on emission standards to one based on marketable emission permits. As Tietenberg points out, however, neither of the major permit designs treated in the literature are optimal from all points of view. This has triggered a search for alternative permit designs, that while they may not minimize compliance costs have sufficient other virtues as to make them attractive on other grounds. The purpose of this paper is to examine, within the context of an empirical mathematical programming model, the air quality emission, and cost consequences of two classes of the permit designs that can be implemented in the absence of information on control costs. This case study involves particulate control in St. Louis.

Atkinson, Scott E., Christopher Cornwell, and Olaf Honerkamp (1999). "Measuring and Decomposing Productivity Change: Stochastic Distance Function Estimation vs. DEA." Draft Report, Department

of Economics, University of Georgia, Athens, GA, August, 26 pp.

Linear programming techniques have been widely used to compute Malmquist indices of productivity change as ratios of fitted distances from a convex hull frontier. These indices are then decomposed into technical and efficiency change. However, since this approach is non-stochastic, inference is problematic. Further, although the Malmquist index is valid for any degree of returns to scale, productivity change is measured relative to a constant returns to scale frontier. As an alternative, we develop and estimate a flexible stochastic distance frontier which allows for statistical inference and imposes no restrictions on returns to scale. We indicate how productivity change can be decomposed into technical and efficiency change and specify an appropriate generalized method of moments strategy. Finally, comparisons are drawn between the stochastic and non-stochastic methods using a panel of electric utilities.

Atlantic Coastal Cooperative Statistics Program (1998). Social and Economic Surveys for Commercial Harvesters. Appendix D.

Survey of commercial and recreational economic data questionnaire forms.

Atlantic States Marine Fisheries Commission (1998). Study of Federal Investment. Draft report. 1444 Eye Street, N.W., Sixth Floor, Washington, D.C., December.

The historical background of the development of government fisheries policy including efforts to promote the development of fishing activity and efforts to conserve fishery resources provides an introduction to two broad concept papers on subsidy issues and capacity as they apply to fisheries.

Atran, Steven (1994). "Quick Estimate of Recreational Red Snapper Reduction From a 15" Size Limit." Memorandum to the Stock Assessment Panel, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 W. Kennedy Blvd., Tampa, FL, November, 26 pp.

A "back of the envelope" type analysis of the impact of a 7 fish bag limit/15" size limit regulation on recreational pounds of red snapper harvest for 1995.

Atran, Steven (1997). "Gulf of Mexico Recreational Red Snapper Closes Nov. 27. Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, Florida, November, 3 pp.

Answers to a series of questions concerning red snapper biological assessments and data collection techniques.

Attaran, Mohsen and Massoud M. Saghafi (1988). "Concentration Trends and Profitability in the U.S. Manufacturing Sector: 1970-84." Applied Economics, 20:1497-1510.

It has been suggested that the U.S. economy is becoming more concentrated and less competitive. Concentration is also claimed to affect the return and risk of companies. In this paper, using the entropy technique, the concentration index for the manufacturing sector of the U.S. economy has been computed and the concentration trend has been analyzed. Furthermore, the impact of concentration on return and risk of manufacturing companies is investigated.



Attaran, Mohsen and Martin Zwick (19??). "An Information Theory approach to Measuring Industrial Diversification." Journal of Economic Studies, 16(1):19-30.

Paper presents the Shannon entropy measure of diversity to determine concentration in a market.

Ault, Jerald S., James A. Bohnsack, and Geoffrey A. Meester (1998). A Retrospective (1979-1996) Multispecies Assessment of Coral Reef Fish Stocks in the Florida Keys USA. Draft report presented at the National Stock Assessment Workshop, National Marine Fisheries Service, Key Largo, FL.

A baseline assessment for 35 economically and ecologically important Florida Keys reef fish stocks is provided using a systems approach that integrates sampling, statistics, and mathematical modeling. Quantitative fishery independent data from reef fish visual surveys conducted by SCUBA divers from 1979-1995 were used to develop estimates of population abundance, assemblage composition, and stock structures in relation to key physical and habitat factors. Exploitation effects were assessed using a new length-based algorithm that calculates total mortality rates from estimates of average length of fish in the exploitable phase of the stock. These estimates were highly correlated for two statistically independent headboat catches. We developed a reef fish equilibrium exploitation simulation (REEFS) model and used estimates of fishing mortality to assess yield per recruit relative to fishing intensity and gear selectivity, and spawning potential ratio (SPR) relative to U.S. federal overfishing standards. Our analysis show that 13 of 16 groupers (Epinephelinae), 7 of 13 snappers (Lutjanidae), one wrasse (Labridae), and 2 of 5 grunts (Haemulidae) are below the 30% SPR overfishing minimum. Some stocks appear to have been chronically overfished since the late 1970's. The Florida Keys reef fish fishery exhibits classic serial overfishing in which the largest, most desirable and vulnerable species are depleted by fishing. Rapid growth of the barracuda population (Sphyraenidae) during the same period suggests that fishing has contributed to substantial changes in community structure and dynamics.

Austin, C. Bruce (1981). "A Interpretive Review of Socio-Economic Study of Mackerel Purse Seine Fishery." Task II Report, South Atlantic Fishery Management Council, One Southpark Circle, Ste. 306, Charleston, South Carolina, May, 24 pp.

This report summarizes the results of the analysis and interpretations of the data collected under task II of a contract to study the mackerel purse seine fleet in the south Atlantic.

Austin, C. Bruce, Robert D. Brugger, J. Connor Davis, Donald P. deSylva, and David M. Kittrell (1976). "Summary of a Survey of Recreational Billfish and Tuna Fishing Boats Along the East and Gulf Coast States." Report to National Marine Fisheries Service, September.

An analysis of 700 questionnaires on recreational fishing for billfish that survived a fire at the Rosenstiel School of Marine and Atmospheric Science collected in 1967-68.

Azzam, Azzeddine M. and John R. Schroeter (1995). The Tradeoff Between Oligopsony Power and Cost Efficiency in Horizontal Consolidation: An Example from Beef Packing. American Journal of Agricultural Economics, 77(4):825-836.

In this paper, we model the tradeoff between regional oligopsony power and cost efficiency resulting from consolidation in a food processing industry. The model can be used to calculate the cost reductions necessary to offset the anticompetitive effects of market power and to compare them to actual cost savings achieved through plant scale or multiplant operating economies. For an application, we choose the beef packing industry. For this case, we find that the estimated cost savings necessary to neutralize the anticompetitive effects of consolidation in beef packing are about half the actual cost savings from scale economies.

Babson, Bob (1994). "Limitations on Foreign Ownership of IFQ." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, General Council, Alaska Region.

A legal discussion of the foreign ownership of individual fishery quota (IFQ). Just as is required for domestic vessels, the Anti-Reflagging Act requires majority domestic ownership of IFQs.

Bailey, Michael (1995). Meeting of the Shark Operations Team. Summary Report, National Marine Fisheries Service, Highly Migratory Species Management Division, Silver Spring, MD, June 8<sup>th</sup>.

Report summarizing the shark operations team meeting where the annual stock access was presented. The meeting is summarized and recommendations for future management actions are taken. Also includes Rusty Hudson's comments on the shark stock assessment and need for management action.

Bailey, Michael (1995). Options for Establishing an Interim Permit Moratorium and Eligibility Criteria for the Atlantic Shark Fishery. Draft Report, National Marine Fisheries Service, Highly Migratory Species Management Division, Silver Spring, MD, July.

This paper discusses possible options for controlling access to the Atlantic shark fishery via a permit moratorium.

Bailey, Michael (1996). Atlantic Sharks Fishery Management. National Marine Fisheries Service, Highly Migratory Species Management Division, Silver Spring, MD.

Management history and fact sheet.

Bailey, Michael (1996). Atlantic Sharks, Specific Data Needs. National Marine Fisheries Service, Highly Migratory Species Management Division, Silver Spring, MD.

A listing of information necessary for the management of shark species. Includes biological, fisheries, assessment and management, and socioeconomic data and analyses.

Bailey, C. Michael (1996). The Integrated Shark Research and Management Program (ISHARK). 1996 Semi-annual Report, National Marine Fisheries Service, Highly Migratory Species Management Division, Silver Spring, MD.

A summary of the ISHARK program accomplishments during 1996 to augment and improve biological and economic data related to the shark fisheries of the United States.

Bainton, Barry, John Catena, and Dick Allen (1987). "Matching Capital to Resources in the Fish Harvesting Industry, Limited Entry and/or Other Alternatives." Background Paper for the Conference, Atlantic Offshore Fishermen's Association.

The central issue is how are decisions affecting capitalization in the fish harvesting industry made, and how can they be influenced to avoid overcapitalization.

Baker, Gregory L. and Jerry P. Collub (1990). Chaotic Dynamics. Cambridge University Press, New York.

Do not have a copy of this one yet.

Bakun, Andrew (1990). "Global Climate Change and Intensification of Coastal Ocean Upwelling." Science, 247:198-201.

A mechanism exists whereby global greenhouse warming could, by intensifying the alongshore wind stress on the ocean surface, lead to acceleration of coastal upwelling. Evidence from several different regions suggest that the major coastal upwelling systems of the world have been growing in upwelling intensity as greenhouse gases have accumulated in the earth's atmosphere. Thus the cool foggy summer conditions that typify the coastlands of northern California and other similar upwelling region might, under global warming, become even more pronounced. Effects of enhanced upwelling on the marine ecosystem are uncertain but potential dramatic.

Baldwin, Rebecca T. and Bernard A. Megrey (1988). "Bioeconomic Simulation Model of the Walleye Pollock Fishery in the Gulf of Alaska." NOAA Technical Memorandum NMFS F/NWC-145, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

A bioeconomic simulation model was used to evaluate the effect of alternative harvesting strategies on the biological status and profit potential of the walleye pollock (Theragra chalcogramma) fishery in the Gulf of Alaska. The simulation model, which projects future stock condition given likely catch and recruitment scenarios, integrates an age structured population dynamics submodel with an economic submodel. The biological submodel describes temporal partitioning of the annual harvest between a January through April roe fishery that targets on prespawning aggregations in Shelikof Strait and the fishery that occurs during the rest of the year in the central and western gulf. The economic submodel includes cost and revenue functions for the harvesting sector. Results of the simulations indicate that: 1) the timing of the harvest can be an important factor affecting stock condition when quotas are high and 2) a reduction in the quota for 1987, to protect the strong 1984 year class that was first available to the fishery in 1987, would reduce the discounted present value of profits from the fishery in the 20 year simulation.

Ball, V. Eldon (1988). "Modeling Supply Response in a Multiproduct Framework." American Journal of Agricultural Economics, 60(4): 813-825.

The paper models multiproduct supply response in agriculture and tests key assumptions traditionally maintained in supply response studies. The technology is approximated by a restricted profit function. The properties of the restricted profit function are imposed during estimation. The hypothesis that maintains the existence of output price and quantity indexes that satisfy

the adding-up property is rejected. The existence of individual production functions for each output is also rejected. Unless joint production is permitted, the estimates of responsiveness of a particular commodity to changes in own price or prices of competing outputs are likely to be considerably understated.

Ballantine, W.J. (1994). The Practicality and Benefits of a Marine Reserve Network. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Marine reserves in New Zealand have proven to be (1) popular, (2) practical to enforce, (3) useful for finding out more about basic marine conditions and processes, (4) providing a more natural baseline for marine managers, and (5) supportive of the natural ecosystem without requiring any particular knowledge of what this is or how it operates.

Ballard, Kenneth and James Roberts (1977). Empirical Estimation of the Capacity Utilization Rates of Fishing Vessels in 10 Major Pacific Coast Fisheries. Office of Scientific and Technical Services, Washington, D.C., March, 35 pp.

This paper proposes to measure the harvesting capacity of the major elements of the U.S. Pacific fishing fleet. The type of capacity used is called peak-to-peak capacity and reflects the percentage of potential harvest that the industry would be willing to produce if there were not constraints on resource availability or restrictions on resource harvesting. Because the definition of capacity is extremely crucial to this analysis and its application, the underlying assumptions is crucial to the methodology chosen to calculate capacity. Ten Pacific coast fisheries have been examined for 15 to 17 years. These fisheries account for 86 percent of the dollar volume and 72 percent of the total weight volume of landings in the Pacific area.

Banks, Richard (1998). Adjustments to Fishing Capacity in the European Union. Draft Report, Technical Working Group on the Management of Fishing Capacity, La Jolla, CA, U.S.A., April 15-18, Nautilus Consultants, March, 29 pp.

An evaluation of the fishing vessel decommissioning scheme of the European Union to achieve a 20 percent reduction in bottom trawl fisheries and a 15 percent reduction in beam trawl fisheries for benthic stocks.

Barbera, Anthony J. and Virginia D. McConnell (1986). "Effects of Pollution Control on Industry Productivity: A Factor Demand Approach." The Journal of Industrial Economics, 35(2):161-172.

Four major manufacturing industries are examined. The abatement effect on capital and labor productivity are determined from parameters of a system of factor demand equations that allow for disequilibrium in factor markets. The system is estimated for each industry with annual time series data from 1960 to 1980. Abatement requirements were found to retard both average capital productivity and average labor productivity in three of the four industries; paper, chemicals and primary metals. For several industries in which factor productivity was slower after 1973, environmental controls accounted for a significant proportion of that slow down.

Bardach, J.E. (1987). "Global Warming and the Coastal Zone." Draft report prepared for the Developing Policies for Responding to

Future Climatic Change, Technical Workshop, Villach, Austria, Sept. 28 - Oct. 2 by Environment and Policy Institute, East-West Center.

This paper treats the shore zones, such as reefs, salt marshes, mangroves, salt ponds or now nice covered Arctic shores and coastal fisheries and aquaculture or some lands now wrested from the sea for agriculture, which are not likely to receive the same degree of attention as the cities with regard to sea level rise. The paper deals first with living resources, then with physical resources such as sand and gravel, or salt making, as well as with certain uses of the sea or the shore such as waste disposal or recreation, and ends with a discussion of specific environments.

Bardarson, Hermann and Terje Vassdal (19??). "Efficiency in Norwegian Trawl Fisheries; A Nonparametric Frontier Production Analysis." Draft report, Norwegian College of Fishery Science, University of Tromso, Breivika, 9037 Tromso, Norway.

This paper focuses on efficiency in trawler vessels operating in the Norwegian cod fisheries. In the last 10 to 15 years, the trawler fleet and the corresponding land-based industry have gone through considerable structural changes. The trawler fleet is composed into two segments; those delivering fresh/chilled cod to the land-based industry and those vessels producing the catch on board into fillets and thus bypassing the land-based industry. The increasing number of factory trawlers have resulted in regional and political conflicts. There has been a lack of economic analysis comparing the productivity in factory trawlers contra fresh fish trawlers and land-based production. Productivity measurement based on nonparametric frontiers have become a standard procedure for analyzing the performance of production units. The efficiency analysis used by us is based on Data Envelopment Analysis (DEA) where micro data from the trawler fleet is used to define a nonparametric best practice frontier which shows the total factor productivity of each unit relative to that frontier in the period 1985 to 1996. The results shows the structural efficiency of the trawler fleet with respect to size, processing technology, quota restrictions and variations in vessel specific productivity.

Barnett, Harold J. (1979). "Scarcity and Growth Revisited." Chapter 8 in V. Kerry Smith (ed.) Scarcity and Growth Reconsidered, Published for Resources for the Future by Johns Hopkins University Press, Baltimore and London.

This chapter reviews the natural resource trends during the last twenty years for the United States including abundance, unit costs, and prices, and the environmental effects of meeting the needs for natural resources.

Barnett, Harold J. and Chandler Morse (1963). Scarcity and Growth, The Economics of Natural Resource Availability. Resources for the Future, Inc., The Johns Hopkins Press, Baltimore.

The authors address the man/land or the population/resource problem afresh, in terms of the latest statistical information and modern analytical tools. They have re-examined the propositions propounded by Malthus, Ricardo, and John Stuart Mill; and they have thought deeply about the roots of the American Conservation Movement associated with Theodore Roosevelt and Gifford Pinchot as these roots may be traced back into Darwinism and the speculations of George Marsh. They have emerged with a clearer view of where the essence of the problem is now to be found and what it means for people today.

Baron-Mounce, E.A., W.R. Keithly, and K.J. Roberts (1991). "Shrimp

Facts." Louisiana State University Sea Grant Report.

The information presented in this booklet has been compiled from several sources to best illustrate many aspects of the shrimp fishery in past years. The material is presented in charts and graphs to give the reader a quick and easy reference for trends occurring in the shrimp fishery. A brief narrative is provided at the beginning of each of the following sections: (1) shrimp species, (2) shrimping seasons in inshore and offshore waters, (3) shrimp size, (4) shrimping effort, (5) participation in the commercial shrimp fishery, (6) recreational shrimping, and (7) shrimp supply and processing.

Barr, Louis (1970). "Alaska's Fishery Resources - The Shrimps." U.S. Fish and Wildlife Service, Fishery Leaflet 631, January, iii + 10 pp., 7 figs., 1 table.

Shrimp fishing began in Alaska over 50 years ago. Recently the annual domestic catch has been as high as 40 million pounds. Japanese and Soviet Union fishermen operating in Alaskan waters have caught as much as 70 million pounds annually in recent years. The five commercially important shrimp of Alaska belong to the family Pandalidae; the most important is the pink shrimp, Pandalus borealis. The complicated life histories of these shrimp are all similar. The shrimp develop first as males and after several years transform to females, which they remain for the rest of their lives. United States fishermen use otter trawls, beam trawls, and pots, and deliver their catch to ports in Alaska; foreign fishermen use larger otter trawls and process the catch at sea. The Alaska Department of Fish and Game and the Bureau of Commercial Fisheries are studying the shrimp. They are sampling the commercial catch, trying to improve the product, and conducting exploratory fishing and biological research.

Barr, Louis (1973). "Studies of Spot Shrimp, Pandalus platyceros, at Little Port Walter, Alaska." Marine Fisheries Review, 35(3-4):65-66.

A summary of the existing and planned biological research being conducted on and the life history of spot shrimp at Little Port Walter, Alaska.

Barrett, James T. (1984). "Challenges of Development for the Manager." Chapter 17 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Although marine resources are jointly shared by many user groups, commercial fishermen are primarily to blame for the overfishing of all fish stocks. If shore side development was banned and all wetlands returned to their pristine condition, commercial fishermen could still harvest all the fish in the sea.

Barss, William H. (1993). "Pacific Hagfish, Eptatretus stouti, and Black Hagfish, E. deani: The Oregon Fishery and Port Sampling Observations, 1988-92." Marine Fisheries Review, 55(4):19-30.

In 1988, the Oregon Department of Fish and Wildlife began sampling and monitoring the development of a new fishery for Pacific hagfish, and black hagfish. Hagfish landings by Oregon trap vessels have ranged from 11,695 kg in 1988 to 340,774 kg in 1992. Whole frozen fish were shipped to South Korea

for the "eel skin" leather market. From 1988 through 1989, I sampled 924 Pacific hagfish and 897 black hagfish from commercial and research catches. Mean length of fish sampled from commercial landings was 39.6 cm for Pacific hagfish and 34.5 cm for black hagfish. Weight-length relationships ( $W=Al^b$ ) were calculated for males and females of both species. Fifty percent maturity for male and female Pacific hagfish was 35 cm and 38 cm, respectively. Examination of gonads for both species indicated that spawning either occurs throughout the year or the spawning period is protracted. Mature females of both species had from one to three distinct sizes of eggs, but they usually carried only one group of eggs over 5 mm in length. Mature Pacific hagfish females averages 28 eggs over 5 mm in length, and black hagfish females averaged 14 eggs over 5 mm in length. Hermaphroditism was found in 0.2% of the Pacific hagfish examined.

Barten, A.P. (1964). "Consumer Demand Functions Under Conditions of Almost Additive Preferences." Econometrica, 32(1-2):1-38.

This paper addresses the gap between the theory of consumer demand and empirical demand research. The theory of consumer demand is reformulated along the lines set out in the articles by Frisch and Houthakker. However, their specialization to direct (or indirect) additivity of the utility function may be considered too severe a restriction for the level of aggregation of the data that are available in this case. A modification of direct additivity has therefore been introduced to take account of specific interaction between the different types of consumers' expenditure. The theory and the resulting restrictions on the elasticities to be estimated are discussed in section 2. The data used for the estimation are a set of time series describing total consumer expenditure in the Netherlands on fourteen types of commodities or services and the corresponding price indices covering the periods 1921-1939 and 1948-1958.

Barten, A.P. and L.J. Bettendorf (1989). "Price Formation of Fish, An Application of an Inverse Demand System." European Economic Review, 33:1509-1525.

Inverse demand systems explain price variations as functions of quantity variations. They have properties analogous to those of regular demand systems. There are very few examples of their empirical application. In part this is due to lack of data for which price is the decision variable and the quantity given. The case of fish landed at Belgian sea ports appears to suit an inverse demand system well. A Rotterdam variant of such a system is estimated. Allais interaction intensities have been derived and show a reasonable pattern.

Bateman, Herbert H. (1984). "Congress Views The Chesapeake Bay." Chapter 2 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Opening address at the Ninth Annual Marine Recreational Fisheries Symposium stressing nonpoint specific pollution of Chesapeake Bay and Congress' intention to reduce pollution and restore the habitat.

Batie, Sandra S. and Leonard Shabman (1979). "Valuing Nonmarket Goods - Conceptual and Empirical Issues: Discussion." American Journal of Agricultural Economics, 61(5):931-932.

Discusses the papers by McConnell (1979) and Bishop and Heberlein (1979) and states that additional research needs to be done before nonmarket valuation studies are of use to policy makers.

Bator, Francis M. (1957). "The Simple Analytics of Welfare Maximization." American Economic Review, 47:22-59.

This paper presents a complete and concise nonmathematical treatment of the problem of welfare maximization in its "new welfare economics" aspects.

Bator, Francis M. (1958). "The Anatomy of Market Failure." The Quarterly Journal of Economics, (August):351-379.

The paper explores those phenomenon that cause even errorless profit- and preference-maximizing calculation in a stationary context of perfect information and foresight to fail to sustain Pareto efficient allocation.

Battese, George E. and Sumiter S. Broca (1996). Functional Forms of Stochastic Frontier Production Functions and Models for Technical Inefficiency Effects: A Comparative Study for Wheat Farmers in Pakistan. No. 4/96, CEPA Working Papers, Department of Econometrics, University of New England, Armidale, NSW 2351, Australia, 26 pp.

This paper considers translog and Cobb-Douglas stochastic frontiers in which the technical inefficiency effects are defined by three different models. The models involved are the time varying inefficiency model, proposed by Battese and Coelli (1992), the inefficiency effects model for panel data, proposed by Battese and Coelli (1995), and the non-neutral frontier model, proposed by Huang and Liu (1994). Technical change is also accounted for in the frontier models. Predicted technical efficiencies of the wheat farmers and estimates of the elasticities of wheat production with respect to the different inputs and the returns to scale parameter are compared under the different model specifications.

Battese, G.E. and T.J. Coelli (1993). A Stochastic Frontier Production Function Incorporating a Model for Technical Inefficiency Effects. No. 6, October, 27 pp.

A stochastic frontier production function is defined for panel data on firms, in which the non-negative technical inefficiency effects are assumed to be a function of firm-specific variables and vary over time. The maximum-likelihood method is applied for the estimation of the parameters of the model and prediction of the technical efficiencies of the firms over time. An empirical application of the inefficiency stochastic frontier model is obtained using up to ten years of data on paddy farmers from an Indian village.

Baumol, William J. (1982). "Applied Fairness Theory and Rationing Policy." The American Economic Review, 72(4):639-651.

While this paper deals with many issues related to a variety of rationing forms, its primary purpose is to show that the fairness criterion is operational; that it can be applied to concrete problems and that with its aid one can derive results that are not all obvious in advance. Of course, rationing was selected for that purpose because of all economic equity issues, it seems to lend itself most readily to this sort of approach.

Baumol, William J. and Wallace E. Oates (1975). "Externalities: Definition, Significant Types, and Optimal-Pricing Conditions."



Chapter 3 in The Theory of Environmental Policy. Prentice Hall, Englewood Cliffs, NJ.

Technological and pecuniary externalities and public and private externalities are defined and discussed in this chapter. Solutions such as taxes equal to the marginal social damage are discussed.

Baumol, William J. and Wallace E. Oates (1975). "Introduction to Part 2." Chapter 9 in The Theory of Environmental Policy. Prentice Hall, Englewood Cliffs, NJ.

An introduction to welfare theory applied to practical problems in environmental policy.

Baumol, William J. and Wallace E. Oates (1975). "Efficiency Without Optimality: The Charges and Standards Approach." Chapter 10 in The Theory of Environmental Policy. Prentice Hall, Englewood Cliffs, NJ.

This chapter presents a proposal for a feasible tax-subsidy program. A practical and effective procedure for the protection of the environment is suggested; the use of pollution charges to implement a predetermined set of standards for environmental quality. Some degree of arbitrariness in the design of such standards is inevitable. And in agreeing to such a procedure, one gives up any attempt to reach any true social optimum. Yet this proposal, that is essentially a "satisficing" approach to the problem, can be shown to offer some significant optimality properties. Aside from the administrative savings made possible by avoidance of central direction and direct controls, we will show that the proposed procedures, properly designed and implemented, can lead to the attainment of the selected standards and that in appropriate circumstances, they can do so at something approximating minimum cost to society.

Baumol, William J. and Wallace E. Oates (1975). "Stochastic Influences, Direct Controls, and Taxes." Chapter 11 in The Theory of Environmental Policy. Prentice Hall, Englewood Cliffs, NJ.

Chapter 11 suggests that direct controls can be a useful supplement to a system of charges for the continuing maintenance of acceptable environmental conditions. Their usefulness arises from the inflexibility of tax rates and the comparative ease with which certain types of direct controls can be instituted, policed, and removed. The problem is that the state of environmental quality at any time depends not only on the level of emissions but on such essentially stochastic influences as wind velocity and rainfall, that determine the rapidity of the dispersion of accumulated pollutants. As a result, we can expect occasional environmental crises that can be predicted only a short time before they occur. It would be too costly to society to keep tax rates sufficiently high to prevent such emergencies at all times. Instead, it may be less expensive in such cases to make temporary use of direct controls, despite their static inefficiency. The chapter ends with the description of a nonlinear programming model that illustrates the logic of the design of an optimal mixed program.

Baumol, William J. and Wallace E. Oates (1975). "Taxes vs. Subsidies: A Partial Analysis." Chapter 12 in The Theory of Environmental Policy. Prentice Hall, Englewood Cliffs, NJ.

Chapter 12 examines the use of subsidies as a reward for decreased damage by those who generate the externalities. First, we describe formally

the conditions under which fees and subsidies are equivalent. Here we find that the equivalent subsidy is a very strange sort of construct, one that we are unlikely to encounter in practice. Next, we show that subsidies in the more conventional sense are a poor substitute for taxes. Although the two may be equally effective in reducing emissions by the individual firm, the subsidy encourages the entry of new firms into the industry, whereas taxes encourage their exit. As a result, we can expect that a subsidy program will be less effective in discouraging pollution than a tax program with similar marginal rates. In particular, we find that, under pure competition, if emissions are uniquely determined by the industry's output level and rise monotonically with output, a subsidy program will necessarily backfire. Although the subsidy will produce a reduction in the emissions of each firm, it will lead to an entry of new firms that more than offsets it. Total emissions under a subsidy program will in this case always be greater than they would have been if no cleanup subsidy program had ever been instituted.

Baumol, William J. and Wallace E. Oates (1988). The Theory of Environmental Policy, Second Edition. Cambridge University Press, New York.

This book places special emphasis on transferable permit systems for controlling emissions, discusses the setting of standards for environmental quality and asks whether such standards should be set by national or "local" authorities, and revises the treatment of depletable and undepletable externalities based on articles by A. Myrick Freeman.

Baxter, Kenneth N. and Elizabeth Scott-Denton (eds.) (1992). Proceedings of the Southeast Fisheries Science Center Shrimp Resource Review, NOAA Technical Memorandum, NMFS-SEFSC-299, August, 186 pp.

This report serves as an official record of the shrimp research program review. Each program component of the shrimp research program is presented in abstract form. Hard copies of visual aids and the questions/clarifications session immediately follow each abstract.

Baxter, Kenneth N., Carlton H. Furr, Jr., and Elizabeth Scott (1988). "The Commercial Bait Shrimp Fishery in Galveston Bay, Texas, 1959-87." Marine Fisheries Review, 50(2):20-28.

Information about landings and species composition associated with the bait shrimp industry of the Galveston Bay system has been collected on a weekly schedule from 1959 through 1984 and on a more limited basis since 1985. Collectively, the bait index and the postlarval index provide: 1) a reliable indication of the subsequent offshore harvest and 2) a long term correlation between juvenile abundance and changing environmental conditions. In addition, insight into local fishing practices and trends provide background for continuing research needed to enhance production value of the shrimp stock.

Bayley, Peter B. and Douglas J. Austen (1989). Fisheries Analysis System: Data Management and Analysis for Fisheries Management and Research. American Fisheries Society Symposium, 6:199-205.

The fisheries analysis system (FAS) is a computerized data management system that was designed for analyses of local and statewide data sets for fisheries management and research purposes. Outputs allow tabular and graphical presentation of summary data among water bodies and years, and text file generation for statistical packages.

Beals, Ralph E., Mildred B. Levy, and Leon N. Moses (1976).  
"Rationality and Migration in Ghana." The Review of Economics and  
Statistics, 49:480-486.

This paper seeks to estimate the effects of income and other variables on the pattern of interregional labor migration in Ghana. While not a logit or probit model, the authors use linear regression to estimate the coefficients of independent variables that affect the percent of individuals that migrate into and out of a region within Ghana.

Bearden, C., R. Low, R. Rhodes, R. Van Dolah, C. Wenner, E. Wenner, and D. Whitaker (1985). "A Review and Analysis of Commercial Shrimp Trawling in the Sounds and Bays of South Carolina." South Carolina Marine Resources Center, Technical Report No. 62, October, 51 pp.

There has been a commercial trawl fishery for shrimp in South Carolina's sounds and bays for over thirty years, and the controversy surrounding this practice is a longstanding one. Major issues of concern are related to potential ecological effects and impacts upon commercial and recreational fisheries. The prevailing management philosophy has been to permit shrimp trawling at appropriate times in offshore waters, sounds, and bays while prohibiting it in the tidal creeks and rivers that serve as nursery areas. This summary presents the historical background of the sound and bay policy, describes the rationale for allowing inside trawling, provides information on the issues, specifies recommendations, and lists alternatives for the management of the sound and bay resources.

Beattie, B.R. and C.R. Taylor. The Economics of Production. New York: John Wiley and Sons, 1985.

This textbook is for a course in production economics theory and the theory of the firm for a first year graduate student.

Beaumariage, D.S. and Lewis H. Bullock (1976). "Biological Research on Snappers and Groupers as Related to Fishery Management Requirements." Pages 86-94 in Harvey R. Bullis, Jr. and Albert C. Jones (eds.) (1976). "Proceedings: Colloquium on Snapper-Grouper Fishery Resources of the Western Central Atlantic Ocean. Report Number 17, Gulf States Marine Fisheries Commission, New Orleans, Louisiana, Texas A&M University Sea Grant College and Mississippi-Alabama Sea Grant Consortium, November, 333 pp.

Fewer than two dozen pertinent studies have been published on the biology of snappers and groupers as related to fishery management requirements. Almost half of this research was based on tagging programs which described migratory patterns. There has been only one major effort on the basic life history of red grouper (Epinephelus morio) and two investigations on red snapper (Lutjanus campechanus) life history. This paucity of data exemplifies the need for similar life history studies, if sound management policies are to be adopted in assuring maximum sustained yield.

Beckmann, Martin J. (1975). "The Limits to Growth in a Neoclassical World." American Economic Review, 65:695-699.

The Club of Rome study on the limits to growth treats preferences, production technology, and the economy unconventionally and implausibly according to many economists. This paper is an attempt to reformulate the

allocation problem for exhaustible resources in neoclassical terms.

Beddington, John R. and Colin W. Clark (1984). "Allocation Problems Between National and Foreign Fisheries with a Fluctuating Fish Resource." Marine Resource Economics, 1(2):137-154.

The problem of allocating the rights to exploit fish resources between domestic and foreign fleets is posed in the context of a fluctuating fish stock. Such fluctuations are ubiquitous and are driven by the recruitment variation. A number of biological models are proposed to describe the dynamics of the resource. It is supposed that harvesting by both foreign and domestic fleets is permitted, and the possibilities for allocation between these two fleets are examined. The optimal allocation policy is derived for a number of different economic and biological situations. In many situations it will be optimal for there to be a mix of foreign and domestic fishing on the resource. This result implies that licensing and joint venture agreements between coastal states and distant water fishing nations may be desirable from the point of view of the coastal state, even in the long term.

Beddington, J.R. and Robert M. May (1977). "Harvesting Natural Populations in a Randomly Fluctuating Environment." Science, 197:463-465.

As harvesting effort and yield are increased, animal populations that are being harvested for sustained yield will take longer to recover from environmentally imposed disturbances. One consequence is that the coefficient of variation (the relative variance) of the yield increases as the point of maximum sustained yield (MSY) is approached. When overexploitation has resulted in a population smaller than that for MSY, high effort produces a low average yield with high variance. These observations accord with observed trends in several fish and whaling industries. We expect these effects to be more pronounced for a harvesting strategy based on constant quotas than for one based on constant effort. Although developed in a MSY context, the conclusions also apply if the aim is to maximize the present value of (discounted) net economic revenue.

Beddington, John R., C.M.K. Watts and W.D.C. Wright (1975). "Optimal Cropping of Self-Reproducible Natural Resources." Econometrica, 43:789-802.

Models of the behavior of populations of self-reproducible natural resources in an economic framework have rarely anticipated the consequences of different forms of production functions. This paper investigates sufficient conditions for extinction in a very general model as well as a model having a specific production function. In the second section additional considerations relating to extinction are deduced as well as the existence of a watershed level of population. These conclusions are exemplified using data from one particular population of red deer.

Beideman, Nelson R. (1995). Letter. Addressed to the Highly Migratory Species Management Division, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, July 17.

Comments on the proposed swordfish total allowable catch rulemaking. An interesting and insightful discussion of the sociology and economics of the longline fishery in the North Atlantic.

Beideman, Nelson R. and Terri Beideman (1995). Summary: BWFA Swordfish 1995 TAC Comments. FAX Transmission. Addressed to the Highly Migratory

Species Management Division, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, July 17, 17 pp.

Formal Blue Water Fishermen s Association comments on the proposed 1995 TAC for swordfish.

Bell, Johann D. (1983). Effects of Depth and Marine Reserve Fishing Restrictions on the Structure of a Rocky Reef Fish Assemblage in the North-Western Mediterranean Sea. Journal of Applied Ecology, 20:357-369.

The present study used an underwater observation technique that accounted for both the abundance and size class structure of each fish species within a transect area, and was designed to (i) determine the effect of depth on the structure of the rocky reef fish assemblage, (ii) assess the effectiveness of a marine reserve as a sanctuary for rocky reef fishes by examining differences in the structure of fish communities at similar depths within and outside the reserve, and (iii) describe fish communities at two depths within the reserve as a basis for monitoring further changes in their structure.

Bell, Frederick (1972). "Technological Externalities and Common-Property Resources: An Empirical Study of the U.S. Northern Lobster Fishery." Journal of Political Economy, 80(1):148-158.

This paper demonstrates the effect of technological externalities on the production of northern lobsters, a common property resource. An increase in effort (that is, size of the industry) of 100,000 traps fished will depress landings per trap for the individual firm by 2.4 pounds. Therefore, the northern lobster industry produces so as to equate average revenue to long run average cost. Approximately one-half of the present fishing effort would be needed to achieve economic efficiency or marginal cost pricing. The goal of allocative efficiency should be weighted against the strategy to provide somewhat greater employment, especially in rural areas where labor opportunity cost is relatively low.

Bell, Frederick (1986). "Mitigating the Tragedy of the Commons." Southern Economic Journal, 52(3):653-664.

As fish farming has emerged to compete with a preexisting common property fishery sector, rent dissipation and consequently welfare losses may be reduced. Fish farming increases the increment to supply resulting in lower prices and reduces the quantity supplied by the commons (not necessarily true). Welfare gains accrue only when marginal cost is rising faster than average cost, which is the usual case in the wild fisheries. Using data from the Louisiana pond and wild crawfishing industries for 1978, fish farming of crawfish reduced potential welfare losses by 76 percent. See AJAE article below.

Bell, Frederick (1986). "Competition from Fish Farming in Influencing Rent Dissipation: The Crawfish Fishery." American Agricultural Economics Association, February: 95-101.

As fish farming has emerged to compete with a preexisting common property fishery sector, rent dissipation and consequently welfare losses may be reduced. Fish farming increases the increment to supply resulting in lower prices and reduces the quantity supplied by the commons (not necessarily true). Welfare gains accrue only when marginal cost is rising faster than average cost, which is the usual case in the wild fisheries. Using data from

the Louisiana pond and wild crawfishing industries for 1978, fish farming of crawfish reduced potential welfare losses by 76 percent. See SEJ article above.

Bell, Frederick (1989). "Main Quarry Hypothesis and Salmon Angling." Marine Resource Economics, 6(1):71-82.

This article explores the main quarry hypothesis, which is a variant of the general fishing success hypothesis. It is argued that for some recreational fisheries it may be more important that the angler catch his target or main quarry than the quantitative number of fish caught in influencing the number of fishing days and the overall quality of the recreational experience. A theoretical function is specified to explain the length of the fishing trip to Ireland by anglers that have designated salmon as their main quarry. The empirical estimation of this function indicates that the length of the fishing trip is positively related to travel cost, but inversely related on-site cost per day. *Ceteris paribus*, the length of the salmon trip to Ireland, is increased by nearly 23% when the angler gets his main quarry, stressing the importance of the quality of the catch rather than quantitative number of fish caught. This finding calls into question the traditional fishing success variables such as catch per day for many recreational fisheries.

Bell, Frederick W. (1989). "Application of Wetland Valuation Theory to Florida Fisheries." Department of Economics, Florida State University, Tallahassee, Florida 32306, Florida Sea Grant Program, Project Number R/C-E-25, Grant Number NA86AA-D-SG068, Report Number 95, June, 118 pp.

The focus of this report is an evaluation in economic terms of the value of estuarine wetlands to marine fisheries in Florida. The marginal productivity theory of estuarine wetland valuation is used to determine the value of the marginal products of an acre of saltwater marsh in the production of estuarine dependent species of fish.

Bell, Frederick W. (1997). Review of the Economics of Management Strategies for Red Snapper in the Gulf of Mexico. Draft report for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Department of Economics, Florida State University, Tallahassee, FL, September, 22 pp.

This paper is a peer review of the appropriateness of management measures in the fishery management plan for red snapper in the gulf of Mexico for conserving and managing the resource and a consideration of the cost and benefits of all reasonable alternatives to an individual fishing quota program for the red snapper resource.

Bell, Frederick W. and Vernon R. Leeworthy (1987). "Economic Demand for Marinas and Projected Impact on Wetlands." Land Economics, 63(1):79-91.

This article develops a theoretical framework for marina demand and empirically estimates such a logit and OLS model using Florida as a case study. Projections of the pattern of land use for marinas can be studied in the light of current environmental policies. The analysis for Florida indicates that environmental concerns involving marinas and the call for rigid permitting of additional sites may not be based on large wetland requirements and that marina-wetland compatibility studies should be considered.

Bell, Frederick W., Darrel A. Nash, Ernest W. Carlson, Frederick V. Waugh, Richard K. Kinoshita, and Richard F. Fullenbaum (1975). "A World Model of Living Marine Resources." Chapter 11 in Walter C. Labys (ed.). Quantitative Models of Commodity Markets. Ballinger Publishing Company, Cambridge, Mass.

A bioeconomic model has been constructed to determine how future increases in world population and income will impact fish resources. This model is essentially a set of relationships describing the main biological and economic forces that determine the maximum sustainable supply of fish from the ocean, the amounts caught and consumed, the prices, the costs of production, and consumer income and population. Its contribution to commodity modeling methodology is that it integrates relevant biological and utilization factors into a single system structure.

Bell, Frederick W., Philip E. Sorensen, and Vernon R. Leeworthy (1982). "The Economic Impact and Valuation of Saltwater Recreational Fisheries in Florida." SGR-47, Florida Sea Grant College, August, 118 pp.

This project quantifies both the market and nonmarket value and economic importance of Florida's saltwater recreational fishery. The objectives are: (1) to produce statistically reliable estimates of the value per recreational day and yearly of Florida's saltwater sport fishing; (2) to provide a demographic and economic profile of instate and out of state sport fishermen; (3) to determine the impact of saltwater sport fishing on the Florida economy; and (4) to identify regions of critical state concern with respect to a decline in productivity of saltwater sport fishing in Florida waters due to overfishing, pollution, etc.

Ben-Akiva, Moshe and Frank S. Koppelman (1974). "Multidimensional Choice Models: Alternative Structures of Travel Demand Models." National Research Council, Transportation Research Board, 149:129-142.

A multidimensional choice situation can be represented by a simultaneous or recursive model structure. The paper described assumptions of each structure and argued that, in the absence of restrictive assumptions about behavior, travel decisions are more realistically represented by a simultaneous model structure. It is simple to estimate a recursive structure, for each choice model contains fewer alternatives and variables. The primary issues in the selection of a strategy for calibration are (a) whether calibrating the simultaneous model is feasible and (b) what effect the use of a recursive rather than a simultaneous model structure has on the estimated parameters.

Ben-Akiva, Moshe and Steven R. Lerman (1974). "Some Estimation Results of a Simultaneous Model of Auto ownership and Mode Choice to Work." Transportation, 3:357-376.

This paper describes the theory, development, and estimation of a simultaneous disaggregate model of automobile ownership and mode to work choices. The motivation for such a model and the general theory of the simultaneous probabilistic choice model are discussed. The general model specification and the set of choices assumed to be available to each household is then considered. Finally, the variables used in the model are defined and the estimation results are presented.

Benavie, Arthur (1970). "The Economics of the Maximum Principle." Western Economics Journal, 8:426-430.

This note provides an economic interpretation of the maximum principle of Pontriagin. A recent paper by Dorfman has developed the economics of this principle as applied to a capital theory model. We present a generalization of Dorfman's result.

Benford, Frank A. (1995). A Model of the North Carolina Bay Scallop Fishery With Endogenous Fishing Effort and Entry. Natural Resource Modeling, 9(3):197-228.

The principle purpose of this model is to aid in the evaluation and design of regulations that affect the fishery. It differs from most previous models with a similar purpose in three ways. (1) Daily fishing costs are assumed to vary among fishermen. (2) Daily fishing effort is determined endogenously rather than being treated as a control variable. (3) Entry into the fishery is determined endogenously up to a cap imposed by the regulatory agency. The model explains the adverse reaction to a proposed attempt to increase the value of the fishery by delaying the opening date. The model is used to predict the economic consequences of four feasible sets of regulations.

Benirschka, Martin and James K. Binkley (1995). "Optimal Storage and Marketing Over Space and Time." American Journal of Agricultural Economics, 77(3):512-524.

Borrowing from the theory of optimal resource extraction, we develop the mechanism guiding efficient commodity storage and marketing over producing regions through the crop year. Optimal storage occurs at producing areas, and time in storage varies directly with distance to market. Prices grow with interest rates in locations where storage is efficient but more slowly elsewhere, which explains why market prices (i.e. prices at the market) grow more slowly than interest rates. The model is empirically supported by examining storage in the Corn Belt, rates of price growth at various points, and quarterly grain marketings.

Benway, Robert L., Kevin P. Thomas, and Jack W. Jossi (1993). "Water-column Thermal Structure in the Middle Atlantic Bight and Gulf of Maine during 1978-92." NOAA Technical Memorandum NMFS-F/NEC-97, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Region, Northeast Fisheries Science Center, Woods Hole, Massachusetts, March, 154 pp.

This report presents water column temperature data for the Middle Atlantic Bight and Gulf of Maine during 1978-92. Data were collected by expendable bathythermographs deployed by merchant ships during monthly transects of both bodies of water. Data are presented as contoured vertical sections. Methods of data collection, management, and portrayal are discussed.

Berck, Peter (1979). "The Economics of Timber: A Renewable Resource in the Long Run." The Bell Journal of Economics, 10(2):447-62.

Critics of current and historical trends in timber production contend that private owners cut their woods more quickly than optimal, while public managers cut their forests more slowly than optimal. Using the douglas fir industry, this paper shows that private entrepreneurs holding rational expectations with respect to future prices have historically been discounting the future at a real rate of 5 percent - a much lower rate than that available for other private investments - and, therefore, that these owners have not cut



their forests prematurely. In the case of public management, calculated shadow losses incurred by holding old timber are so great that an appeal to nontimber use values is not sufficient to reconcile management practices. Finally, predictions for the long-term price trends for timber indicate a slowdown in the rate of price increase.

Berck, Peter (1979). "Open Access and Extinction." Econometrics, 47(4):877-882.

This paper reconsiders necessary conditions for extinction of an animal population. Containing many of the models previously developed in the literature, the general model proposed here suggests that (i) conditions for extinction depend exclusively on the relation of a minimum viable population size to the minimum population size at which any exploitation is profitable, (ii) necessary conditions for extinction need not be characterized in terms of returns-to-scale parameters or growth rates as other authors have contended, and (iii) possible short run shutdown may save a population from extinction if the fish population at the time of shutdown is large enough to sustain the species.

Berck, Peter (1981). "Optimal Management of Renewable Resources with Growing Demand and Stock Externalities." Journal of Environmental Economics and Management, 8:105-117.

In an equilibrium framework, optimal management of renewable resources in the presence of growing demand or externalities leads to steady states that differ from those characterized by rate of interest equals rate of change in growth plus rate of change in prices. Measures to reach an optimum with externalities other than direct controls are found to be critically mediated by the costs of harvesting.

Berck, Peter and Jeffrey M. Perloff (1982). "An Open-Access Fishery with Rational Expectations." Working Paper No. 187, Division of Agricultural Sciences, California Agricultural Experiment Station, Giannini Foundation of Agricultural Economics, University of California, December, 34 pp.

How potential entrants to an open access fishery form their expectations determines the fishery's adjustment path to a steady state but not the steady state values themselves. It is well known that, in the standard model with myopic expectations (those based on current values), boats enter the fishery only when the fish stock is greater than its steady state stock. We show that, with rational expectations (perfect foresight), however, boats may enter when the fish stock is much lower than its steady state value if the boat fleet is sufficiently small. This paper contrasts myopic and rational expectations within a general dynamic model of an open access fishery.

Berck, Peter and Jeffrey M. Perloff (1984). "An Open-Access Fishery with Rational Expectations." Econometrica, 52(2):489-506.

How potential entrants to an open access fishery form their expectations determines the fishery's adjustment path to a steady state but not the steady state values themselves. It is well known that, in the standard model with myopic expectations (those based on current values), boats enter the fishery only when the fish stock is greater than its steady state stock. We show that, with rational expectations (perfect foresight), however, boats may enter when the fish stock is much lower than its steady state value if the boat fleet is sufficiently small. This paper contrasts myopic and rational expectations within a general dynamic model of an open access fishery.

Bergin, Anthony (1997). Albatross and Longlining - Managing Seabird Bycatch. Marine Policy, 21(1):63-72.

Seabirds can be accidentally injured or killed during certain types of fishing. The fishing method currently under most scrutiny for its impact on seabird populations is demersal and pelagic longlining. The main species of concern at present are albatross. This paper outlines current mitigation measures, both gear and operational changes, to deal with the problem. It is suggested that measures can be developed that achieve a reduction in bird loss and are practical and economic for the fishing industry.

Bergstrom, John C. and John R. Stoll (1993). Value Estimator Models for Wetlands-Based Recreational Use Values. Land Economics, 69(2):132-137.

Evaluation and implementation of policies affecting wetlands management may require measurement of the economic value of the policies to individuals and groups. A potentially powerful means for measuring changes in wetlands-based recreational values is the use of value estimator models. The general specification and potential applications of value estimator models for wetlands-based recreational use values are discussed in this paper. Future research needs are also identified.

Bergstrom, Theodore C. (1982). "On Capturing Oil Rents with a National Excise Tax." The American Economic Review, 72(1):194-201.

In a static competitive analysis the entire burden of an excise tax on a good in fixed supply falls on the supplier. Imposing a tax does not affect the price paid by consumers and the price received by suppliers falls by the amount of the tax. One is tempted to conjecture that this result extends to the case of costlessly extracted depletable resource. Although the amount of such a resource that is supplied in any single period can change in response to variation in the intertemporal price structure, the total amount available for all time is fixed. Thus it is plausible that the effects of an excise tax imposed once and forever might be the same in the static model. This conjecture turns out to be true.

Berkeley, Steven A. (1985). A Letter to W. Steven Otwell. South Atlantic Fisheries Management Council, 1 Southpark Circle, Charleston, S.C., December.

Summarized data on Japanese yellowfin tuna catch from the Gulf of Mexico FCZ.

Berkeley, Steven A., Edwin W. Irby, Jr., and John W. Jolley, Jr. (1981). "Florida's Commercial Swordfish Fishery: Longline Gear and Methods." MAP-14, Marine Advisory Bulletin, Florida Sea Grant College in cooperation with University of Miami, Rosenstiel School of Marine and Atmospheric Science and Florida Department of Natural Resources, West Palm Beach Field Station, Marine Advisory Program, Florida Cooperative Extension Service, 6022 McCarty Hall, University of Florida, Gainesville, FL, August, 23 pp.

The paper briefly describes commercial fishing methods employed in the swordfish fishery.

Berkes, Fikret (1985). "Fishermen and 'The Tragedy of the Commons'." Environmental Conservation, 12(3):199-206.

Both natural and social scientists have reported from diverse regions of

the world how certain local populations have maintained viable systems of resource management by successfully self-regulating resource harvesting activities. Far from being owned by one and freely open to any user, many of the fish stocks of the world are under claims of ownership by communities of fishermen who exercise use-rights and who control access to the resource. Open access and common property conditions were created and the tragedy started only after the destruction of such traditional marine tenure systems.

Berkson, J. (1944). "Application of the Logistic Function to Bio-assay." Journal of the American Statistical Association, 39:357-365.

A comparison of the normal and logistic functions in the analysis of drug dosage mortality. The results indicate that the logistic curve results are as good as or better than the normal model results.

Berndt, Ernst R. and Melvyn A. Fuss (1989). "Economic Capacity Utilization and Productivity Measurement for Multiproduct Firms with Multiple Quasi-Fixed Inputs." Working Paper No. 2932, National Bureau of Economic Research, Inc., 1050 Massachusetts Avenue, Cambridge, MA, April, 36 pp.

In this paper, we develop measures of economic capacity output and economic capacity utilization for firms producing multiple outputs and having one or more quasi-fixed inputs. Although we produce an impossibility theorem showing that based only on the assumption of cost minimization, the concept of capacity output is undefined whenever the number of outputs ( $I$ ) exceeds the number of fixed inputs ( $M$ ), we are able to provide alternative constructive procedures for defining capacity output whenever  $I \leq M$ . We also propose a number of additional primal and dual measures of utilization of the variable and fixed inputs. Including a multi-fixed input analog to Tobin's  $q$ . We relate these alternative utilization measures to one another, and show that unambiguous inequality relationships among them (relative to unity) can typically be specified a priori only under rather restrictive assumptions. We show that unless restrictive assumptions are made, the multi-fixed input analogs to Tobin's  $q$  have little informational content regarding incentives for net investment of any specific fixed input. Finally, we demonstrate the usefulness of the alternative utilization measures by showing how they can be incorporated to adjust traditional measures of multi-factor productivity growth for variations in short run utilization.

Berndt, Ernst R. and David O. Wood (1975). "Technology, Prices, and the Derived Demand for Energy." The Review of Economics and Statistics, 62(3):259-268.

This paper presents evidence on the possibilities for substitution between energy and nonenergy inputs. Our principal finding is that technological possibilities for substitution between energy and nonenergy inputs are present, but to a somewhat limited extent. Specifically, we find that energy demand is price responsive, energy and labor are slightly substitutable, and energy and capital are complementary. We also find that our data do not support the value added specification typically used in studies of production and investment behavior.

Berndt, Ernst R. and David O. Wood (1979). "Engineering and Econometric Interpretations of Energy-Capital Complementarity." The American Economic Review, 69(3):342-354.

This paper provides a reconciliation and interpretation of engineering and econometric studies of energy-capital substitutability versus

complementarily from economic and engineering studies. An analytical framework is developed that reconciles the engineering evidence with the possibility of energy-capital complementarily. Empirical evidence reconciling the seemingly disparate econometric results of energy complementarily and substitutability is also presented.

Berrien, Peter and Doris Finan (1977). Biological and Fisheries Data on Spanish Mackerel, Scomberomorus maculatus (Mitchill). Technical Series Report No. 9, Sandy Hook Laboratory, Northeast Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Highlands, N.J., November, 52 pp.

A summary of the biology and brief description of the fishery for Spanish mackerel.

Berry, Brian J.L. and Robert S. Bednarz (1975). "A Hedonic Model of Prices and Assessments for Single-Family Homes: Does the Assessor Follow the Market or the Market Follow the Assessor?" Land Economics, :21-40.

The paper explores the question of who is likely to benefit from a change in the Cook County assessment system and who is likely to find that his taxes are increased. Factors determining the selling price of single family homes in Chicago are compared with factors related to variations in property tax assessments, to discover the ways in which the market and the assessor differ. The results of these comparisons are then combined to reveal those factors causing variations in the assessment:price ratio whose effects would be eliminated by uniform percentage taxation based on market values.

Bertsekas, Dimitri P. (1976). Dynamic Programming and Stochastic Control. Academic Press, New York.

The basic objective of the book is to provide a unified framework for sequential decision making under uncertainty and to stress the few fundamental concepts underlying the treatment of uncertainty and the technique of dynamic programming.

Bessette, Cheryl (1985). Growth, Distribution, and Abundance of Juvenile Penaeid Shrimp in Galveston Bay. Thesis, Department of Biology, University of Houston, Houston, Texas, August, 132 pp.

The bait shrimp industry of Galveston Bay was studied from May through November of 1984 to identify patterns of abundance and distribution of juvenile shrimp, Penaeus aztecus and P. setiferus, and to note the growth of both populations before movement of each to offshore waters. In addition to the work conducted on shrimp, a characterization of the incidental catch (all animals caught besides shrimp) was also performed.

Beverton, R.J.H. (1994). Notes on the Use of Theoretical Models in the Study of the Dynamics of Exploited Fish Populations. Marine Fisheries Section, American Fisheries Society, Special Publication 1.

This book reprints a series of lectures given in 1951 at the U.S. Fisheries Laboratory, Beaufort, North Carolina by the author on the theory of fishing and the analysis of the dynamics of fish populations. The bulk of the material on which the lectures were based was taken from recent work by the author in collaboration with Dr. S.J. Holt.

Beverton, Raymond J.H. and Sidney J. Holt (1957). On the Dynamics of Exploited Fish Populations. Fishery Investigations, Series II, Volume XIX, Ministry of Agriculture, fisheries and Food, London: Her Majesty's Stationery Office.

The initial investigation into fish population dynamics.

Bhattacharyya, Arunava, Thomas R. Harris, Rangesan Narayanan, and Kambiz Raffiee (1995). Technical Efficiency of Rural Water Utilities. Journal of Agricultural and Resource Economics, 20(3): 373-391.

Technical efficiency of rural water utilities is determined using frontier production functions. An indirect production function is developed to model the two-step production process of a local government controlled firm. Data from 26 rural Nevada water utilities are used to estimate inefficiency in terms of firm specific variables. A multi step estimation procedure is used instead of single step maximum likelihood estimation. Model selection tests are used to choose the best model. Privately owned utilities are most efficient; self-governing water districts are the least efficient. Municipal governments operate the most and least efficient utilities.

Biais, G. (1994). "A Decade of Fisheries Resources Management By TACS in European Community Waters from 1983 to 1992." C.M. 1994/T:2, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Seas, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September.

In 1983, the European Community agreed on a management and conservation regime for fisheries resources by adopting the EEC regulation n° 170/83. This has been one of the main text of the Common Fisheries Policy for ten years. It gave a major place to Total Allowable Catch (TAC) by stock or by group of stock.

After ten years of implementation of this regime, the European Commission admitted that it had some large insufficiencies (ECC, 1991). The EEC regulation n° 3760/92, which has replaced the EEC regulation n° 170/83 since the end of 1992, put some stress on other management instruments, e.g. licenses, and on the possibility of using TACs by fishery or over several years. Nevertheless, the annual TAC by stock appears to still have a future and it seems interesting to look at data in the debate on their performance.

Bibb, Sally (1994). "Monitoring Catch, Bycatch, and Discards for Individual Vessels." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Alaska Region, P.O. Box 21668, 709 West 9th Street, Juneau, Alaska, October.

A description of the groundfish bycatch problem in Alaskan waters and the effect of ITQ management on bycatch levels.

Bielsa, Lourdes M., William H. Murdich, and Ronald F. Labisky (1983). "Pink Shrimp." Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Florida), Performed for Coastal Ecology Group, Waterways Experiment Station, U.S. Army Corps of Engineers, Vicksburg, MS and National Coastal Ecosystems Team, Division of Biological Services, Research and Development, Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C. October, 21 pp.

This species profile is one of a series on coastal aquatic organisms, principally fish, of sport, commercial, or ecological importance. The profiles are designed to provide coastal managers, engineers, and biologists with a brief comprehensive sketch of the biological characteristics and environmental requirements of the species and to describe how populations of the species may be expected to react to environmental changes caused by coastal development. Each profile has sections on taxonomy, life history, ecological role, environmental requirements, and economic importance, if applicable. A Habitat Suitability Index (HSI) model is being prepared by the U.S. Fish and Wildlife Service for the pink shrimp. HSI models are designed to provide a numerical index of the relative value of a given site as fish or wildlife habitat.

Bigford, Thomas E. (1991). "Sea-Level Rise, Nearshore Fisheries, and the Fishing Industry." Coastal Management, 19:417-437.

Global meteorological conditions may be changing, and sea levels over the next centuries could rise at rates usually measured over millennia. As a result, fish habitats, fishery yields, and the industry's shoreside infrastructure could change dramatically. This article summarizes predicted sea-level changes; forecasts possible short- and long-term effects on fish habitats, valued estuarine and coastal species, and fishing industry sectors; and recommends specific actions to maintain a viable fishing industry. Lacking applicable research results, most effects are extrapolated from professional opinions and related research on other coastal industries or features. Emphasis is on the United States' Atlantic Coast.

Predicted impacts should change over time. Some short-term changes could be beneficial as new habitats are created for estuarine species, but the long-term implications on most sectors, especially shoreside industries, are more negative than positive. Potential impacts should inspire harvesting and processing sectors to participate in remedial planning, where assistance is available from coastal managers.

Recommendations address deficiencies in natural resource management strategies, development policies, short- and long-term waterfront plans, decision-making protocols for actions such as wetland permits, and priorities for remedial action.

Binswanger, Hans P. (1974). "A Cost Function Approach to the Measurement of Elasticities of Factor Demand and Elasticities of Substitution." American Journal of Agricultural Economics, 56(2):377-387.

This paper derives the Allen partial elasticity of substitution in terms of the cross derivatives of the cost function. Then, the result is applied to the case of the translog cost function and methods to avoid estimation biases caused by neutral and non-neutral efficiency differences are presented. Finally, the translog method is used to derive estimates of elasticities of derived demand and of elasticities of substitution for the agricultural sector using U.S. cross sectional data of states for the years 1949, 1959, and 1964.

Bird, Peter J.W.N. (1986). "Econometric Estimation of World Salmon Demand." Marine Resource Economics, 3(2):169-182.

This paper reports the estimation of a single equation model of the world market price of salmon over the period 1958-1982. The equation estimated explains the equilibrium price in terms of world salmon landings, OECD consumer expenditures, and the price of a substitute. The equation is specified dynamically. It implies relatively elastic short run responses of demand to price and income changes, together with the persistence of habits

over a longer period.

Birnie, Patricia (1982). "IWC - A New Era." Marine Policy, January:74-76.

Report on the 33<sup>rd</sup> meeting of the International Whaling Commission including the withdrawal of Canada from the Commission and the outcome of a proposed international commercial whaling moratorium.

Biro, Elizabeth (1992). "Wide Support for the Wreckfish Plan." National Fisherman, July:16-19.

The final installment in the series on individual transferable quotas (ITQs) focuses on a system that has a great chance of success. Wreckfishermen and regulators alike seized an opportunity to carefully manage a fishery before it got out to hand.

Bishop, Richard C. (1978). "Endangered Species and Uncertainty: The Economics of the Safe Minimum Standard." American Journal of Agricultural Economics, 60(1):10-18.

Species extinction irreversibly narrows the reservoir of potential resources. The future repercussions of this narrowing are uncertain. This paper develops the safe minimum standard (SMS) approach to public decisions involving endangered species. The SMS approach is based on game theory and calls for avoidance of extinction unless the social costs are unacceptably large. The level at which costs become excessive is a matter of intergenerational distribution. The paper also explores important linkages between the SMS approach and recent literature on preservation of natural environments.

Bishop, Richard C. (1987). "Economic Values Defined." Chapter 3 in Decker, Daniel J. and Gary R. Goff (eds.) Valuing Wildlife, Economic and Social Perspectives, Westview Press, Boulder, CO.

This chapter explains fundamental economic concepts that underlie wildlife valuation. These fundamental economic concepts will clarify economists objections to expenditures as a measure of value. Finally, the concepts will show that part of the tension between wildlifers and economists can be traced to a basic difference in their perspectives; wildlifers and economists bring different held values to bear on wildlife issues.

Bishop, Richard C. and Thomas A. Heberlein (1979). "Measuring Values of Extramarket Goods: Are Indirect Measures Biased?" American Journal of Agricultural Economics, 61(5):926-930.

A number of potential sources of bias in the contingent valuation and travel cost methods of valuing outdoor recreation have been discussed in the literature. These are summarized in the first section of the paper. When summed together, these potential problems are sufficient to justify considerable skepticism about the accuracy of resulting value estimates. In the second section of the paper, we report the results of an experiment where TC and CV values were compared to values based on actual cash transactions. Though preliminary, the results of this experiment indicate that substantial biases exist in both TC and CV estimates.

Bishop, Richard C. and Karl C. Samples (1980). "Sport and Commercial Fishing Conflicts: A Theoretical Analysis." Journal of Environmental Economics and Management, (7):220-233.

A recreational sector is added to a standard commercial fishing optimal control model to identify public decision variables that should be considered when determining optimal population levels and allocating harvestable fish between sport and commercial users. Both linear and nonlinear models are presented. A predator-prey relationship is also considered. Results derived from the models indicate that shortcomings exist with current economic inputs to policy making because of failure to consider relevant bioeconomic relationships. Future research topics to remedy this are discussed.

Bishop, Richard C., Thomas A. Heberlein, and Mary Jo Kealy (198?).

"Contingent Valuation of Environmental Assets: Comparisons with a Simulated Market." Draft report.

The evidence to support the view that people confronting a contingent valuation mechanism do not have well developed beliefs about how they would behave in real markets for environmental assets comes primarily from an experiment involving Wisconsin goose hunting permits. These permits were evaluated using several CV mechanism and a travel cost model. They were also evaluated in a "simulated market" where permit holders were offered real money not to hunt. The results show that contingent values could easily be in error by 50 percent or more. After describing the experiment and its results, the remainder of the paper explores the reasons for these errors with particular emphasis on the artificiality of CV mechanisms. Several conclusions emerge, including one particularly interesting hypothesis: Our results and those of some other studies seem to show that CV mechanisms tend to underestimate willingness to pay and overvalue environmental assets when the criterion is willingness to accept compensation.

Bjorndal, Trond (1988). "The Optimal Management of North Sea Herring." Journal of Environmental Economics and Management, 15:9-29.

A discrete time dynamic bioeconomic model for a fish resource is developed. The objective is maximization of discounted net revenues subject to changes in stock size. The model of population dynamics is described by a delay-difference equation. Natural growth and recruitment are related to stock size, with recruitment taking place with a time lag. Conditions characterizing the optimal stock level are derived. The model is applied to North Sea herring. Estimates of the optimal stock level are given, and optimal trajectories derived. Due to the schooling behavior of herring, it is shown that open access may cause stock extinction.

Bjorndal, Trond (1988). "Optimal Harvesting of Farmed Fish." Marine Resource Economics, 5(2):139-159.

This paper analyzes the optimal harvesting of farmed fish. A biological model for a year class of fish is specified. Output price and costs are added to constitute a bioeconomic model. The effects of economic and biological parameters on optimal harvesting are analyzed. Examples of optimal harvesting for salmon and turbot are given.

Bjorndal, Trond (1989). "Production in a Schooling Fishery: The Case of the North Sea Herring Fishery." Land Economics, 65(1):49-56.

This paper undertakes an empirical analysis of the harvest function for the North Sea herring fishery. The empirical results indicate that there is a rising marginal product to the variable input in the fishery. Fishery regulations that were in force, including total quotas and closed seasons, are found to be either ineffective or causing boats to operate inefficiently.



Bjorndal, Trond and Jon M. Conrad (1987). "Capital Dynamics in the North Sea Herring Fishery." Marine Resource Economics, 4: 63-74.

A discrete time model is formulated to model decisions of boats to enter or exit the North Sea herring fishery. A lagged model is specified to reflect adjustment time to changes in profits. The empirical results indicate that fleet adjustment in this fishery primarily depends on current period profits and that the opportunity cost may depend on returns in the alternative fishery (mackerel). Lagged variables reflecting vessel construction time accounted for a small increase in the statistical fit. The hypothesis that entry in response to positive profits is more elastic than exit due to negative profits was not supported by the results.

The harvesting industry's capital investment model was relatively simplistic reflecting the limited data set available to the authors. The annual data covered a relatively short period of time and probably little cross sectional data existed for this fishery. These limitations restrict the available degrees of freedom necessary to construct and estimated more sophisticated models.

Black, Robert, Bruce McKenney, Robert Unsworth, and Nicholas Flores (1998). Economic Analysis for Hydropower Project Relicensing: Guidance and Alternative Methods. Industrial Economics, Incorporated, 2057 Massachusetts Avenue, Cambridge, Massachusetts, October.

A review of the Federal Power Regulatory Commission guidelines of cost benefit analysis for relicensing hydropower projects. Comments and suggestions for improving the analyses are included.

Blackman, Sue Anne Batey and William J. Baumol (1980). "Modified Fiscal Incentives in Environmental Policy." Land Economics, 56(4):417-431.

We have sought to describe how ingenuity can devise a variety of modified environmental programs that in different degrees approximate the pure financial incentives advocated by many economists.

Blake, Kevin S. (1996). Modeling Preferences for Regulatory Options: A Case Study of the Northeast Recreational Bluefin Tuna Fisherman. Non-Thesis, Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, R.I., August, 86 pp.

Since passage of the Magnuson Fishery Conservation and Management Act of 1977, U.S. fishery managers have concerned themselves with achieving optimum social yield. To effect this mandate, fishery managers have focused on direct effort controls without determining how fishermen, commercial or recreational, may prefer the fishery be regulated. Using contingent valuation methods, economists may determine if preferences exist for some types of regulations. This paper uses contingent, or discrete, choice questions from a 1991 mail survey of Northeastern recreational Western Atlantic bluefin tuna fishermen to demonstrate that fishermen have preferences for catch limit regulations.

Blomo, Vito J. (1983). "Economic Criteria Regarding Diversification Through Public and/or Private Sector Financing." Report V in Assessment of Shrimp Industry Potentials and Conflicts, Volume II, Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August, 22 pp.

Cyclical swings in the profitability of shrimp harvesting operations has

prompted an evaluation of diversifying the scope of fishing activities. This report first develops economic criteria the vessel owner can use to determine the profitability of any additional investment including the advisability of borrowing additional investment funds. Secondly, with financing for diversification from public and/or private sources being likely, economic criteria will be developed so that funds from these sources are loaned out and committed with minimal risk and with a high degree of accountability to the public for public funds.

Blomo, Vito J. and James E. Easley (1983). "Awareness Program for Shrimp Harvesters as to the Uses of Various By-Catch, The On-Going Development of the Turtle Excluder Device (TED) Information Program." Report IV in Assessment of Shrimp Industry Potentials and Conflicts, Volume II, Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August, 23 pp.

The purpose of this report is to discuss alternatives for an awareness program for shrimp fishermen regarding bycatch utilization. Bycatch reduction of undesirable sizes and species is an integral part of the problem, hence is also addressed. The first section below briefly summarizes recent information on bycatch, its utilization and problems surrounding bycatch utilization. The second section discusses possible objectives of an awareness program and types of information that would be required. The third section then addresses strategies that might be pursued in terms of vehicles for conducting an awareness program. The next section discusses possible content and delivery methods for a Turtle Excluder Device (TED) information program. As such, it emphasizes bycatch reduction. The last section then discusses techniques for monitoring the effectiveness of an awareness program. Monitoring will be important to future decisions concerning whether to continue such a program.

Blomo, Vito J. and Wade L. Griffin (1978). "Costs and Returns Data: Florida-Based Gulf of Mexico Shrimp Trawlers, 1977." TAMU-SG-79-604, Department of Agricultural Economics, Texas Agricultural Experiment Station, Texas A&M University, October, 33 pp.

This report summarizes estimates of costs and returns for vessels of different characteristics that anchor in Florida and trawl in the Gulf of Mexico. Data for the calendar year 1977 were collected from vessel owners. Results are presented in self explanatory tables. No attempt is made to draw inferences or discuss implications of trends, or relationships that may be apparent in the data. The file also contains a June, 1978 draft final report to NMFS.

Blomo, Vito J. and John P. Nichols (1974). "Utilization of Finfishes Caught Incidental to Shrimp Trawling in the Western Gulf of Mexico, Part I: Evaluation of Markets." Department of Agricultural Economics and Rural Sociology, Texas Agricultural Experiment Station, Texas A&M University, June, 85 pp.

Discarded trawl fish can be processed into fish meal, fish solubles, fish oil, pet food, and various forms of seafood. This study evaluates the nature of the markets potentially available for trawl fish and estimates potential volumes that could be marketed through these channels. Price flexibilities were estimated for each market to evaluate impact of increased supplies on price. Based on these estimated relationships, current market conditions and the availability of trawl fish in the Western Gulf of Mexico, potential volumes that could move through each market were determined. For example, the total catch of trawl fish by shrimpers of 368 million pounds could move through the reduction market with only a negligible effect on

price. The lack of viable marketing facilities along the Texas Coast for many product forms is an important limitation on flow of trawl fish into market channels.

Blomo, Vito J., Wade L. Griffin, and John P. Nichols (1978). "Catch-Effort and Price-Cost Trends in the Gulf of Mexico Shrimp Fishery: Implications on Mexico's Extended Jurisdiction." Marine Fisheries Review, 40(8):24-28.

This paper reviews the trends in the catch-effort and price-cost relationships in the Gulf of Mexico shrimp fishery. In addition, these relationships provide a rudimentary framework for analyzing the effect of Mexico's extended 200-mile jurisdiction. This paper updates the data series presented by Nichols and Griffin (1975) and also provides a more accurate estimate of fishing effort by shrimp vessels (Griffin, 1977).

Blomo, V.J., J.P. Nichols, W.L. Griffin, and W.E. Grant (1982). "Dynamic Modeling of the Eastern Gulf of Mexico Shrimp Fishery." American Journal of Agricultural Economics, 64(3):475-482.

The impact of alternative management schemes on the shrimp fishery of the eastern Gulf of Mexico is analyzed and compared to a baseline using simulation techniques (GBFSM). The fishery's biological and economic functions are modeled including intraseasonal shrimp growth rates, differences in demand for shrimp by size, and a heterogenous fishing fleet. Using consumer and producer surplus techniques, new fishing regulations appear socially optimal compared to the baseline. A rent maximization scheme increases social surplus to its highest level. However, applying such a scheme to one part of the total Gulf of Mexico shrimp fishery is not recommended.

Blomo, V., K. Stokes, W. Griffin, W. Grant, and J. Nichols (1978). "Bioeconomic Modeling of the Gulf Shrimp Fishery: An Application to Galveston Bay and Adjacent Offshore Areas." Southern Journal of Agricultural Economics, 10(1): 119-125.

This article incorporates a nonlinear optimization procedure into the simulation model developed by Grant and Griffin (1979). The simulation model that integrates the biological relationships and shrimp fleet characteristics is combined with economic theory into a 12 month analysis that maximizes net income to the industry (gross returns over costs) over a shrimping season. The analysis can also evaluate changes in several institutional parameters that affect the utilization of the common property shrimp resource.

Blonder, Greg (1995). Faded Genes. AT&T Bell Labs.

In 2088, our branch on the tree of life will come crashing down. We will be driven to extinction by a smarter and more adaptable species, the computer. And our only alternative is to tinker with the very stuff that makes us human, our genes.

Blue Water Fishermen s Association (1997). Economic Impacts to the U.S. Pelagic Longline Fishery due to Wasteful, Misguided U.S. Unilateral Management Policies of the National Marine Fisheries Service. P.O. Box 579, 910 Bayview Ave., Barnegat Light, NJ, 17 pp.

A fishery description and estimates of the negative economic impacts associated with several NMFS Highly Migratory Species management policies.

Bockstael, N.E. (1976). "Analysis of Investment Behavior and Price Determination: Analytical Input for the Formation of Policy in the Fisheries." Dissertation, Department of Natural Resource Economics, University of Rhode Island, Kingston, Rhode Island.

This study provides a theoretical base and an analytical model that would allow for the generation of necessary information inputs to policy decisions regarding foreign fishing within the U.S. extended fisheries zone. Two segments of the analysis include a fisheries investment behavior and economic agent behavior model. The coordination of the two segments into an interrelated, policy oriented, prediction model is discussed.

Bockstael, Nancy (1978). "Seafood Processing Capacity in Commercial Fisheries Management: Discussion." American Journal of Agricultural Economics, 60(5):1026-1027.

Reply to Prochaska, F.J. (1978). "Theoretical and Empirical Considerations for Estimating Capacity and Capacity Utilization in Commercial Fisheries." American Journal of Agricultural Economics, 60(5):1020-1025.

Bockstael, N.E. (1984). "Uncertainty About Consumption and Consumer Uncertainty." Draft report.

Uncertainty in the context of demand for fisheries products suggests two quite distinct issues. The first is the uncertainty that resource managers face in predicting demand; the second is the uncertainty that faces consumers of fishery products. This paper argues that the first either is of little importance relative to other prediction problems of fishery managers or provides no new problems of analysis. However, the second issue relates to the demand for quality, a topic receiving much attention in the recent economic literature and one that has particular significance for the demand for seafood. When producers in a competitive industry have control over quality but consumers cannot perceive quality upon inspection, welfare gains can be made from imposing minimum quality standards. In addition, publicly supplied and accurate information about quality would have returns to both parties when consumers, uncertain about the health risks related to fish consumption, exhibit risk averse behavior.

Bockstael, N.E. (1984). "Uncertainty About Consumption and Consumer Uncertainty." Marine Resource Economics, 1(1):67-76.

Uncertainty in the context of demand for fisheries products suggests two quite distinct issues. The first is the uncertainty that resource managers face in predicting demand; the second is the uncertainty that faces consumers of fishery products. This paper argues that the first either (a) is of little importance relative to other prediction problems of fishery managers or (b) provides no new problems of analysis. However, the second issue relates to the demand for quality, a topic receiving much attention in the recent economic literature and one that has particular significance for the demand for seafood. When producers in a competitive industry have control over quality but consumers cannot perceive quality upon inspection, welfare gains can be made from imposing minimum quality standards. In addition, publicly supplied and accurate information about quality would have returns to both parties when consumers, uncertain about the health risks related to fish consumption, exhibit risk averse behavior.

Bockstael, N.E. and Catherine L. Kling (1988). "Valuing Environmental Quality: Weak Complementarity with Sets of Goods." American Journal of Agricultural Economics, 70(3):654-662.

In practice, it is frequently impossible to identify a single good that is a weak complement to an environmental amenity for which welfare measures are desired. However, a set of goods exhibiting this property sometimes exists, e.g., water related recreational activities when the nonmarket good to be valued is water quality. A set of weak complements is defined and implications for welfare measurement presented. The proper welfare measure now involves evaluation of a line integral and simple additions of areas under demand curves will not always be correct. However, under certain econometric circumstances, approximate welfare measures can be obtained from estimated functions.

Bockstael, Nancy E. and Kenneth E. McConnell (1979). "Calculating Equivalent and Compensating Variation for Natural Resource Facilities." Draft report, Department of Resource Economics, University of Rhode Island, Kingston, RI, August, 15 pp.

This paper addresses the theoretical and applied difficulties involved in estimating compensated and equivalent variation for large price changes in natural resource facilities. Unambiguous measures of welfare changes cannot be calculated when a resource is eliminated (price changes from zero to infinity). Also, contingent valuation measures are preferred to the direct approach of travel cost demand analysis for estimating consumer surplus due to the difficulties of using Willig's bounds in this case of zero demand for access to the natural resource (trips).

Bockstael, Nancy E. and Kenneth E. McConnell (1981). "Theory and Estimation of the Household Production Function for Wildlife Recreation." Journal of Environmental Economics and Management, 8:199-214.

The household production function is an intuitively appealing way to model man's interaction with nature. This paper models the interaction between the household's behavior and publicly provided inputs into wildlife recreation. The paper shows how to compute benefits, assuming that the household production function is known. The household production function approach collapses to the simple travel cost approach when households are unable to substitute their own inputs for publicly provided inputs. In addition, the paper demonstrates the conditions under which the parameters of cost and preference functions can be identified. The conditions for identification are quite restrictive when several choices are endogenous.

Bockstael, Nancy E. and Kenneth E. McConnell (1983). "Welfare Measurement in the Household Production Framework." American Economic Review, 73(4):806-814,

A new conceptual basis for welfare measurement of nonmarket goods is provided. The paper shows that the traditionally conceived Marshallian demands are not uniquely defined. In contrast, the utility constant marginal value functions that are dependent only on preferences and not technology do exist and have the usual normative interpretation. Regardless of joint production or nonconstant returns to scale, the area behind the marginal value and marginal cost curves measure economic surplus. Changes in this area measure welfare effects associated with changes in the individual's economic environment. Finally, the paper shows that equivalent measures of welfare change can often be obtained in the market for goods that serve as inputs into the household production process without assuming that the technology is known.

Bockstael, N.E. and J.J. Opaluch (1983). "Discrete Modeling of Supply

Response Under Uncertainty: The Case of the Fishery." Journal of Environmental Economics and Management, 10:125-137.

In the absence of complete control in a regulated industry, effective management requires prediction of firms' behavioral responses to public policy. This paper develops a discrete choice model of supply response under uncertainty and applies it to fishery choice problems of New England fishing firms. While fishermen demonstrate a bias towards remaining within the same fishery, sufficient incentives, in terms of changes in expected returns and risk, are shown to elicit response. Due to extreme uncertainty concerning population dynamics of fish stocks, a satisficing approach to management, facilitated by this type of modeling, may be more appropriate than bioeconomic optimization.

Bockstael, Nancy E. and Ivar E. Strand, Jr. (1987). "The Effect of Common Sources of Regression Error on Benefit Estimates." Land Economics, 63(1):11-20.

This paper explores how the assumptions about sources of error influence estimates of recreational benefits. A discussion of the various sources of error in demand estimation is first offered. The analysis is confined to omitted variables and measurement error or random preferences. These represent the primary explanations for the stochastic term in recreational demand analysis. Also, they can be treated with the same estimation technique and hence imply identical estimators.

Bockstael, Nancy E. and Ivar E. Strand, Jr. (1993). "Free Trade and Global Resources: The Case of Protected Marine Species." Paper prepared for the IDB/ECLAC Project on Trade Liberalization, June, 1993.

The authors determine the impacts of institutional rules for the international trade of seafood on protected and endangered species focusing on the dolphin/tuna and shrimp/turtle controversies. Because of differences in the processing and harvesting industries for tuna and shrimp, essentially different results were obtained to protect endangered turtles and protected dolphins.

Bockstael, Nancy E., Ivar E. Strand, Jr., and W. Michael Hanemann (1984). "Time and Income Constraints in Recreation Demand Analysis." Draft report, Department of Agricultural and Resource Economics, University of Maryland, March, 33 pp.

In this paper, the existing recreational demand analysis is improved by developing a defensible model of recreation behavior conditional on labor market decisions. The primary purpose is to explore the implications of realistic time and income constraints for modeling the behavior of recreationalists. These constraints are developed from the labor supply literature which is also used to identify the appropriate econometric estimation techniques. The proposed approach incorporates a defensible method for treating the value of time as well as addressing the sample selection bias arising from sampling only participants. Exact measures of recreational benefits are developed by estimating demand functions consistent with utility maximization. In the final section, recreational benefits estimated from this approach are compared with those generated by conventional models and estimation practices.

Bockstael, Nancy E., Ivar E. Strand, and W. Michael Hanemann (1987). "Time and the Recreational Demand Model." American Journal of

Agricultural Economics, 69(2):293-302.

In this paper, a theoretically consistent approach to including time costs in recreational demand models is developed. The demand model is conditional on the recreationist's labor market situation. For individuals at corner solutions in the labor market, utility maximization is subject to two constraints, leading to a demand function with travel costs and travel time as independent variables. With interior solutions in the labor market, time is valued at the wage rate and combined with travel costs to produce one "full cost" variable. In an illustration, welfare measures based on the new model are estimated for a sample of sportfishermen.

Bockstael, N.E., W. Michael Hanemann, and Catherine L. Kling (198?). "A Survey of Models of Recreation Demand in a Multiple Site Framework." Draft report, Department of Agricultural Economics, University of Maryland, College Park, MD.

A topic that has received particular attention in the recreational demand modeling literature is the modeling of the demand for systems of alternative sites, as compared with the more traditional single site modeling approaches. The multiple site models are frequently complex, diverging from simple intuitive extensions of the single site model. They are also diverse, and this together with their complexity makes assessment and comparison of models and results difficult. While problems in the theory and application of single site models remain, most practitioners understand these models and their inherent problems and can apply them with a cautious confidence. In contrast, multiple site models are difficult to sort out, to interpret, and to estimate.

In this paper, we first explore the reasons why multiple site models have been developed and outline a number of the approaches which have been used. We then assess these models with a specific criteria in mind: how well do they account for the specific nature of benefit changes in a multiple site framework? Using a common data set, we demonstrate a few of the estimation techniques.

Bockstael, N.E., K.E. McConnell, I.E. Strand (1989). "Measuring the Benefits of Improvements in Water Quality: The Chesapeake Bay." Marine Resource Economics, 6(1):1-18.

Federal, state, and local government agencies have joined forces in the ambitious and expensive task of improving the water quality of the Chesapeake Bay. Clean up efforts will be devoted to three major problems: nutrient over enrichment, toxic substances, and the decline of submerged aquatic vegetation. Although the beneficiaries are ultimately human, criteria for judging the Bay's water quality have been primarily biological and physical. This paper addresses the question of the human values from the Bay. How do people use the Bay and how much are they willing to pay for the changes in water quality that improve their use: With a variety of methods and data sources, we estimate the annual aggregate willingness to pay for a moderate improvement in the Chesapeake Bay's water quality to be in the range of \$10 to \$100 million in 1984 dollars.

Bockstael, N.E., K.E. McConnell, I.E. Strand (1989). "A Random Utility Model for Sportfishing: Some Preliminary Results for Florida." Marine Resource Economics, 6(3):245-260.

The gray literature in the field of nonmarket benefit measurement has made extensive use of the random utility (or discrete choice) model in recent years, but few applications appear in the literature. This article provides

such an application, illustrating the technique with preliminary results from a regional study modeling east coast sportfishing behavior. The article discusses some of the strengths and weaknesses of the random utility model. It also illustrates how data regularly collected by the National Marine Fisheries Service can be supplemented with economic survey data to estimate these discrete choice behavioral models.

Bohi, Douglas R. and Michael A. Toman (1984). Analyzing Nonrenewable Resource Supply. Resources for the Future, Washington, D.C.

This study is concerned with the general problem of using economic models of nonrenewable resource supply to understand actual supply behavior.

Bohnsack, James A. and Douglas Harper (1987). "Automated Landings Assessment for Responsive Management (ALARM) Package for Gulf of Mexico Commercial Reef Fish Landings: March 1987 Summary." National Oceanic and Atmospheric Administration, National Marine Fisheries Center, Miami Laboratory, Reef Resources Team, 75 Virginia Beach Drive, Miami, FL, March, 16 pp.

A summary of landings of reef fish species for the Gulf of Mexico commercial reef fish fishery.

Bohnsack, James A., Ausbon Brown, and Douglas Harper (1987). "Automated Landings Assessment for Responsive Management (ALARM) Package for Gulf of Mexico Commercial Reef Fish Landings: 1987 Summary." Contribution No. CRD-86/87-29, National Oceanic and Atmospheric Administration, National Marine Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL, June, 17 pp.

A summary of the 1986 landings of reef fish species for the Gulf of Mexico commercial reef fish fishery.

Booth, Douglas E. (1989). Hydroelectric Dams and the Decline of Chinook Salmon in the Columbia River Basin. Marine Resource Economics, 6(3):195-211.

The decline of chinook salmon runs into the mouth of the Columbia River in recent decades is thought to be partly attributable to the construction of hydroelectric dams. The purpose of this article is to estimate the magnitude of losses in chinook salmon runs caused by hydroelectric dams, using regression analysis. Such estimates are not only of historical interest but also can potentially affect the extent of efforts to mitigate salmon losses from hydropower operations. Congress has mandated the Northwest Power Planning Council to consider the magnitude of run losses caused by hydroelectric operations in determining the extent of mitigation efforts.

Borseman, John, Michael P. Sissenwine, Merton C. Ingham, and Wallace G. Smith (1984). "Marine Recreational Fisheries Opportunities." Chapter 15 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

In addition to enhancement and development of new fishing opportunities, the management agencies are also responsible for promoting conservation. This apparent dilemma has led the agencies to be more creative in their fisheries



resource and development programs, and has led the agencies to the examination of new methods for providing greater utilization of resources without overexploitation.

Bosch, Darrell J. and Leonard A. Shabman (1989). The Decline of Private Sector Oyster Culture in Virginia: Causes and Remedial Policies. Marine Resource Economics, 6(3):227-243.

Oyster production from private grounds in Virginia has declined significantly since 1960. Restoring industry production requires a better understanding of the reasons for this decline. Currently, state fishery managers and the popular press attribute the decline to the oyster disease Haplosporidium nelsoni (MSX). In fact, private planters themselves consider MSX disease as the primary constraint on the future profitability of private oyster culture. This study analyzes potential causes of the decline using a simulation model of oyster production with data from the 1960's, 1970's, and 1980's. The analysis suggests that rising seed prices driven by economic and productivity changes are more important than MSX in reducing the economic incentives to private planting. Therefore, reducing oyster seed prices is an effective policy strategy. However, education of planters will also be needed to assure a better understanding of the profit potential in oyster planting.

Bose, Shekar and Alistair McIlgorm (1996). Substitutability Among Species in the Japanese Tuna Market: A Cointegration Analysis. Marine Resource Economics, 11(3):143-155.

This paper examines two sets of hypotheses concerning the existence and the cause of the long run inter-species price relationships in the Japanese tuna market. A shock variable is introduced into the system to determine the degree of influence on the price relationships as well as the magnitude of the power in explaining the variation in prices of tuna species. Although in most cases the coefficient estimates of the shock variable are statistically significant, overall, the variable does not have significant explanatory power in both bivariate and multivariate regressions. We also find that the degree of substitutability between bigeye and albacore is substantially lower than the degree of substitutability between bigeye and yellowfin and, yellowfin and albacore.

Boskin, Michael J. (1974). "A Conditional Logit Model of Occupational Choice." Journal of Political Economy, 82:389-98.

The conditional logit decision model is applied to the choice of occupation by individual workers to test the implications of the theory of human capital. The empirical results support the human capital hypothesis that workers choose occupations to maximize the discounted present value of potential lifetime work time. Allowing for imperfect capital markets by including training costs relative to wealth and for unemployment by including the discounted present value of expected earnings foregone due to unemployment also yielded results consistent with a priori expectations.

Botton, Mark L. and John W. Ropes (1987). "The Horseshoe Crab, Limulus polyphemus, Fishery and Resource in the United States." Marine Fisheries Review, 49(3):57-61.

The American horseshoe crab is a focus for increasing economic and scientific importance because its blood has important biomedical applications and because the crab is used as bait in several fisheries. In addition, horseshoe crab eggs may be critical as a source of food for migratory

shorebird populations of the Delaware Bay region, and adult crabs are predators of valuable clam resources. Fishing related mortality in the United States is estimated minimally at 350,000 crabs per year, mostly in the middle Atlantic and southern New England states. Bait operations apparently kill (10-20 times the number of animals killed for bleeding to obtain the valuable Limulus amoebocyte lysate (LAL). Based on National Marine Fisheries Service groundfish trawl surveys, the population of horseshoe crabs on the middle Atlantic continental shelf has remained relatively constant since 1975 at 2.3 to 4.1 million individuals. Exploitation may not be trivial, particularly if local populations are targeted during the spawning period; we suggest several foci for further investigations on this species. There is no evidence that current levels of harvesting are depleting the resource. It is important, however, to continue monitoring activity, particularly if levels of exploitation increase.

Bouchelle, E. Lee (1992). "An Economic Analysis of Harvest Restrictions in the North Atlantic Swordfish Fishery." Thesis, Department of Food and Resource Economics, University of Florida, Gainesville, FL, December.

In an attempt to reduce fishing mortality of the North Atlantic swordfish fishery, domestic and international management agencies have cooperated in a multilateral effort to establish quotas and minimum size requirements in the fishery. These restrictions can have significant economic consequences on the participants in the fishery. A four equation partial equilibrium model of swordfish and tuna supply and demand is developed to derive a general equilibrium swordfish demand function. The empirical model predicts behavior consistent with general equilibrium theory.

Bouchelle, E. Lee, Eric Thunberg, Charles Adams, and James L. Seale Jr. (1991). "The North Atlantic Swordfish Fishery: Problems, Trends and Management." Draft report, Department of Food and Resource Economics, University of Florida, Gainesville, FL.

This paper begins with a historic overview of the swordfish fishery. The problems that have developed within the fishery become evident as we discuss production trends. The evolution of the original swordfish management plan is traced to today's impending regulations. Since the U.S. is the primary importer of swordfish the role of imports is analyzed within a simple economic trade model. We will conclude with a summary of the impacts of the regulations that affect domestic producers and consumers. However, because of the number of countries involved in the North Atlantic swordfish fishery, the regulations have international implications as well. Two Versions.

Bowen, B.K. (1987). "Fisheries Management and Recreational Fisheries in Western Australia." Marine Fisheries Review, 49(2):177-178.

A review of fishery management in western Australia and the effect limited entry programs for commercial fisheries has on recreational activities.

Bowen, Bernard K., Bob Lindner, Marec Pty Ltd, and Neil McLaughlan (1994). "Long Term Management Strategies for the Western Rock Lobster Fishery." Volumes 1 to 4, Fishery Management Paper Numbers 67 to 70, Fisheries Department of Western Australia, 108 Adelaide Terrace, East Perth, October, 67 pp.

This report focuses on the options for the future management of the Australian rock lobster fishery in relation to (i) the continued use of input

controls and (ii) the use of output controls. Optimum fleet size is considered and its associated implications for the rules for pot transfer, pot reduction and boat replacement, and license splitting.

Bowes, Michael D. and John V. Krutilla (1985). "Multiple Use Management of Public Forestlands." Chapter 12 in Kneese, Allen V. and James L. Sweeney (ed.). Handbook of Natural Resource and Energy Economics, Vol. II, Elsevier Science Publishers B.V.

This chapter is intended to provide a background in economic concepts specifically focused on the multiple use management of public forestlands by extending the models introduced in Chapter 2. The managers of these lands must, in addition to considering the value of timber harvests, the primary focus of Chapter 2, consider the various nonmarket amenity services such as recreation, water flow and wildlife which are influenced by alterations in the standing stocks of timber. We discuss research results on the relation of such multiple use management to single purpose timber management. The presentation is motivated by a number of issues of current concern: the withdrawal of lands from timber management, the specialization or diversification of land use, the level and stability of timber supply, and the wisdom of certain accepted rule-of-thumb principles of public forestland management related to the age and level of harvests.

Boxall, Peter C. (1995). The Economic Value of Lottery-Rationed Recreational Hunting. Canadian Journal of Agricultural Economics, 43(1):119-131.

Lottery-rationed permit systems are used to allocate hunting opportunities where demand for permits exceeds the ability of the animal populations to sustain hunting harvest levels. Attempts to estimate the values of lottery-rationed hunting use a zonal travel cost model where applications per capita formed the dependent variable and expected travel costs represent the price variable. This paper reexamines this analysis using a discrete choice travel cost model which incorporates the expectation of receiving a permit. This model is developed for lottery-rationed antelope hunting in Alberta. Choice in the lottery-rationed hunting context involves selecting one site from a set defined through management regulations. The discrete choice travel cost model is proposed as superior to the early models because it better represents this behavioral process.

Boyce, John R. (1987). "Information and Uncertainty: A Behavioral Model of a Commercial Fishery." Draft report, Department of Agricultural Economics, University of California, Davis.

This paper addresses fishery management from a within season point of view; the movement of fishermen with multiple locational choices. A model is developed that explains fishing fleet allocation among the alternative locations given uncertainty with respect to the catch rates in each location and competition between the fishermen for the allowed catch. The model focuses upon the decision rules under which rational risk-neutral agents would choose to operate when competing with other agents in a stochastic environment.

Boyce, John R. (1988). "Rent Dissipation from Entry and Exit in a Fishery." Draft report.

This paper examines the dissipation of rents that occurs in an open access fishery within a season. The behavioral model that is developed below explicitly assumes that agents seek to maximize their expected profits over a fishing season. To do so, agents must account for both the variable costs and

the fixed costs. The fixed costs in this model are essentially the costs of entering the fishery. These may be in terms of foregone opportunity costs or in terms of direct costs of entering such as the costs of fuel and crew time to move from the home port to the fishery.

Boyce, John R. (1988). "An Econometric Model of Entry and Exit in a Fishery." Draft report, Department of Economics, University of Alaska, Fairbanks, Fairbanks, Alaska, 99775.

A set of simple behavioral relationships are postulated that may be used to determine the number of agents who will actively participate in the fishery at any moment in time and the spatial distribution of the agents over a fishery with multiple locations. These relationships are then used to develop a switching regression model that predicts the participation rates and distribution for the British Columbia Salmon fishery from the observed data of catch and effort. A crowding externality, a stock externality, and costs increasing from most to least efficient are incorporated into the model. The results of the model estimation are not provided.

Boyce, John R. (1991). "The Economics of Bycatch Regulation in the North Pacific." Draft report, Department of Economics, University of Alaska, Fairbanks, Fairbanks, Alaska, 99775.

The North Pacific groundfish fishery is modeled to determine the impact of ITQ and penalty box management schemes on firm bycatch levels. It is the heterogeneity of the fishery and the fact that decisions are made in the political process that drives the selection of institutions over common property resources. I should come as no surprise then that when the industry was faced with a real choice of how to deal with the problem, that it chose to implement a system that most closely resembled the status quo.

Boyce, John R. (1992). "Individual Transferable Quotas and Production Externalities in a Fishery." Natural Resource Modeling, 6(4):385-408.

This paper determines the conditions under which an individual transferable quota (ITQ) system will cause fishermen to engage in cost decreasing, rather than cost increasing, competition. If there are production externalities (e.g., congestion or stock externalities) present, the market price of a quota will not be fully reflected in these externalities. Thus, fishermen will not fully internalize the externalities in their effort decisions. Even if there are no production externalities, an individual fisherman imposes costs on others under open access by removing a fish that was available to all fishermen. An ITQ system allows the individual who values that fish most to obtain the right to harvest the fish, so each fisherman must internalize the full social cost. Thus, an ITQ system is capable of solving the common property externality but not the production externalities in a fishery.

Boyce, John R. (1993). "Using Participation Data to Estimate Fishing Costs for Commercial Salmon Fisheries in Alaska." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

Using the number of fishermen participating in a particular opening as a proxy for net revenues, estimates of fishing costs can be estimated using total revenues. The results are used to estimate producer surplus for each of nine fisheries for the 1990 season.

Boyce, John R. (1993). "Using Participation Data to Estimate Fishing Costs for Commercial Salmon Fisheries in Alaska." Marine Resource Economics, 8(4):367-394.

This paper estimates the fishing costs and the returns to fishing from nine commercial salmon fleets in Alaska. The econometric model uses a two-stage least squares estimation procedure to estimate the effect of congestion and heterogeneity on the returns to fishermen. The hypotheses that fishermen are homogenous and that there is no congestion externality present in the fisheries are strongly rejected. The data indicates that fishermen are quite heterogeneous in fishing skill levels. This difference accounts for the overall estimates of positive net returns to the common property fisheries. Estimates of the net returns to the fisheries suggest that the returns to different gear types vary largely. The set net fleets are found to have the highest return as a percentage of total revenues.

Boyce, John R. (1995). Optimal Capital Accumulation in a Fishery: A Nonlinear Irreversible Investment Model. Journal of Environmental Economics and Management, 28:324-339.

A nonlinear two state variable, two control variable model of a fishery with irreversible investment and harvest capacity constraints is examined. The model relaxes assumptions of linearity in investment costs and variable harvest profits in an earlier model by Clark, Clarke, and Munro (1979). In both the linear and nonlinear models, the optimal capital accumulation paths in new fisheries is characterized by a period in which the physical capital stock level exceeds its long run sustainable equilibrium. However, unlike the linear model, periods of positive net (but declining gross) investment are optimal in the nonlinear model. This accords with observed capital accumulation paths from a number of fisheries. The paper also finds different effects in optimal harvest policy depending upon whether the linearity appears in the variable profits function or the investment cost function.

Boyce, John R. (1996). "An Economic Analysis of the Fisheries Bycatch Problem." Journal of Environmental Economics and Management, 31(3):314-336.

Bycatch is the incidental take of a species that has value to some other group. This paper compares open access and individual transferable quota equilibria to the equilibrium in which the joint value of the fisheries is maximized. The open access induced problems can be corrected by an individual transferable quota system only if both the target species and the bycatch species have tradable quotas, and only if the bycatch species does not have existence value. There exists a range of the bycatch-to-target species harvest levels for which the total harvest of each will be exactly taken by a given technology, even under open access. However, there may not even exist a unique open access equilibrium if bycatch is allocated by rule of capture. Prohibitions on the sale of bycatch reduce the bycatch level, but they also reduce social welfare.

Boyce, John, Mark Herrmann, Diane Bischak, and Joshua Greenberg (1993). "The Alaska Salmon Enhancement Program: A Cost/Benefit Analysis." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

In May 1991, the Alaska Senate's Special Committee on Domestic and International Commercial Fisheries initiated the first review of the state's salmon enhancement program since its inception 20 years ago. As part of this review, a cost/benefit analysis of the State's enhancement program for

sockeye, chinook, coho, chum, and pink salmon was performed with cooperation from the Fisheries Research Enhancement Division of the Alaska Department of Fish and Game. Results indicate that for all species, except chinook, net benefits will decrease as the enhancement program is expanded, and increase if the enhancement program is scaled back. However, in only the case of pink salmon was the estimated effect judged to be significant enough to warrant the recommendation that the state would benefit from the reduction of the hatchery program. Under this scenario there would, however, be significant regional differences. For all scenarios, it is recommended that the State of Alaska reduce its funding of the enhancement program and allow the fishers, through the private nonprofit hatcheries, to fund the programs that they consider to be profitable.

Boyce, John, Mark Herrmann, Diane Bischak, and Joshua Greenberg (1993). "The Alaska Salmon Enhancement Program: A Cost/Benefit Analysis." Marine Resource Economics, 8(4): 293-312.

In May 1991, the Alaska Senate's Special Committee on Domestic and International Commercial Fisheries initiated the first review of the state's salmon enhancement program since its inception 20 years ago. As part of this review, a cost/benefit analysis of the State's enhancement program for salmon was performed with cooperation from the Fisheries Research Enhancement Division of the Alaska Department of Fish and Game. The main results are that the additional producer's surplus generated by the pink and sockeye hatchery programs are estimated to be less than the costs of running these programs. Eliminating the entire pink or sockeye salmon programs is estimated to increase net benefits by about 8% and 6%, respectively. A 15% increase in either program is estimated to result in a reduction in net benefits and a 15% decrease in either program is estimated to result in a slight increase in net benefits. Estimates of the confidence intervals for net benefits suggest that the gains from the elimination of either the pink program or the sockeye program are statistically different from zero. However, changes of plus or minus 15% of current hatchery production are found not to statistically affect net benefits.

Boyd, Rick O. and Christopher M. Dewees (1992). "Putting Theory into Practice: Individual Transferable Quotas in New Zealand's Fisheries." Society and Natural Resources, 5:179-198.

New Zealand's implementation of an individual transferable quota (ITQ) management system in 1986 for most of its fisheries is being observed closely world wide. We describe New Zealand's ITQ system and analyze the first 5 years of the New Zealand experience. We use Copes' (1986) paper as a catalyst to compare his assessment of potential problems of individual quotas with the actual operation of individual quotas in New Zealand. The brief New Zealand ITQ experience demonstrates that the economic rationale behind individual transferable quotas is sound. We discuss the problems and positive effects of New Zealand's experience. Individual transferable quotas should not be viewed as a panacea, but simple as another fisheries management option.

Boyle, Kevin J. and Richard C. Bishop (1988). "Welfare Measurements Using Contingent Valuation: A Comparison of Techniques." American Journal of Agricultural Economics, 70(1):20-28.

Three commonly used techniques of asking contingent valuation questions are compared: iterative bidding, payment cards, and dichotomous choice. The results reveal that no single contingent valuation technique is neutral in the elicitation of hicksian surplus and each technique has its strengths and weaknesses. The iterative bidding estimates contain a starting point bias,

while the payment card and dichotomous choice estimates were influenced by the interviewers soliciting the contingent values. Finally, the analysis of dichotomous choice responses involves unresolved issues that warrant further investigation. On the other hand, dichotomous choice is the easiest technique to administer in a survey setting.

Brainerd, Theophilus R. (1995). "Fishery Co-Management: A Discussion Paper." South Atlantic Fisheries Management Council, One Southpark circle, Suite 306, Charleston, SC, January, 18 pp.

This paper discusses some of the factors that should be considered when deciding whether a fishery could be managed by some form of a co-management system. It provides case studies of three forms of fishery co-management systems that are in place and that have achieved some measure of success. It examines their strengths and weaknesses, and provides suggestions for deciding how to structure a system to suit a particular fishery.

Brainerd, Theophilus R. (1998). "Regulatory Flexibility Analysis." Draft Summary of Workshop Proceedings, Long Beach, California, Office of Sustainable Fisheries, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD, September 14-15 March, 24 pp.

A summary of the proceedings of a workshop to develop recommendations of existing certification criteria for regulatory flexibility Act analyses.

Brainerd, Theophilus R. (1995). "Potential Options for Inclusion in Snapper Grouper Amendment 9: Controlled Access to the Snapper Grouper Fishery." South Atlantic Fisheries Management Council, One Southpark circle, Suite 306, Charleston, SC, March, 19 pp.

The Council is currently developing Amendment 8 to the snapper grouper FMP. The proposed actions include additional regulations for (1) greater amberjack in Monroe County, Florida; (2) yellowtail snapper; (3) multi-day bag limits; (4) prohibiting possession of fish traps in the south Atlantic EEZ to increase enforcement; (5) specifying the time when commercial permits are available; and (6) limiting access based on the number of permitted fishermen that have complied with all reporting requirements. At its February 1995 meeting in St. Augustine, Florida, the Council referred the proposed action limiting access to the snapper grouper fishery to the Controlled Access Committee as the appropriate committee to develop actions for controlled access. This document presents various options for controlled access to the snapper grouper fishery.

Brainerd, Theophilus R., John M. Ward, and John R. Gauvin (1994). "A Look at the Utility of Socioeconomic Data for the Individual Transferable Quota (ITQ) Program for the Wreckfish (Polyprion Americanus) Fishery in the South Atlantic Region." Draft report presented at the Atlantic States Marine Fisheries Commission Workshop on Socio-Economic Data and Analysis for Recreational Fisheries Management in Annapolis, Maryland, July, 18 pp.

The individual transferable quota (ITQ) program for wreckfish in the south Atlantic was first implemented during the 1992-1993 season. The program has now entered its third year and so far no changes have been made to the initial actions that established the ITQ program. A monitoring program has been tracking landings, shares and coupons transactions, among others and has provided information to the stock assessment group that meets annually to evaluate the status of the fishery. This paper presents a brief background of

the fishery, the conception, development, and implementation of the ITQ program. Monitoring the progress of the program is vital to evaluating whether it is fulfilling its objectives. The use of socioeconomic data is important not only for this process, but also in developing the ITQ program. A close look is given to the role socioeconomic data has played in this process. Some thoughts are provided on the lessons learned from this process and to what types of socioeconomic data could improve future implementation of ITQ programs.

Brainerd, Theophilus R., John M. Ward, and John R. Gauvin (1994). "A Look at the Utility of Socioeconomic Data for the Individual Transferable Quota (ITQ) Program for the Wreckfish (Polyprion Americanus) Fishery in the South Atlantic Region." Paper presented at the Atlantic States Marine Fisheries Commission Workshop on Socio-Economic Data and Analysis for Recreational Fisheries Management in Annapolis, Maryland, July, 19 pp.

The individual transferable quota (ITQ) program for wreckfish in the south Atlantic was first implemented during the 1992-1993 season. The program has now entered its third year and so far no changes have been made to the initial actions that established the ITQ program. A monitoring program has been tracking landings, shares and coupons transactions, among others and has provided information to the stock assessment group that meets annually to evaluate the status of the fishery. This paper presents a brief background of the fishery, the conception, development, and implementation of the ITQ program. Monitoring the progress of the program is vital to evaluating whether it is fulfilling its objectives. The use of socioeconomic data is important not only for this process, but also in developing the ITQ program. A close look is given to the role socioeconomic data has played in this process. Some thoughts are provided on the lessons learned from this process and to what types of socioeconomic data could improve future implementation of ITQ programs.

Brander, James A. and M. Scott Taylor (1998). Open Access Renewable Resources: Trade and Trade Policy in a Two-Country Model. Journal of International Economics, 44(2):181-210.

This paper develops a two-good, two-country model with national open access renewable resources. We derive an appropriate analog of factor proportions for the renewable resource case and link it to trade patterns and to the likelihood of diversified production. The resource importer gains from trade. However, a diversified resource exporting country necessarily suffers a decline in steady state utility resulting from trade, and may lose along the entire transition path. Thus the basic gains from trade presumption is substantially undermined by open access resources. Tariffs imposed by the resource importing country always benefit the resource exporter and may be Pareto-improving.

Brandt, Hartmut (1999). Stretching Our Fish Stocks. Samudra (Sept): 37-42.

A discussion of capacity, overfishing, and demand for seafood. The author suggests that the inelastic demand for fish is responsible for overcapitalization in fisheries. He feels this brings into question the usefulness of using ITQ to efficiently manage fish stocks. Two suggested types of intervention to improve marine ecological outcomes depend on (1) the future success of direct government actions to reduce worldwide catching overcapacities, and the coordination of these actions at the international level and (2) the successful propagation of ecologically, socially, and economically rational fishery policies.



Brandt, Sylvia (1997). Regulation and Productivity in a Common Property Resource Industry: A Case Study of the Middle Atlantic Surf Clam Fishery. Draft report, University of California, Berkeley, CA.

The impact of regulation of inputs and the establishment of property rights on productivity are contrasted using a Tornqvist index with and without the effect of abundance included in the productivity estimates. The negative productivity during periods of binding quotas confirms economists predictions for limited access. The available data indicate favorable results of ITQ management, though only time will tell if these initial trends will continue. Accounting for changes in abundance removes the variation in productivity which is due to variations in environmental conditions and reduces the annual average productivity growth by 66%.

Brannan, Darrell R. (1989). "An Economic Analysis of Multispecies Production in Florida's Commercial In-Shore Fishery." Thesis, Department of Food and Resource Economics, University of Florida, Gainesville, FL.

An economic analysis of the inshore fisheries for mullet, seatrout, and red drum is presented in this thesis. Output supply equations are estimated using translog revenue functions. Own price elasticities for each species are calculated and shadow values of effort are derived from the translog revenue functions.

Brannon, Gerard M. (1975). "U.S. Taxes on Energy Resources." American Economic Review, 65(2):397-406.

A review of U.S. tax policy towards energy resources; past, present, and future.

Branstetter, Henry R. (1976). "Statement Before the United States International Trade Commission." President Ocean Garden Products, Inc., January, 53 pp.

The National Shrimp Congress proposes that duties and quota restrictions be placed upon shrimp products imported to the United States to provide market stability for the domestic producers and to assist them in combating the major increases in operating costs that have occurred during the past several years.

Branstetter, Steve (1993). "Update of Foundation Activities for Bycatch Reduction Program." Memorandum from the Gulf and South Atlantic Fisheries Development Foundation, Inc., September 17.

An update on the Foundation's activities concerning the bycatch reduction research program. A total of 1,000 observer days for both characterization and BRD work aboard cooperating commercial vessels have been completed. A summary of the data collected to date is included in the report.

Brauer, F. and A.C. Soudack (1979). "Stability Regions and Transition Phenomena for Harvested Predator-Prey Systems." J. Math. Biology, 7:319-337.

We analyze the global behavior of a predator-prey system under constant rate predator harvesting, showing how to classify the possibilities and determine the region of asymptotic stability by a combination of relatively elementary theoretical methods and computer simulations.

Bresnayan, Edward and Eric Thunberg (1992). "Economic Analysis of a

Multi-Species Fishery." Presented at The American Agricultural Economics Association Annual Meeting, Baltimore, Maryland.

The paper reports on the results of an analysis of the economic interrelationships in Florida's commercial near-shore fishery. A dual-based revenue function is specified to estimate own-price and cross-price elasticities of supply for selected key species. Implications for fishery management policy is discussed.

Brewster-Geisz, Karyl K. (1997). Preliminary Results of Atlantic Bluefin Tuna (Thunnus thynnus) Catch Rates in U.S. Commercial Longline Pelagic Fisheries: 1991-1995. Draft report, Highly Migratory Species Management Division, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, Maryland, October.

The National Marine Fisheries Service (NMFS) is attempting to decrease discards, particularly dead discards, of Atlantic bluefin tuna (Thunnus thynnus) by U.S. commercial longline pelagic fisheries. This document describes preliminary analyses of logbook and dealer weight out slips collected from 1991 to 1995. Analyses partition trip data into three regions: fish caught north of 34 degrees latitude, fish caught south of 23 degrees latitude, and fish caught in the Gulf of Mexico. Non-parametric tests were conducted on the data by region and season. Initial results indicate significant differences between the number of Atlantic bluefin tuna caught and discarded per trip by season and region. This suggests time/area closures may reduce discards by the U.S. commercial longline pelagic fisheries.

Bribitzer, Clem (1991). Review of the 1990 COE Update of the 1984 Economic Analysis of Manteo (Shallowbag) Bay Project. Draft Report, National Marine Fisheries Service, December, 11 pp.

A critique of The Corps of Engineers economic analysis which is built on several critical assumptions. The Corps assumes that through better fisheries management many currently depleted fish stocks will be rebuilt to former robust level. The Corps further assumes that the fishery management (including those stocks that are not under the aegis of the Magnuson Act) will be effective in preventing overcapitalization. That is, potential economic rents created by the stabilization of Oregon Inlet will not be dissipated by increases in the number, average size, or efficiency of the current fishing fleet. In practice this probably means that the fisheries will be managed using some sort of individual transferable fishing quotas. Implicit in the Corps analysis is also the assumption that the general condition of fisheries habitat will not continue to deteriorate and that the presence of the jetties will not harm fisheries through disruption of larval transport through the inlet. The author questions the usefulness of the Corps analysis.

Bricklemeyer, Bo (1985). "Sea Turtle Rescue Efforts." Draft report for the Center for Environmental Education.

Report on TED regulations and actions. History of laws enacted to protect sea turtles.

Bricklemeyer, Eugene C., Jr., Suzanne Ludicello, and Hans J. Hartmann (1990). "Discarded Catch in U.S. Commercial Marine Fisheries." In Audubon Wildlife Report, 1989/1990, pp. 259-295.

This chapter examines the discard problem in U.S. managed waters. It also examines the mechanisms for regulation fisheries, and the reasons why U.S. fishery managers, for the most part, do not apply those mechanisms to

reducing discards. This chapter explores how the practice of discard has become institutionalized to such a degree that managers in effect sanction waste by counting discards against the catch quotas of directed fisheries that wish to take and use the very species discarded. It questions whether this policy of allocating catch levels first to a fishery that must discard this take is in keeping with a stated national policy of wise use of marine resources.

Broadus, James M. ( ). "Impacts of Future Sea Level Rise." Chapter 13, Source Unknown.

General overview of the sea level rise problem as it affects the coastal zone. The changes to expect in the coming decades and their implications for us are the issues at hand.

Broadus, J.M. (1986). Asian Pacific Marine Minerals and Industry Structure. Marine Resource Economics, 3(1):63-88.

Eventual development of marine minerals potential in the Asian Pacific would likely draw on the technology, skills, and experience of the emerging international seabed mining industry. As a result of strategic behavior by its firms, this small numbers industrial strategic group has created a level of capacity for seabed mining exploration and research and development (R&D) that far exceeds the near term level of activity expected in seabed mining. The paper reports on the nature of preproduction industry structure (or protostructure ) in seabed mining and draws implications for efforts to develop the resource potential of Asian Pacific marine minerals. Seabed minerals exploration and R&D services might be offered to Asian Pacific nations at bargain prices (below unit cost) by firms with first starter advantages in the emerging industry. However, cautionary notes are included about constraints on the economic potential of the regions s deep sea minerals such as manganese nodules, polymetallic sulfides, and cobalt crusts.

Brod, Andrew C. and William M. Shobe (1994). "The Market for Fishing Quota: Lessons From the Wreckfish Fishery." Draft report, Department of Economics, University of North Carolina at Greensboro, November, 22 pp.

This paper explores the reasons for the observed behavior of the wreckfish catch and the market for quota and annual leases of quota. Understanding these observations may have important implications for the management of ITQ fisheries; it may change our expectations of how much of the actual resource rents can actually be recovered under realistic management conditions and it may point to changes in management that allow for the greater recovery of otherwise lost rents.

Brod, Andrew C. and William M. Shobe (1996). "The Demand for ITQs: The Puzzle of the Atlantic Wreckfish Industry." Working Papers Series: ECO960201, Working Papers in Economics, Center for Applied Research, Joseph M. Bryan School of Business and Economics, University of North Carolina at Greensboro, February, 29 pp.

Recent experience with individual transferable quotas (ITQs) as a tool of fisheries management has begun to shed empirical light on the well established theory of ITQs. The Atlantic wreckfish (Polyprion americanus) is currently under ITQ management by the U.S. federal government, and in many ways the theoretical predictions about ITQs have been borne out by developments in this fishery. But an unexpected puzzle has arisen; not all owners of wreckfish quotas are using their fishing rights, even though the market price

of quota has increased over time. We evaluate two possible explanations of this phenomenon, first that fishermen in this small fishery are withholding their ITQs to improve a depleted stock, and second that a combination of fixed costs and opportunities in other fisheries has created an excess ex post supply of ITQs. We argue that the first explanation is inconsistent with the observed facts of the wreckfish fishery, but that the second appears to match those facts fairly well. We conclude with a discussion of the implications of our results for ITQ management.

Bromley, Daniel W. (19??). "Property Rights and Economic Incentives in Resource and Environmental Economics." Draft of a paper presented at "The Political Economy of Natural Resource and Environmental Use," Department of Agricultural Economics, University of Wisconsin, Madison.

The paper presents a conceptual view of property rights as they influence resource control and hence resource use.

Bromley, Daniel W. (1978). "Property Rules, Liability Rules, and Environmental Economics." Journal of Economic Issues, 12(1):43-60.

A taxonomy of entitlements is presented.

Bronsard, Camille and Lise Salvas-Bronsard (1984). "On Price Exogeneity in Complete Demand Systems." Journal of Econometrics, 24:235-247.

Complete demand systems have always been estimated under the assumption that either prices or quantities were exogenous. In this paper, we introduce some explicit price adjustment process and test the assumption of exogeneity of prices. Comparing the model with endogenous prices to the model with exogenous prices will reveal that the assumption of the exogeneity of prices is not a very dramatic one as both estimated models are very similar in many experiments with American and Canadian data. Applying a system wide Wu-Hausman test and a likelihood ratio test, will always lead us to reject the exogeneity of prices in three commodity models, while at the more disaggregated level, prices may often be considered as exogenous.

Brooks, David B. (eds.) (1974). Resource Economics, Selected Works of Orris C. Herfindahl, Washington, D.C., Resources for the Future.

The collected works of Orris C. Herfindahl concerning the nature and scope of resource economics, natural resource supply and conservation, the application of economics to the minerals industry, the supply of natural resource information, and the quality of the natural environment.

Brooks, Prescilla (1986). REN 410 Notes. Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island.

Introductory fisheries economics taught by Dr. Jon Sutinen course notes.

Brookshire, David S., Mark A. Thayer, William D. Schulze, and Ralph C. D'Arge (1982). "Valuing Public Goods: a Comparison of Survey and Hedonic Approaches." American Economic Review, 72(1):165-177.

This paper reports on an experiment designed to validate the survey approach by direct comparison to a hedonic property value study.

Brorsen, B. Wade, Jean-Paul Chavas, and Warren R. Grant (1987). "A

Market Equilibrium Analysis of the Impact of Risk on the U.S. Rice Industry." American Journal of Agricultural Economics, 69(4):733-739.

An economic model of supply and demand for U.S. rice suggests that increases in risk result in decreased acreage and increased marketing margins. In a market equilibrium context, the empirical results also suggest rice production and rice prices are more responsive to changes in risk faced by marketing firms than changes in risk faced by producing firms.

Browder, Joan A. (1983). "Vessel Activity Relative to the Texas Closure, 1981 and 1982." NOAA Technical Memorandum, NMFS-SEFC-118, U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami, Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149-10999.

A quantitative description of shrimp vessel activity in the Gulf of Mexico relative to the Texas closure in 1981 and 1982 has been prepared to determine if Louisiana ports are more heavily utilized because of the closure, if Louisiana offshore fishing grounds are more heavily utilized because of the closure, if vessels have been prevented from fishing by the closure, and if benefits of the closure accrue to only a small proportion of the fleet. This is a brute force analysis of some extremely large data sets.

Browder, Joan A., J. Connor Davis, and Eulalie Sullivan (1978). "The Paying Passenger Recreational Fisheries of the Florida Gulf Coast and Keys." Draft report, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, FL.

Four types of paying passenger recreational fisheries operate on the Florida Gulf Coast and in the Florida Keys. An estimated 604 captains were active in the fisheries in 1977. Target species differ with fishery type and region of operation. Declining catches (catch per unit effort) and increased operating costs, particularly for fuel, are major problems of these fisheries according to the captains. In those fisheries where previous information is available the number of operations has increased in the past fifteen years in the Florida Keys, decreased greatly on the west Florida coast and decreased slightly on the northwest Florida coast.

Browder, Joan A., L. Nelson May, Jr., Alan Rosenthal, James G. Gosselink, and Robert H. Baumann (1989). "Modeling Future Trends in Wetland Loss and Brown Shrimp Production in Louisiana Using Thematic Mapper Imagery." Remote Sens. Environ., 28:45-59.

The land-water interface of coastal marshes may influence the production of estuarine dependent fisheries more than the area of these marshes. To test this hypothesis, we created a spatial model to explore the dynamic relationship between land-water interface and degree of land loss in disintegrating coastal marshes of Louisiana's Barataria, Terrebonne, and Timbalier basins. Calibrating our model with Landsat Thematic Mapper satellite imagery, we found a parabolic relationship between land-water interface and marsh disintegration. Aggregated simulation data suggested that the land-water interface in the study area will soon reach its maximum and then decline. We found a statistically significant positive linear relationship between brown shrimp catch and total interface length over the past 28 years. This relationship suggests that shrimp yields will decline when interface declines, possibly beginning about 1995.

Brown, Ausbon, Jr., James A. Bohnsack, and Douglas Harper (1989). "Automated Landings Assessment for Responsive Management (ALARM): Gulf of Mexico Commercial Reef Fish Landings, December 1989." Contribution No. CRD-89/90-02, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Dr., Miami, FL, December, 4 pp.

Summary of red snapper landings in graphical form from 1979 to 1987.

Brown, Bradford (1995). Briefing Document Blue Tuna. Draft report, Southeast Fisheries Science Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, FL, 13 pp.

A history of the ICCAT bluefin tuna work from the perspective of the author.

Brown, Gardner, Jr. (1974). "An Optimal Program for Managing Common Property Resources with Congestion Externalities." Journal of Political Economy, Jan/Feb:161-173.

This paper derives an optimum program for managing a common property natural resource whose rate of growth of the resource stock depends on the resource stock level and the current rate of extraction. If the resource stock initially is sufficiently small it is shown that it will be socially optimal to have a period of no extraction. When extraction begins, it and the variable factor increase faster than the resource stock is increasing. Changes reflecting the imputed marginal social value of the resource are a decreasing function of the level of the stock. These results differ from Smith (1968) recent static treatment of the same problem and are discussed below.

Brown, Gardner, Jr. (1981). "Hedonic Demand Functions with Linear and Non-Linear Budget Constraints." Draft report, Department of Economics, University of Washington, November, 35 pp.

Consumers do not always face constant unit prices for the goods and services they purchase. The urban and environmental literature abounds in examples where implicit prices are nonlinear. We show that nonlinear budget constraints fundamentally alter the demand relationship. The exogenous parameter (marginal price) consumers face in the linear case is replaced by an exogenous price function (the price gradient) in the nonlinear case. Two ways are developed in Section II to solve the demand functional: a parametric approach and a system equation approach.

Brown, Gardner, M. (1997). Economic Review of the Red Snapper Fishery. Draft report for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Department of Economics University of Washington, Box 353330, Seattle, Washington, September, 25 pp.

It would be a very rare fishery for which the economic analysis is adequate.

Brown, Gardner, Jr. and J. John Charbonneau (1978). "The Value of Wildlife Estimated by the Hedonic Approach." Working Paper No. 6, Division of Program Plans, U.S. Fish and Wildlife Service, March, 25 pp.

This paper describes a model for deriving hunting and fishing values based on the hedonic price approach and estimates such values using data from the 1975 National Survey of Hunting, Fishing and Wildlife Associated Recreation.

Brown, Gardner, Jr. and Barry C. Field (1978). "Implications of Alternative Measures of Natural Resource Scarcity." Journal of Political Economy, 86(2):229-243.

We argue that the most commonly used measures of natural resource scarcity are deficient. The discussion begins with some general comments on natural resource scarcity, then turns to a description and evaluation of each of the major scarcity indices: unit cost, product output prices, and rental rates. Rental rates are a useful proxy, marginal discovery costs are preferred over the rival measures. But there are important instances where good scarcity indicators may be entirely absent.

Brown, Gardner, Jr. and C.B. McGuire (1967). "A Socially Optimal Pricing Policy for a Public Water Agency," Water Resources Research, 3(1):33-43.

A simple model is developed for determining the socially optimum price to charge locationally differentiated irrigation districts for both surface and groundwater supplies. Steady state conditions are assumed for groundwater conditions and water demand functions. A divergence between social and private optimums arises from the existence of unadjudicated rights to groundwater supplies. The social optimum can be achieved by an appropriately conceived taxing policy. Water prices, tax rates, and optimum lift levels are estimated for seven irrigation districts, members of a master water agency.

Brown, Gardner, Jr. and Robert Mendelsohn (1984). "The Hedonic Travel Cost Method." The Review of Economics and Statistics, 66:427-433.

The hedonic travel cost method is a technique that reveals how much users are willing to pay for the individual characteristics of outdoor recreation sites. The prices of recreation attributes are estimated by regressing travel costs on the bundles of characteristics associated with each of several potential destination sites. The demand for site characteristics on site quality is then revealed by comparing the site selection of users facing different attribute prices. The technique is applied to value steelhead fish density in Washington State streams.

Brown, Gardner, Jr. and Henry O. Pollakowski (1977). "Economic Valuation of Shoreline." Review of Economics and Statistics, 59(August):272-278.

Shoreline development is a growing public policy issue in many urban areas. This paper extends recent economic work that has produced quantitative measures of value for phenomena hitherto restricted to qualitative expression. First examined is the choice of housing attributes, including water related open space and proximity to bodies of water, faced by a household in a metropolitan area. Next, the process of implicit price formation is examined, and, employing data on individual dwelling units in a metropolitan area with numerous bodies of water, these implicit prices are estimated. Then, the question of what can and cannot be inferred from these results about the demand for open space and the welfare gains or losses resulting from possible changes in the amount of water related open space.

Brown, Gary L. (1981). "A Survey of Recreational Shrimping in the Bay

and Sound Systems of the Gulf Coast for 1980." Final report, HSR-RR-81/2-PON prepared for Gulf States Marine Fisheries Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi 29564, April, 28, 140 pp.

This paper reports the results of a 1980 survey of recreational shrimpers along the bay and sound systems of the Gulf Coast in 1979 and 1980 that was conducted complementarily with the NMFS recreational finfish survey (MRFSS?).

Brown, Gary (1994). "Self-Implemented Limited Entry. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Recently the situation in Argentina was one of declining fishery production in the domestic arena, with only 25-30 percent of the resource being exploited. Lack of technology and working capital led to abandonment of substantial parts of the fleet, and flight from the industry. A new government administration took an aggressive stance and attempted to reduce manipulation and tampering in the management process, and reduce union control over the industry. To encourage investment and attract new technology a quota scheme was established.

Allocations of quota share were made between local fishing groups and foreign subsidiaries as well, via an auction. Supplemental conservation measures such as gear restrictions and seasonal closures were implemented to address biological concerns. The preliminary results indicated that the new system was dramatically better than the prior system, and was highly successful in attracting capital and technology.

Two models are currently being evaluated by a variety of fishing groups. One essentially creates a co-op system that includes a negotiated fee structure and submitted performance criteria. The other model uses a tonnage allocation system, under which an auction is held for the industry to purchase shares of quota.

Brown, James N. and Harvey S. Rosen (1982). "On the Estimation of Structural Hedonic Price Models." Econometrica, 50(3):765-768.

This paper points out certain pitfalls in Rosen's estimation procedure which, if ignored, could lead to major identification problems.

Brown, Mark Murray- (1996). 1996 Atlantic Bluefin Tuna landing Data. Memorandum to William Hogarth, Highly Migratory Species Management Division, National Marine Fisheries Service, Northeast Region, Gloucester, MA.

Current versus previous year landings information for bluefin tuna including number of fish, average and gross weight, and adjusted quota.

Brusher, Harold A. and Barbara Jayne Palko (198?). "An Analysis of Marine Recreational Catch and Effort Data from a 1983 Charterboat Survey of the Southeastern United States and the U.S. Caribbean." Southeast Fisheries Center, National Marine Fisheries Service, NOAA, Panama City Laboratory, 3500 Delwood Beach Road, Panama City, FL.

A survey of charterboats from coastal areas of the southeastern United States, Gulf of Mexico, and Caribbean was undertaken in 1983. Captains were contracted to provide daily catch and effort data. They reported on 3,479 of



3,503 available boat fishing weeks. A total of 348,976 pelagic and demersal fish were caught in 46,921.5 hours of effort. Species catch and catch per boat hour (CPH) are presented annually, monthly, and geographically. Data are compared with similar results obtained in a 1982 pilot survey. The charterboat survey provided timely CPH data.

Brusher, Harold A. and Barbara Jayne Palko (1987). "Results from the 1984 and 1985 Charterboat Surveys in Southeastern U.S. Waters and the U.S. Caribbean Sea." Marine Fisheries Review, 49(2):109-117.

In 1984 and 1985, surveys of southeastern U.S. waters, including the Gulf of Mexico and the U.S. Caribbean Sea, were conducted to gather catch and effort records from charterboat captains located along coastal areas. Captains were contracted to supply daily records of fishing activity. During the 2 year period, 10,380 fishing trips, 48,231 hours of fishing effort were expended and 342,258 fishes were caught. Species, catches, and catch per boat fishing hour are presented by year, month, and area. Major species groups caught by trolling included mackerels and tunas, while other than trolling methods caught mostly snappers, groupers, and croakers. Annual response rates for returning log forms for the 1984 and 1985 surveys were 98.8 and 95.7 percent, respectively.

Brusher, Harold A., Mark L. Williams, and Lee Trent (1982). "Catch and Effort Data from the Charterboat Fishery in the Southeastern United States--A Pilot Study." National Marine Fisheries Service, Panama City Laboratory, 3500 Delwood Beach Road, Panama City, Florida.

This survey was designed to determine the efficiency of contracting with selected charterboat captains to provide catch and effort data. Data included date, zones fished, method of fishing, hours fished, and numbers of each species caught.

Brusher, Harold A., Mark L. Williams, Lee Trent, and Barbara Jayne Palko (1982). "Using Charterboat Catch Records for Fisheries Management." Draft report, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory, 3500 Delwood Beach Road, Panama City, FL.

A pilot survey to study the feasibility of using catch records from charterboats for obtaining daily catch and effort data was initiated on 28 March 1982. Nine charterboat captains produced records for 39,410 marine fishes caught in 4,392 trolling hours and in 919.5 hours using other fishing techniques. Captains were contracted to supply daily records of fishing zones, fishing methods, and all species in their respective catches. Response rate (i.e., weekly submission of logs) was 90.4 percent for all boat fishing weeks between 28 March and 31 December 1982. The potential use of this type of recreational data is discussed.

Brusher, Harold A., Mark L. Williams, Lee Trent, and Barbara Jayne Palko (1984). "Using Charterboat Catch Records for Fisheries Management." Marine Fisheries Review, 46(3):48-55.

A pilot survey to study the feasibility of using catch records from charterboats for obtaining daily catch and effort data was initiated on 28 March 1982. Nine charterboat captains produced records for 39,410 marine fishes caught in 4,392 trolling hours and in 919.5 hours using other fishing techniques. Captains were contracted to supply daily records of fishing

zones, fishing methods, and all species in their respective catches. Response rate (i.e., weekly submission of logs) was 90.4 percent for all boat fishing weeks between 28 March and 31 December 1982. The potential use of this type of recreational data is discussed.

Bryan, C.E. (1983). "Abundance of Brown Shrimp (Penaeus aztecus) as Related to the 1982 Closure of the Texas Territorial Sea to Shrimping." Management Data Series Number 52, Coastal Fisheries Branch, Texas Parks and Wildlife Department.

To determine the closing and opening dates of the shrimping season in the Texas territorial sea in 1982 and relative abundance of brown shrimp in 1981 and 1982, samples were taken with 18.3 m bag seines along shorelines of seven bay systems; with 6.1 m trawls in the deeper portions of three bay systems and in five passes leading from the bays to the Gulf; and with 12.2 m trawls in Gulf of Mexico waters off the central coast. The purpose of the closed season was to protect small shrimp from fishing until they reached a larger, more valuable size and to minimize waste caused by discarding smaller sizes during the harvest. Based on biological sampling in April the closed season dates were set for 25 May to 14 July 1982. Additional sampling through July verified that these dates were appropriate to accomplish the purpose of the closure.

Bryan, C.E. and Terry J. Cody (1975). "Discarding of Shrimp and Associated Organisms on the Texas Brown Shrimp (Penaeus Aztecus Ives) Grounds." Draft report, Texas Parks and Wildlife Department.

From June 1973 through June 1975, the Texas Parks and Wildlife Department took 89 samples with the commercial shrimping fleet in the northwestern Gulf of Mexico to provide more information on the discarding of shrimp and associated organisms in the Texas brown shrimp fishery. Shrimp discards averaged 40% by number and 26% by weight in 1973 and 37% by number and 22% by weight in 1974 samples. Most of the shrimp discarding took place in June, July, and August. Using the average yearly landings of brown shrimp for the last nine years, an estimated 14.9 million kilograms (32.8 million pounds) of small shrimp and 116 million kilograms (255 million pounds) of associated organisms were discarded per year. Comparisons of catch rates for various types of trawls is also discussed.

Bryan, C.E., Terry J. Cody, and Gary C. Matlock (1982). "Organisms Captured by the Commercial Shrimp Fleet." Technical Series No. 31, Texas Parks and Wildlife Department.

During June-December 1973 and 1974, 81 samples were collected with a 13.7 m. wide otter trawls from aboard a research vessel in the same areas that commercial shrimp vessels were fishing on the Texas brown shrimp grounds. This study was done to estimate the amounts and kinds of organisms captured during shrimping operations and to estimate the amounts discarded and times when most discarding occurred. Economic waste of small shrimp discarding could be minimized if legal size limitations were removed and waters were closed to shrimping when small, less preferred shrimp predominated. Under present conditions, no monetary incentive to market other invertebrates and fish species captured on the brown shrimp grounds appears to exist because of their relatively low volume and small size.

Buchanan, Chester C., Richard B. Stone, and Frank W. Steimle (1988). "Marine Recreational Boat Fishery of the New York Bight Apex in 1971." Marine Fisheries Review, 50(2):6-19.

The marine recreational boat fishery in the heavily populated New York City metropolitan area has not been well described. This paper describes the 1971 catch composition and the distribution of estimated effort over spatial and seasonal scales and between major vessel types (party, charter, and private boats) engaged in the fishery. Anglers spent an estimated 2.3 million hours fishing in the New York Bight apex in 1971, over half of this by party boat anglers, and caught almost 8 million game fish. Overall effort was about equal for pelagic and demersal species and was generally concentrated nearshore. There appeared to be a substantial change in the fishery since the late 1940's and early 1950's, possibly reflecting socioeconomic trends and population dynamics of the fish species.

Buchanan, James M. (1980). "Rent Seeking and Profit Seeking." Chapter 1 in Toward a Theory of the Rent Seeking Society, College Station, Texas A&M University.

As institutions have moved away from ordered markets toward the near chaos of direct political allocation, rent seeking has emerged as a significant social phenomenon.

Buchanan, James M. and Gordon Tullock (1975). "Polluters' Profits and Political Response: Direct Controls Versus Taxes." American Economic Review, 65(1):139-147.

Economists of divergent political persuasions agree on the superior efficacy of penalty taxes as instruments for controlling significant external diseconomies that involve the interaction of many parties. However, political leaders and bureaucratic administrators, charges with doing something about these problems, appear to favor direct controls. Our purpose in this paper is to present a positive theory of externality control that explains the observed frequency of direct regulation as opposed to penalty taxes or charges. In the public choice theory of policy, the interests of those who are subjected to the control instruments must be taken into account as well as the interests of those affected by the external diseconomies. As we develop this theory of policy we shall also emphasize an elementary efficiency basis for preferring taxes and charges which heretofore has been neglected by economists.

Buck, Eugene H. (1995). Overcapitalization in the U.S. Commercial Fishing Industry. Senior Analyst in Natural Resources Policy, Environment and Natural Resources Policy Division, Congressional Research Service, The Library of Congress, Washington, D.C. 20540, February 22, 17 pp.

A review of the concepts of overcapitalization in world and U.S. domestic fisheries, its causes, and possible solutions written for a nontechnical audience. With too many fishermen vying for too few fish, the U.S. commercial fishing industry is becoming as overcapitalized as the resource is over fished. A management regime that addresses open access concerns appears warranted, as does an overall reduction in fishing capacity. Nevertheless, significant questions remain. In particular, how and in what form should access be addressed? In what sector(s) and by what means ought reductions in capital invested in the commercial fishing industry occur? And, what is the role of the Federal government in such proceedings? These questions and several others await careful evaluation by scientists, conservationists, industry experts, and lawmakers alike, while the fates of fishermen and the fish they depend upon hang in the balance.

Buck, Eugene H. (1995). Individual Transferable Quotas in Fisheries Management. Senior Analyst in Natural Resources Policy, Environment and Natural Resources Policy Division, Congressional Research Service,

The Library of Congress, Washington, D.C. 20540, July, 18 pp.

A discussion of individual transferable quotas (ITQs) in terms of their application to fisheries management. Pros and cons of ITQs are presented based on their application in three U.S. domestic fisheries and in six other countries. Problems arising from program design are separated from those inherent to the ITQ concept.

Buerger, Robert and James R. Kahn (1989). "New York Value of Chesapeake Striped Bass." Marine Resource Economics, 6(1):19-25.

This article looks at the interstate open access externalities associated with Chesapeake Bay striped bass. These fish spawn in the Chesapeake Bay and then migrate to other areas of the East Coast. The Chesapeake striped bass have been in substantial decline over the last decade. Of specific interest are the losses suffered in New York from the decline in striped bass production from the Chesapeake Bay. This is done by estimating demand and supply curves for commercial fishing and then computing the losses in consumers' and producers' surplus associated with the decline, estimated to be \$396,000 per year.

Bullis, Harvey R., Jr. and Albert C. Jones (eds.) (1976). "Proceedings: Colloquium on Snapper-Grouper Fishery Resources of the Western Central Atlantic Ocean. Report Number 17, Gulf States Marine Fisheries Commission, New Orleans, Louisiana, Texas A&M University Sea Grant College and Mississippi-Alabama Sea Grant Consortium, November, 333 pp.

The purpose of the colloquium was to assemble information on the snapper and grouper resources in the region and to provide a forum to discuss the problems of the fishing industries.

Burgess, Ed (1996). Snapper/Grouper Permits Issued Since 1992. Memorandum to Theo Brainerd, Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive N., St. Petersburg, FL, May 2, 3 pp.

SERO has resolved differences between the NMFS Annual Reports and previously derived SERO estimates of the number of vessels with snapper/grouper permits for the years 1992 through 1995. Numbers of vessels for each year are provided.

Burgess, James (1997). Biological Effects/El Nino/FWD. Memorandum to Gene Cope, National Marine Fisheries Service, Silver Spring, MD, October, 2 pp.

Brief notes on the potential biological effects of El Nino on domestic fish stocks.

Burke, L., C. Annand, R. Barbara, L. Brander, M.A. Etter, D. Liew, R. O'Boyle, and G. Peacock (1994). "The Scotia-Fundy Inshore Dragger Fleet ITQ Program Background, Implementation, and Results to Date." C.M. 1994/T:35, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Seas, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September.

After Canada extended its 200 mile limit in 1977, the inshore small

dragger fleet in the Scotia-Fundy Region grew dramatically in fishing power. By 1989, fleet capacity had exceeded that required to harvest the resource at  $F_{0.1}$  by four times. This increase in capacity was paralleled by an expansion of regulations to contain effort and protect the stocks. In 1989, management plan negotiations broke down and a Task Force was struck to define a new management system. Among other initiatives, it was recommended that Individual Transferable Quotas (ITQ) be implemented. During 1990, the ITQ program was designed through joint DFO/industry committees and launched in 1991. Since then, dragger fleet capacity has been reduced, with concentration of quota in fewer boats. There have also been changes in price structure, seasonal pattern of landing and fishermen's attitudes. However, it is not obvious that at sea fishing practices have changed. As well, due to recent resource declines, effort has been displaced to non-ITQ fisheries. This paper documents the background to the ITQ program, its implementation and what has been achieved to date.

Burness, H. Stuart (1976). "On the Taxation of Nonreplenishable Natural Resources." Journal of Environmental Economics and Management, 3:289-311.

A resource constraint alters the profit maximizing decision rule for a natural resource producer. Such a producer also responds differently to common policy instruments. For a zero rate of discount, it is shown that a franchise (lump sum), severance (ad valorem or unit), or profit tax result, respectively, is increased, unchanged, and unchanged output. These results are generalized to the case when the rate of discount is nonzero and tax rates vary over time. A tax subsidy scheme for guaranteeing the equality of optimal social and private rates of depletion is presented for a case where these rates diverge.

Burns, Scott (1997). The Role of Trade Policies in the Fishing Sector. : Natural Resource Management Workshop, World Wildlife Fund, U.S., Washington, D.C., April, 6 pp.

Proposal and agenda for a workshop in Geneva on subsidies in fish harvesting sectors worldwide. Case studies are provided as a basis for a discussion.

Burt, Oscar R. (1964). "Optimal Resource Use Over Time with an Application to Ground Water." Management Science, 11(1):80-93.

This paper is concerned with optimal allocation over time of a single resource that is either fixed in supply or only partially renewable at a point in time. Some resources that fall in this category are mineral deposits, ground water, petroleum, wildlife, and fish. A functional equation is obtained from a dynamic programming formulation of the problem. This functional equation is used to derive approximate decision rules for resource use as a function of current supply. The results are applied to ground water storage control and tested empirically by comparison with a decision rule obtained by detailed numerical methods.

Burt, Oscar R. (1967). "Temporal Allocation of Groundwater." Water Resources Research, 3(1):45-56.

A relatively simple economic model for allocation of groundwater in time is developed. The economic consequences of altering various parameters in the model are examined with respect to the effect on equilibrium stocks and rate of use. The concept of a conditional decision rule for stochastic groundwater recharge and the properties of the implied equilibrium are discussed. In its

simplest form, the derived decision rule is to equate marginal net output with respect to rate of use to capitalized marginal net output with respect to water stocks.

Burt, Oscar R. and Durward Brewer (1971). "Estimation of Net Social Benefits From Outdoor Recreation." Econometrica, 39(5):813-827.

An economic framework is presented for measurement of the net social benefits that can be attributed to development of a new outdoor recreation site, taking into consideration the influence that existing recreation developments have on the demand for services from the newly developed site. Methods are given for statistically estimating the empirical measures needed to apply the model, and an application is made to water oriented outdoor recreation in Missouri. Results of the application suggest that investments in outdoor recreation can be evaluated under an objective economic decision criterion.

Burt, O. And R. Cummings (1970). Production and Investment in Natural Resource Industries. American Economic Review, 60:576-90.

This paper attempts to provide a general model that could be adapted and the results applicable to any specific resource. Earlier reports concerning specific resources would fall out as a special case of a general theory concerning the intertemporal allocation of natural resources.

Butler, Richard W., Walter A. Nelson, and Tyrrell A. Henwood (1987). A Trawl Survey Method for Estimating Loggerhead Turtle, Caretta Caretta, Abundance in Five Eastern Florida Channels and Inlets. Fishery Bulletin, 85(3):447-453.

Five eastern Florida navigational channels were surveyed on a quarterly basis from November 1981 through August 1982. The purpose of the surveys was to provide estimates of loggerhead turtle abundance for each channel over all seasons of the year. Standard methods for estimating loggerhead turtle abundance from trawl samples were developed, and the probability of capture in a 30 m by 1,483 m substation was estimated to be  $0.28 \pm 0.05$  (95% confidence level). Abundance estimates based on this probability of capture were then developed for each channel and survey. Of the channels surveyed, only Port Canaveral harbored significant concentrations of loggerhead turtles; populations ranged from  $701 \pm 291$  turtles in February to a low of  $38 \pm 26$  turtles in August. A few loggerhead turtles were captured in the other channels, but infrequency of occurrence suggested random encounters rather than areas of concentration.

Byrne, Richard, Wade Griffin, and Joy Clark (1988). "Four Teds and Analysis of Variance." Natural Resource Working Papers Series, Natural Resource Workgroup, Department of Agricultural Economics, Texas A&M University, College Station, Texas 77843.

The Cape Canaveral data is analyzed statistically to determine the effects of the four TEDs. First, we describe the structure of the experiment. Then, we present the Anova table and perform tests of hypotheses. Next, we analyze the percent of shrimp retention of the four TEDs using confidence intervals. Finally, we perform multiple comparisons to determine which TEDs have the highest yields.

CWA (1995). Report on Survey Regarding TED Compliance. Draft Report, November, 29 pp.

Shrimp fishing and specifically shrimper non-compliance with the use of Turtle Excluder Devices (TEDs) have been deemed the most plausible causes of ongoing mortality in endangered sea turtles. Our objectives were 1) to quantify the prevalence of TED use, 2) to identify barriers to TED use, 3) quantify the perception of the barriers, and 4) identify means to enhance compliance.

Cabot, Courtenay Bromfield (1996). *Shrimp and Sea Turtles in the Gulf of Mexico: An Economic Analysis of the Effects of Turtle Excluder Devices on the Shrimp Fishery and the Benefits of Protecting Sea Turtles*. Senior Honors Thesis, Northwestern University, May, 50 pp.

This study analyzes the effects of the use of Turtle Excluder Devices (TEDs) in the Gulf of Mexico shrimp fishery. It also examines the benefits of protecting a sea turtle. Regression analysis indicates that TED regulations are having a statistically significant negative impact on the fishery's landings and revenue. Data also indicate that the fishery is overcapitalized and possibly over harvested. A preliminary analysis of the value of a sea turtle is accomplished through the use of the contingent valuation method.

Caddy, J.F. and R. Mahon (1995). Reference Points for Fisheries Management. FAO Fisheries Technical Paper No. 347, Food and Agriculture Organization of the United Nations, Rome, 83 pp.

This paper reviews the conceptual background and application of technical reference points in fishery management. Despite considerable investment in stock assessment methodology and expertise, fisheries worldwide are overexploited. This appears to be due to a mismatch between the precision of assessment and the precision of management. Two types of reference points are recognized: target reference points (TRPs) and limit reference points (LRPs). The use of MSY as a target reference point is considered in the light of past performance of fishery management, and it is suggested that MSY and other reference points formerly used as targets, may be more appropriately applied as LRPs. The recent trend towards the quantification of uncertainty and estimation of risk in the provision of advice is considered to be good, but the cost and availability of information and expertise required may preclude the use of these techniques for many small or low value stocks and for most stocks in developing countries. The recent trend towards inclusion of ecosystem concepts in setting fishery management objectives is also seen as good, and overdue. Although still in their formative stages, ecosystem concepts can still provide LRPs. Effective management will require a set of rules comprising both TRPs and LRPs. In most national and international fishery management situations, the current institutional structure will probably require some modification to successfully apply these sets of rules. Fisheries management organizations will continue to assess and manage fisheries routinely, but management may need to develop an independent review which comes into play when resource production limits are approached. The action to be taken at such limits should be discussed and agreed on in advance.

Caillouet, Charles W., Jr. and Kenneth N. Baxter (1973). "Gulf of Mexico Shrimp Resource Research." Marine Fisheries Review, 35(3-4):21-24.

This paper describes shrimp resource research presently being conducted by the Galveston Laboratory of the National Marine Fisheries Service Gulf Coastal Fisheries Center. Discussed are plans for development of a mathematical model capable of explaining and predicting changes in shrimp catch, and on-going mark recapture experiments, prediction of catch, stock

identification studies, and study of spawning grounds. Trends in Texas and Louisiana brown and white shrimp catches and catch rates are presented.

Caillouet, Charles Wax, Jr. and Dennis Brian Koi (1983). "Ex-Vessel Value and Size Composition of Reported May-August Catches of Brown Shrimp and White Shrimp from 1960 to 1981 as Related to the Texas Closure." Gulf Research Reports, 7(3):187-203.

Indices were used to test for trends in ex-vessel price spread (value per shrimp by size category), size composition, and ex-vessel value composition of the reported May-August catches (inshore and offshore combined) of brown shrimp (Penaeus aztecus) and white shrimp (P. setiferus) from the Texas coast, the Mississippi River to Texas, and Pensacola to the Mississippi River, from 1960 to 1981. Levels of reported May-August catch and ex-vessel value of the catch also were examined for the same period. Statistical tests were conducted to determine if 1981 was an outlier as compared to other years, in the context of impacts of closure of the fishery conservation zone (FCZ) off Texas to shrimping from May 22 to July 15, 1981, a management measure referred to as the Texas Closure.

Caillouet, Charles W., Frank J. Patella, and William B. Jackson (1979). "Relationship Between Marketing Category (Count) Composition and Ex-Vessel Value of Reported Annual Catches of Shrimp in the Eastern Gulf of Mexico." Marine Fisheries Review, (May-June): 1-7.

The relationship between estimated ex-vessel value of reported annual shrimp catches and weight of these catches is used to show the effects of regional differences in count composition of these catches, a function of differences in shrimp laws and harvesting strategy. It seems clear that the strategy of harvesting large proportions of larger shrimp in Texas increases both the weight and ex-vessel value of these catches. Social impacts and economic inputs beyond the ex-vessel level also require consideration in studies of effects of harvesting strategy.

Caillouet, Charles W., Frank J. Patella, and William B. Jackson (1980). "Trends Toward Decreasing Size of Brown Shrimp, Penaeus Aztecus, and White Shrimp, Penaeus Setiferus, in Reported Annual Catches from Texas and Louisiana." Fishery Bulletin, 77(4):985-989.

An exponential model adequately characterized the size composition (expressed as a regression of transformed cumulative percentage of weight on size category) of reported annual catches of brown and white shrimp in Texas and Louisiana from 1959 to 1976. Louisiana catches contained considerably greater proportions of small shrimp than did Texas catches. For both species and states, there was a significant trend toward increases in the proportion of small shrimp in the catches over the period.

Caillouet, Charles W., Jr., B.J. Fontenot, Jr., W.S. Perret, R.J. Dugas, and H.F. Hebert (1971). "Catches of Postlarval White Shrimp Penaeus setiferus (Linn.) and Brown Shrimp, P. aztecus, Ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967." U.S. Department of Commerce, NOAA, NMFS, Data Report 64, July, 39 pp.

A small trawl towed in a semicircle of 30.5 m (100 ft) radius in shallow water near the shoreline was used to collect postlarval white shrimp and brown shrimp. Dates and hour of sampling, catches of postlarvae, species composition and subsamples of the catches, and water temperature and salinity data are presented.



Caillouet, Charles W., Jr., Marcel J. Duronslet, Andre M. Landry, Jr., Dickie B. Revera, Donna J. Shaver, Kerry M. Stanley, Erich K. Stabenau, and Robert W. Heinly (1990). "Sea Turtle Strandings and Shrimping Effort in the Northwestern Gulf of Mexico, 1986-1989." Draft report, National Marine Fisheries Service, Galveston Laboratory, Galveston, Texas 77551-5997.

The purpose of this paper was an examination of sea turtle strandings and shrimping effort in the northwestern Gulf of Mexico during 1986-1989 to determine the relationship if any between them. The study confuses correlation with causation.

Caillouet, Charles W., Jr., Marcel J. Duronslet, Andre M. Landry, Jr., Dickie B. Revera, Donna J. Shaver, Kerry M. Stanley, Robert W. Heinly, and Erich K. Stabenau (1991). "Sea Turtle Strandings and Shrimp Fishing Effort in the Northwestern Gulf of Mexico, 1986-1989." Fishery Bulletin, 89(4):712-718.

Incidental capture of sea turtles in shrimp trawls is the most important human cause of sea turtle mortality. In this study, a product-moment correlation analysis to test the null hypothesis that there was no relationship between monthly sea turtle strandings and shrimp fishing effort on the northwestern Gulf of Mexico coast during 1986-89. A positive, statistically significant result was found causing the null hypothesis to be rejected. Several caveats to the analysis are cited including the effects of wind, waves, tides, and scavengers on the stranding levels of turtles. These caveats tend to reduce the implied causation that shrimp fishing effort levels affects turtle stranding levels.

Cameron, Trudy Ann (1988). "A New Paradigm for Valuing Non-market Goods Using Referendum Data: Maximum Likelihood Estimation by Censored Logistic Regression." Journal of Environmental Economics and Management, 15:355-379.

This paper challenges the W.M. Hanemann (1984) and C. Sellar, J.P. Chavas, and J.R. Stoll (1986) utilizations of logit models to estimate the value of nonmarket resources from "referendum" survey data. These data are more informative than conventional choice data. The "random utility" interpretation of logit models is therefore too restrictive. Bypassing the utility function entirely, it will be shown that parameters and standard errors for utility-theoretic inverse Hicksian demand functions can be extracted directly and much more simply. Estimated demand functions need not be limited to those corresponding to the linear in parameters utility difference specification that can be handled by packaged logit programs.

Cameron, Trudy Ann (1992). "Combining Contingent Valuation and Travel Cost Data for the Valuation of Nonmarket Goods. Land Economics, 68(3):302-317.

The travel cost method (TCM) has long been used to infer the economic value of nonmarket resources and public goods. More recently, contingent valuation (CVM) survey methods have gained popularity for eliciting these values. Here, CVM survey responses are combined with TCM data on actual market behavior to estimate jointly both the parameters of the underlying utility function and its corresponding ordinary demand function. This is a prototypical empirical example of a new modeling strategy, variants of which should provide useful in many applications, especially where reliance on a single valuation method is undesirable.

Cameron, Trudy Ann and John Quiggin (1994). "Estimation Using Contingent Valuation Data from a Dichotomous Choice with Follow-Up Questionnaire. Journal of Environmental Economics and Management, 27:218-234.

Dichotomous choice (referendum) contingent valuation questions are inefficient in that a very large number of observations are required to identify a distribution of resource values with any degree of accuracy. An alternative questioning strategy introduce a follow up dichotomous choice question. We generalize upon previous analyses of this type of data by relaxing the assumption that the identical unobserved resource value motivates both responses. While values implied by the first and second responses are highly correlated and may be drawn from the same distribution, they are definitely not identical. Furthermore, assuming that they are can severely distort the estimated valuation distribution.

Campbell, David, Tony Battaglione, and Sean Pascoe (1991). Management Options for the Southern Shark Fishery. Australian Bureau of Agricultural and Resource Economics, Discussion Paper 91.12, December, 43 pp.

Falling shark stocks led to interim management plan based on input controls. Task force created to examine future management options that include annual total allowable shark catch, reductions in amount of nets, and individual transferable catch quotas. This study estimates the likely effects of each of the proposed management options on shark stocks and the shark fishing industry. A bioeconomic model of the fishery has been developed to help in this assessment.

Campbell, Donald E. (1987). Resource Allocation Mechanisms. Cambridge University Press.

This book is concerned with the general welfare implications of individual decisions in systems in which some sort of coordination of individual activities is essential to the achievement of a high level of overall welfare.

Campbell, H.F. and A. McIlgorm (1995). Australian Vessel Performance in the East Coast Tuna Longline Fishery. Marine Fishery Review, 57(3-4):35-39.

A sample of daily observations on the activities of Australian vessels longlining for yellowfin tuna, Thunnus albacares, during 1987-90 was analyzed, using a production function approach, to determine the effects of vessel characteristics and operational practices and conditions. Significant differences were found between the tuna fisheries in the northern and southern regions of the inshore yellowfin tuna fishery in the east Australian Exclusive Economic Zone. The type of vessel used, and fishing practices such as soaktime, patrolling the longline, and choice of surface water temperature were found to have significant effects on yellowfin tuna catch rates.

Campbell, H.F. and R.B. Nicholl (1995). Allocating Yellowfin Tuna Between the Multispecies Purse Seine and Longline Fleets. Marine Resource Economics, 10(1):35-58.

Yellowfin tuna in the western Pacific are harvested as juveniles by purse seiners and as adults by longliners. The study presents estimates of the multi-species harvest technology of these two types of vessels operating in Papua New Guinea s Exclusive Economic Zone. The results, together with price and cost information and estimates of the impact of the purse seine

catch on the catch rates of longline vessels are used to perform a benefit/cost analysis of a reallocation of juvenile yellowfin through a one percent decline in purse seine harvest in P.N.G. s EEZ. The marginal benefit of investment in the yellowfin stock is found to exceed that of marginal cost, suggesting that there may be an economic case for a reallocation.

Campbell, Page, Ted Storck, Vanenise Price, and Lance Robinson (1992). "Trends in Texas Commercial Fishery Landings, 1972-1991." Management Data Series No. 86, Texas Parks and Wildlife Department, Fisheries and Wildlife Division, 4200 Smith School Road, Austin, Texas.

This report summarizes annual commercial landings and ex-vessel value statistics of finfish and shellfish harvested from Texas bays and the Gulf of Mexico off Texas. These landings and value data for individual species groups are summarized according to bay system or Gulf area from which the product was taken and by month landed. Total coast wide landings in 1991 were more than 102 million pounds and ex-vessel value was over \$199 million. These values were 11% and 19%, respectively, below the record values of 1986. Shrimp accounted for 89% of the weight and 94% of ex-vessel value of all seafood landed in calendar year 1991. During 1991 blue crabs, Eastern oysters and finfish made up 6%, 3%, and 2% of total landings and 1%, 4%, and 1% of the total ex-vessel value, respectively. Compared to 1990 prices, the 1991 average unit price for shrimp increased; the unit prices of blue crabs did not change, while the unit price of Eastern oysters decreased 22%. Finfish unit prices generally declined.

Canning, Patrick and Harry Vroomen (1994). Welfare Impacts of a Trade Restriction: An Equilibrium Approach and Application in the Potash Industry. Technical Bulletin No. 1834, Resources and Technology Division, Economic Research Service, U.S. Department of Agriculture, June, 25 pp.

A three-sector equilibrium open economy model is developed for measuring welfare effects of a trade restriction. The approach is applied to the U.S./Canadian trade agreement on potash (USCTAP). The net effect of USCTAP to U.S. firms, households, and the government over the July 1987-June 1992 period was a social welfare cost of \$815 million. The big losers were U.S. potash users (-\$956 million), while Canadian potash producers (+\$723 million), U.S. potash producers (+\$211 million), and other foreign producers (+\$99 million) were the big winners (in 1987 dollars). Other countries that import U.S. goods that contain potash as an input incurred additional costs of \$40 million, due to higher prices of those goods, resulting in a net gain of \$59 million to other countries. U.S. taxpayers bear a lighter burden (-\$55 million) due to USCTAP.

Capps, Oral, Jr. (1982). "Consumer Expenditure Patterns for Fish and Shellfish." Marine Fisheries Review, 44(3):1-6.

This study investigates the nature and magnitude of the influence of household income, and socioeconomic and demographic variates on aggregate seafood expenditure in the United States.

Caputo, Michael R. (1990). "A Qualitative Characterization of the competitive Nonrenewable Resource Extracting Firm." Journal of Environmental Economics and Management, 18:206-226.

Using variational differential equations, a systematic qualitative analysis is carried out for the competitive nonrenewable resource extracting

firm. The parameters of interest are the output price, variable input price, discount rate, lease length, initial resource stock, and various tax rates. The effects of changes in these parameters on the entire optimal time paths of the current shadow value of the stock, the resource stock, and the extraction rate are characterized in the perturbed phase plan.

Caribbean Fishery Management Council (1996). Fishery Management Plan, Regulatory Impact Review, and Final Environmental Impact Statement for the Queen Conch Resources of Puerto Rico and the United States Virgin Island. 268 Munoz Rivera Ave., Suite 1108, San Juan, Puerto Rico, June, 78 pp.

The fishery management plan imposes limits on the harvesting of queen conch to curb overfishing in the EEZ. However if recruitment is dependent on conch populations in other Caribbean countries, cooperative efforts with other nations will be necessary to effectively manage queen conch throughout its range.

Caribbean Fishery Management Council (1997). Amendment Number 1 to the Fishery Management Plan for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the United States Virgin Islands for Establishing a Marine Conservation District Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis and an Environmental Impact Statement. 268 Munoz Rivera Ave., Suite 1108, San Juan, Puerto Rico, September, 54 pp.

The Council is proposing the establishment of a Marine Conservation District (MCD) in the EEZ. The expected effects of the MCDs under the Coral FMP and this amendment are (1) to provide refuge and replenishment areas to ensure continued abundance and diversity of reef resources; (2) to protect critical spawning stock and recruits from depletion and overfishing, thus increasing abundance of fishery resources; (3) to protect coral and coral habitat; and (4) to improve opportunities for eco-tourism. An excellent regulatory impact analysis of the plan is included in the document.

Caribbean Fishery Management Council (1998). Essential Fish Habitat (EFH) Generic Amendment to the Fishery Management Plans (FMPs) of the U.S. Caribbean, Volume I and II. Draft, 268 Munoz Rivera Ave., Suite 1108, San Juan, Puerto Rico, September, 54 pp.

This generic amendment amends FMPs for reef fish, spiny lobster, queen conch, and coral to address EFH. The generic amendment identifies and describes EFH for selected management unit species, identifies threats to EFH from fishing and non-fishing activities, presents, where possible, options to conserve and enhance EFH, and identifies research needs. This amendment proposes no management measures, and, therefore, no regulations are anticipated. It is expected that the final amendment will contain an environmental assessment.

Carlberg, Stig R. (1994). "Quality Assurance, What it is and What it is not." C.M. 1994/(C+E+L):2, Joint Session on Quality Assurance of Marine Measurements, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 4 pp.

This paper discusses some aspects of quality; what it is and how it can be regarded to avoid or at least reduce ambiguity. It describes the relation between quality assurance and standardization, accreditation, and other terms that are frequently used and often misunderstood in this context. The paper

also discusses how one can assure that a certain quality is achieved in a production (e.g. chemical analysis) and demonstrates that a consistent management system is needed for this purpose. On the other hand, the paper does not contain detailed arguments why quality assurance is necessary nor how a quality assurance system should be designed in detail. These aspects are covered by other contributions to the Joint Session.

Carlton, Frank E. (1984). "Introduction to Symposium." Chapter 1 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Introduction to the symposium whose objectives are to achieve recognition of marine recreational fisheries as an important element of national policy; to identify major marine recreational fisheries problems and develop fresh solutions thereto; and to foster effective management regimes for the conservation of living marine resources.

Carothers, Paul E. and William E. Grant (1987). "Fishery Management Implications of Recruitment Seasonality: Simulation of the Texas Fishery for the Brown Shrimp, Penaeus aztecus." Ecological Modeling, 36:239-268.

The relationship between recruitment seasonality and ordination of alternative management policies for the Texas brown shrimp (Penaeus aztecus) fishery is explored through utilization of a general stochastic simulation model developed for annual crop marine fisheries. The model represents harvest dynamics within the fishery through a series of finite difference equations representing recruitment, growth, migration, and mortality of brown shrimp, and fishing effort. The model is parameterized to reflect two alternative representations of brown shrimp recruitment dynamics, and the behavior of each model version is explored under four management policy options. The alternative recruitment representations differ in temporal pattern of postlarval brown shrimp immigration into coastal estuaries, and the management policy options reflect variations in seasonal closures and minimum size restrictions for the fishery. Analysis of model outputs identified a statistically significant interaction between recruitment representation and the performance of the alternative management policies based upon predicted harvests within the fishery. This interaction indicates the failure of the alternative recruitment model versions to produce a consistent predicted harvest response over all management policy options. Under an average representation of postlarval recruitment pattern, no significant differences in management option performance were detected, while two of four management options produced significantly lower harvests under a seasonally variable recruitment pattern.

Carpenter, James S. (1965). "A Review of the Gulf of Mexico Red Snapper Fishery." U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Circular 208, Washington, D.C.

Developments in the fourth most valuable fishery in the Gulf of Mexico are shown by comparing vessels, fishing grounds, gear, equipment, and fishing methods, handling and marketing, and production techniques and methods.

Carrier, Roy R. (1996). Regulatory Reform and Private Property Rights Protection. Staff Paper SP 96-4, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of

Florida, Gainesville, Florida, May, 9 pp.

Upon gaining control of Congress in the elections of November 1994, the new Republican majority in Congress embarked on an aggressive campaign to fulfill its Contract With American. Among its priorities was regulatory reform. Included in regulatory reform were measures to protect property owners, under certain circumstances, from losses in property values resulting from the imposition of environmental regulations. Although passed by the House of Representatives in 1995, the Senate had not yet acted on the measures a year later. Private property rights protection legislation passed by the 1995 Florida Legislature was signed into law in May 1995. The manner of its implementation and the nature of its impacts remain to be seen.

Carroll, Michael J. (1998). An Assessment of the Atlantic Bluefin Tuna Market: The Economic Implications for Management. Masters of Science Thesis, Environmental and Natural Resource Economics, University of Rhode Island, Kingston, RI.

The U.S. Atlantic Bluefin Tuna Fishery under pressure from the International Commission for the Conservation of Atlantic Tuna (ICCAT) and the National Marine Fisheries Service (NMFS) has been confronted with substantial quota reductions in recent years. Effort reduction strategies used to sustain these quota cuts combined with increased participation have created market gluts and decreased the length of the season. Apparent implications of these problems have decreased the price received by U.S. fishermen for Atlantic bluefin tuna. Optimal management of the Atlantic bluefin tuna requires these market implications be considered. This research econometrically examines factors that influence ex-vessel price, focusing on changes in quantity supplied, quality characteristics, gear types used, and spatial and temporal harvests. Results of this research indicate gains in gross revenues to the U.S. Atlantic bluefin tuna fishery are possible through reduction in excessive daily production and shifts in temporal harvests into later periods of the season.

Carroll, Raymond J. and David Ruppert (1984). "Power Transformations When Fitting Theoretical Models to Data." Journal of the American Statistical Association, 79(386):321-328.

Power transformations in nonlinear regression problems are investigated when there is a physical model for the response but little understanding of the underlying error structure. In such circumstances, and unlike the ordinary power transformation model, both the response and the model must be transformed simultaneously and in the same way. We show by asymptotic theory and a small Monte Carlo study that for estimating the model parameters there is little cost for not knowing the correct transform a priori; this is in dramatic contrast to the results for the usual case where only the response is transformed. Possible applications of the theory are illustrated by examples.

Carson, Rachel (1962). "Rivers of Death." Chapter 9 from Rachel L. Carson, Silent Spring, Houghton Mifflin Company, Boston, The Riverside Press, Cambridge.

A discussion of the effect of pollution on shrimp and finfish stocks in U.S. coastal estuaries.

Carson, Richard T. and Robert Cameron Mitchell(1995). "Sequencing and Nesting in Contingent Valuation Surveys." Journal of Environmental Economics and Management, 28:155-173.

The term embedding is ill defined and has been applied to distinct phenomena, some predicted by economic theory and others not. This paper lays out a theoretical framework for looking at these phenomena and provides a set of well defined terms. Included is a discussion of survey design problems that may induce spurious evidence in favor of the hypothesis that respondents are insensitive to the scope of the good being valued. An empirical example of the component sensitivity is provided. This test rejects the hypothesis that respondents are insensitive to the scope of the good being valued.

Carson, Richard T., Norman F. Meade, and V. Kerry Smith (1993).  
"Introducing the Issues." Choices, 2nd Quarter: 5-8.

The contingent value passive use value debate.

Casey, Keith E., Christopher M. Dewees, Bruce R. Turriss, and James E. Wilen (1995). The Effects of Individual Vessel Quotas in the British Columbia Halibut Fishery. Marine Resource Economics, 10(3):211-230.

Implementation of individual vessel quotas (IVQs) in the British Columbia halibut fishery has provided a unique opportunity to examine the effects of this management technique on a previously intense derby fishery. This paper describes the changes that have occurred in the fishery since the introduction of individual vessel quotas in 1991. The results presented here are largely based on the finds of two surveys. In September 1993, we conducted in-depth interviews with most of the major halibut processors in British Columbia. These processors reported significant changes in the processing and marketing of halibut. In Spring 1993, we conducted a mail survey of all 435 licensed halibut fishermen. The survey consisted of several series of questions designed to measure changes in fishing operations (crew size, fishing practices, etc.), quota leasing activities, changes in fishing income, and opinions about the effects of IVQs. The results presented here provide important information about the effects of the British Columbia halibut IVQ program to date and will be useful for comparison to similar management programs implemented elsewhere.

Casteel, Pamela (1991). "Bycatch A Matter of Opinion." Texas Shores, 23(3):1-33. Texas A&M University Sea Grant College Program and Palacios Marine Education Center.

A collection of articles concerning bycatch in the Gulf of Mexico shrimp fishery.

Casteel, Pamela (1993). "Scary Stepchild of the Sea." Texas Shores, 26(2/3):4-21. Texas Sea Grant Program, Texas A&M University, P.O. Box 1675, Galveston, Texas.

Sharks are a highly valuable resource both commercially and recreationally and are a highly vulnerable population of animals. Although sharks have evolved as apex predators, they are ill equipped to endure man's intense exploitation.

Castro, Carlos A. and Scott J. Soares (eds.) (1996). Proceedings of the Symposium on the Potential for Development of Aquaculture in Massachusetts. NOAA Technical Memorandum NMFS-NE-109, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Region, Northeast Fisheries Science Center, Woods Hole, Massachusetts, January, 26 pp.

Proceedings from a symposium on the potential for developing aquaculture

in New England as a possible source of employment for those displaced from the wild harvest fishery operations due to the collapse of the groundfish fishery.

Castro, Jose I. (1993). A Field Guide to the Sharks Commonly Caught in Commercial Fisheries of the Southeastern United States. NOAA Technical Memorandum, NMFS-SEFSC-338, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida, December, 43 pp.

The purpose of this guide is to enable fishery personnel to identify sharks and shark carcasses by their diagnostic characteristics. It is intended for identification of only those species commonly found in commercial or recreational landings. The information is abridged from Jose I. Castro, The Sharks of North American Waters (1993) Texas A&M University Press, College Station, Texas, 189 pp.

Castro, Kathleen, Tony Corey, Joseph DeAlteris, and Chris Gagnon (eds.) (1996). Proceedings of the East Coast Bycatch Conference. Rhode Island Sea Grant, University of Rhode Island Bay Campus, Narragansett, RI, December, 160 pp.

Proceedings of a workshop between industry and the National Marine Fisheries Service hosted by Sea Grant to address bycatch issues on the east coast of the United States. The goals of the workshop are, first, to recognize that bycatch is a regional problem that has contributed to depressed fish stocks, but that it is a manageable problem that can be solved when the industry is involved with all the major players. Second, to generate new joint research projects in specific fisheries to address the real bycatch problem and education programs to address perceived problems.

Cato, James C. (1986). "Emerging Tuna Fishery Gains Attention." Marine Log, Winter 1985-86, Florida Sea Grant College Publication.

Announcing a new Sea Grant program to assist the newly emerging fresh tuna fishery.

Cato, James C. and Herman E. Kumpf (1990). "The Economic Influence of Population Growth, Fisheries, Coastal and Marine Industries, and Tourism Derived from Use of The Gulf of Mexico." Presented at The Environmental and Economic Status of the Gulf of Mexico, December 2-5, 1990, Clarion Hotel, New Orleans, Louisiana.

This paper focuses on the economic use of the Gulf of Mexico's resources by pointing out some of the major economic values associated with them.

Cato, James C. and Frank J. Lawlor (1981). "Small Boat Longlining For Swordfish on Florida's East Coast: An Economic Analysis." MAP-15, Marine Advisory Bulletin of Florida Sea Grant College in cooperation with the Food and resource Economics Department, University of Florida, Gainesville, FL.

This bulletin contains a method for making a profitability analysis based on cost and returns of a 36 foot swordfish longline vessel on Florida's lower Atlantic coast. In addition, a number of other factors that merit consideration before becoming a fisherman are also discussed. Potential investors who are not experienced in fishing should pay particular attention to the estimated costs and returns statements. Net returns and the return on investment to an absentee owner are often much different than those to a



captain/owner. The same techniques can be used in analyzing any fishery.

Cato, James C. and Fred J. Prochaska (1976). "The Gulf of Mexico Commercial and Recreational Red Snapper-Grouper Fishery: An Economic Analysis of Production, Marketing, and Prices." Pages 95-128 in Harvey R. Bullis, Jr. and Albert C. Jones (eds.) "Proceedings: Colloquium on Snapper-Grouper Fishery Resources of the Western Central Atlantic Ocean. Report Number 17, Gulf States Marine Fisheries Commission, New Orleans, Louisiana, Texas A&M University Sea Grant College and Mississippi-Alabama Sea Grant Consortium, November, 333 pp.

Owners and captains of both commercial red snapper boats and party boats along the north Florida Gulf coast were interviewed in 1975. Cost and return data were collected and analyzed for 1974. Also documented and analyzed was the economic importance to the region of the commercial and party boat industry. Price analyses are conducted and compared with past research. A description of marketing channels is provided with special emphasis placed on the role of imports. Finally, the need for management programs in the red snapper-grouper industry receives comment.

Cato, James C. and Fred J. Prochaska (1977). "A Statistical and Budgetary Economic Analysis of Florida Based Gulf of Mexico Red Snapper-Grouper Vessels by Size and Location, 1974-75." Marine Fisheries Review, 39(11):6-14.

This paper combines the analysis of production data for the northern gulf commercial vessels with additional production data collected from the Florida west coast or southeastern gulf red snapper-grouper production area to provide a comparative report on the costs and returns for vessels operation in these two areas. Two methods of analysis were used to analyze the cost and returns data. First, an ordinary least squares regression equation using dummy variables was used to determine if statistically significant differences exist in costs and revenues between port locations and size of the fishing firm. Second, specific differences in costs and revenues by firm size and port location are analyzed using detailed cost and return budgets for the four classes of vessels.

Cato, James C., and Carlos A. Lima Dos Santos (1998). European Union 1997 Seafood-Safety Ban: The Economic Impact on Bangladesh Shrimp Processing. Marine Resource Economics, 13(3):215-227.

Major markets for Bangladesh frozen shrimp are the European Union, the United States, and Japan. Bangladesh frozen shrimp imports into the EU and the U.S. have experienced safety and quality problems. The 1997 European Commission ban on Bangladesh seafood imports into the EU cost the Bangladesh frozen shrimp processing industry US \$14.665 million in lost revenues.

Cato, James C., Fred J. Prochaska, and Peter C.H. Pritchard (1978). An Analysis of the Capture, Marketing and Utilization of Marine Turtles. Final Report, Purchase Order No. 01-7-042-11283, Environmental Assessment Division, National Marine Fisheries Service, St. Petersburg, Florida.

The objectives of this report are to 1) determine sources of published and documented data concerning sea turtle harvesting, consumption and prices; 2) analyze trends in production and consumption of sea turtle meats and shells by country from best available statistics; 3) determine from available statistics international trade patterns in sea turtle meats and shells; and 4)

through informal consultation in selected areas gather information on turtle harvest and trade not reported in trade statistics because of inadequate or nonexistent record keeping or through deliberate attempts to circumvent protective laws.

Caulkins, Peter P. (1982). "An Empirical Study of the Recreational Benefits Generated by a Water quality Improvement." Masters Thesis, Department of Agricultural Economics, University of Wisconsin-Madison.

Two different methods of estimating the economic benefits that accrue to recreationalists at Shadow Lake in Wisconsin as a result of an improvement in that lake's water quality are developed and compared. The conventional travel cost model is compared to a multinomial logit share model that is able to explicitly incorporate as arguments not only the different substitute sites used by each lake recreationalist but also each site's quality characteristics including water quality. The difference in the benefit estimates derived from these two models reflects, in part, this difference in dealing with the substitutes.

Caulkins, Peter P., Richard C. Bishop, and Nicolaas W. Bouwes (1985). "Omitted Cross-Price Variable Biases in the Linear Travel Cost Model: Correcting Common Misperceptions." Land Economics, 61(2):182-187.

It is apparent that the traditional economic demand relationship between two substitute goods has been confused with the relationship of the own and cross-price proxies used in a travel cost demand equation. Adequate consideration has not been given to how these price proxy variables are generated. The purpose of this paper is to make explicit the behavioral relationship of these price proxy variables, explain what factors govern this relationship, and present the rules and conditions for determining the nature of the bias when the cross-price terms are omitted from the estimated, linear travel cost demand equation. While a simplified two site cases is used in this analysis, the insights gained can be employed in analyzing more complicated, multiple site situations.

Cauvin, D.M. (1979). "Regulating Access in Canada's Inland Fisheries." J. Fish. Res. Board Can., 36:827-836.

Uncontrolled access in Canada's inland fisheries has served neither the resource manager's interest in protecting fish stocks nor the economist's interest in promoting the most efficient use of all factors of production, including fisheries resources. Economically accessible fisheries have generally attracted more labor and capital than is required to harvest the productive potential of fisheries resources. As a result, costs of production are high in relation to the value of production and profit margins have been eroded. Of equal importance, a return from the resource in the form of a resource rent has been foregone. Access control and a price system represent management options to control excess fishing effort, promote economic efficiency in the deployment of private and public resources, and promote fiscal accountability in government.

Centaur Associates, Inc. (1981). "Socio-Economic Study of Mackerel Purse Fishery." Task I and Task II Report prepared for the National Marine Fisheries Service, 9450 Koger Boulevard, St. Petersburg, Florida.

This report is part one and two of a study to estimate the probable

economic and sociological impacts if purse seine gear is allowed to participate in the harvest of Spanish and king mackerel in the Fishery Conservation Zone of the Gulf and South Atlantic regions.

Centaur Associates Inc. (1985). Commercial Fishing Cost Return Profiles for Gulf Coast Areas. Prepared for Army Corps of Engineers Mobile District, 109 St. Joseph Street, Mobile, Alabama. Under Contract No. DACW01-84-C-0111.

Final report of a shrimp vessel cost and returns survey contract of selected ports in Mississippi and Alabama. Summarized data is provided in the form of tables with some preliminary analysis of wage rates, returns to owner for management, returns to the vessel, daily operating costs, and unit operating costs. Hard copy of the raw data is also included in the file.

Centaur Associates Inc. (1990). "Environmental Costs of Fishing Ground Preemption and Gear Loss." Chapter 6 of a draft report prepared for the Mineral Management Service, Department of Interior, June 16, 39 pp.

This section addresses non-oil spill impacts on the commercial fishing industry due to loss of access to fishing grounds, and to damage or loss of fishing gear. The placement of OCS structures, such as production platforms and pipelines, in the waters of the Outer Continental Shelf, have been shown to prevent a certain amount of ocean area from being used by fishing industry. This area foreclosure can lead to a potential reduction in catch for the industry, and an associated economic loss. OCS oil and gas activity can also cause loss or damage to fishing gear, due to sea floor structures, debris and other sea floor disruptions. In certain instances, increased vessel traffic associated with offshore oil development can cause damage to fixed fishing gear such as pots or traps.

Cesario, Frank J. (1973). "A Generalized Trip Distribution Model." Journal of Regional Science, 13(2):233-247.

A new trip distribution model that hypothesizes statistical regularities in travel behavior is developed. To begin the development of the model, operational definitions of origin emissiveness and destination attractiveness were advanced. It was pointed out that heterogeneous trip costs typically found to exist in trip making systems tend to distort the pure trip patterns such that the cost of travelling from each origin to each destination must be explicitly introduced into the analysis. A linear model, for which data requirements are quite meager, was developed to estimate parameters of the generalized model and test for existence of origin and destination effects, cost effects, and origin destination interactions. This model and the ensuing analysis conform to what is known in statistics as the analysis of covariance.

Cesario, Frank J. (1976). "Value of Time in Recreation Benefit Studies." Land Economics, 52(1):32-41.

Explicitly incorporating travel time valuations in recreation benefit analysis seems vastly superior to excluding them on both theoretical and practical grounds. As further research turns up more refined estimates of travel time valuations in different circumstances, future studies should make use of them. In the meantime the results presented here should lead to improved estimates.

Cesario, F.J. and J.L. Knetsch (1976). "A Recreation Site Demand and Benefit Estimation Model." Regional Studies, 10:97-104.

A model useful for estimating both the numbers of visits per unit time attracted to recreation sites in a region and the primary social benefits associated with these sites is developed. The visitor component of the model predicts use as a function of the characteristics of population centers, recreation sites and spatial separation. The benefits component of the model estimates aggregate willingness to pay using an extension of the familiar Clawson-Knetsch travel cost technique. Novel features of the model include incorporation of a way to capture substitution effects of price changes and inclusion of a measure of time cost as well as money cost in the analysis. An application is provided.

Chambers, James R. (1991). "Trends in National Habitat Degradation, Fishery Declines, and NMFS' National Habitat Conservation Program." Report, Office of the Chief Scientist, National Oceanic and Atmospheric Administration.

Man's habitat degradation of coastal, estuarine, and riverine systems most drastically affects estuarine dependent species, and generally at their most sensitive stages. Habitat loss and degradation, unlike over fishing or natural mortality, generally leads to permanent population effects. In most cases, declines in living marine resources are probably due to a combination of overfishing, habitat degradation and natural factors.

Chambers, James R. (1995). "Strengthen Habitat Protection to Rebuild U.S. Marine Fisheries and Restore Coastal Ecosystem Health." Draft Report, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland, 26 pp.

Without including fishery habitat protection as an essential element, fishery management is merely the management of harvesting, which alone will not ensure maximum sustainable populations for future generations. In the view of many, the protection of essential habitats must be adopted as a co-equal objective with protection of stocks if the national goal of conservation of populations of marine fish and shellfish is to be realized. This paper provides the rationale for creating a strong National Habitat Protection Program to rebuild the nation's marine fisheries populations and protect U.S. coastal ecosystem health.

Chambers, James R. (1996). "Inshore-Dependency of U.S. Marine Fishery Resources." Draft Report, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland, June, 8 pp.

Coastal marine waters and tributary river systems contain a variety of habitats such as wetlands, sea grass beds, coral reefs, and mud flats that collectively are essential to the reproduction, growth, and survival of a majority of the marine fish and shellfish of the United States. However, such productive habitats continue to be destroyed and degraded by water development projects, housing, agriculture, logging, water diversion, pollution and other human induced ecosystem alterations. Concurrently, marine fishery populations have experienced great declines due primarily to the combined effects of overfishing and inshore habitat degradation and loss. Even at today's depressed population levels, marine fishery resources are extremely valuable - contributing \$50 billion per year to the nation's GNP. A detailed evaluation of the composition of the U.S. commercial landings of fish and invertebrates determined that 75% of the total (by weight) and 63% (by value) in 1991 was composed of species that are dependent for their survival on inshore habitats. Moreover, between 1978 and 1991, commercial landings of inshore-dependent fish and shellfish in the lower 48 states declined 18% in weight and 32% in value

(\$450 million lost annually).

Chambers, Robert B. and Ivar E. Strand, Jr. (1986). "Estimating Parameters of a Renewable Resource Model Without Population Data." Marine Resource Economics, 2(3):263-274.

A general approach to determining parameters of a traditional bioeconomic model is offered for the situation in which knowledge of resource abundance is unknown. Production parameters (such as catchability coefficients) and biological factors (such as natural mortality and recruitment) are included in the model. The general model is articulated for a typical fishery and further specified to obtain estimates of parameters for the St. John's river Shad fishery. The results, considering the illustrative nature of the analysis, are promising and suggest avenues of additional research.

Chambers, Robert B., Rolf Fare, Shawna Grosskopf, James Kirkley, Johan A. Mistiaen, Catherine J. Morrison Paul, Dale Squires, and Ivar E. Strand, Jr. (1999). "A Workshop on Measuring Productivity in Fisheries." Draft report, Department of Agricultural and Resource Economics, University of Maryland, May.

A summary of the results of a workshop held to develop an index of fishery productivity. Unique problems arising from common property fisheries, regulation, and multiple outputs were discussed in the context of existing productivity theory. Case studies were presented for a number of different approaches including econometric analysis and an application of a Malmquist index.

Chapman, D.G. (1964). "A Critical Study of Pribilof Fur Seal Population Estimates." Fishery Bulletin, 63(3):657-669.

Previously unresolved problems in the populations studies of the Pribilof fur seal are reviewed. The tagging estimates of fur seal pups may have been biased by tag mortality and hence the apparent year class fluctuations after 1952 may be unreal. A set of cumulative estimates are given for the number of pups born in each year since 1950. These cumulative estimates depend on the estimate of the ratio of survival of females to males from birth to age 3. An estimate of this ratio is given. The implications of this study on the population dynamics model of the fur seal are reviewed: in particular while the exact model is less definite, the suggested optimum population level is almost unchanged from that suggested in earlier studies.

Charles, Anthony T. (1983). "Optimal Fisheries Investment: Comparative Dynamics for a Deterministic Seasonal Fishery." Can J. Fish. Aquat. Sci., 40:2069-2079.

A dynamic fisheries model is developed to simultaneously optimize investment in the resource stock (the fish) and investment in the capital stock (the fleet). Each of these investment problems faces a major complication; investment in the resource is constrained by the natural population dynamics, while investment in the physical capital stock tends to be irreversible because capital used in natural resource industries is often nonmalleable. The model assumes a seasonal fishery in which annual escapement and capital investment levels can be controlled. A dynamic programming approach is used to analyze the model heuristically and numerically. The comparative dynamics of optimal investment strategies are studied, with regard to (i) delays in investment, (ii) population dynamics parameters, (iii) fish price, (iv) capital cost, (v) depreciation rate, and (vi) discount rate. In

particular, the depreciation rate and the ratio of unit capital costs to unit operating costs play interesting and complex roles in determining optimal investment levels.

Charles, Anthony T. (1983). "Optimal Fisheries Investment Under Uncertainty." Can J. Fish. Aquat. Sci., 40:2080-2091.

A full analysis of optimal fisheries investment strategies must take into account high levels of uncertainty in future fishery returns, as well as irreversibility of investment in specialized, nonmalleable fishing fleets. A stochastic optimization model is analyzed using dynamic programming to determine optimal policy functions for both fleet investment and fish stock management within an uncertain environment. The resulting policies are qualitatively similar to those found in the corresponding deterministic case, but quantitative differences can be substantial. Simulation results show that optimal fleet capacity should be expected to fluctuate over a fairly wide range, induced by stochastic variations in the biomass. However, the performance of a linear-cost risk-neutral fishery is fairly insensitive to variations in investment and escapement policies around their optimum levels, so that economic optimization is "forgiving" within this context. A framework of balancing upside and downside investment risks is used here to explain the roles of several fishery parameters in relation to optimal investment under uncertainty. In particular, the intrinsic growth rate of the resource and the ratio of unit capital costs to unit operating costs are found to be key parameters in determining whether investment should be higher or lower under uncertainty.

Charles, Anthony T. (1988). "Fishery Socioeconomics: A Survey." Land Economics, 64(3):276-295.

This paper reviews the relevant literature on fishery socioeconomics, addressing the questions: What contribution can multi-objective socioeconomic analysis play in fisheries economics and in practical fisheries management? What insights can be obtained from existing socioeconomic research? What specific questions need to be emphasized in future research?

Charles, Anthony T. (1989). "Bio-Socio-Economic Fishery Models: Labour Dynamics and Multi-Objective Management." Can J. Fish. Aquat. Sci., 46:1313-1322.

Fishery systems involve complex interactions between resource stocks and the people involved in harvesting those stocks. While the population dynamics of fish stocks have received considerable attention in the ecological literature, the dynamics of human communities dependent on the fishery are equally important. Indeed, the joint dynamics of the fish stocks and the fishermen must be taken into account in determining appropriate management policies. A bio-socio-economic modelling approach is developed here to incorporate these effects within a multi-objective optimization framework. Fishery labour dynamics are determined by the decisions of individual fishermen, with net migration into and out of the fishery (and hence the fishing community) dependent on internal conditions, such as per capita incomes and employment rates, as well as on the state of the external economy. The task of fishery management is then one of balancing multiple objectives - such as conservation, income generation, employment, and community stability - subject to fish and fishermen dynamics. Control theory and simulation methods are used to study the bio-socio-economic dynamics of the fishery system and the interactions of multiple management objectives in determining the resulting fishery equilibrium. Implications for fishery policy development are also discussed.

Charles, Anthony T. and Gordon R. Munro (1985). "Irreversible Investment and Optimal Fisheries Management: A Stochastic Analysis." Marine Resource Economics, 1(3):247-264.

In recent years, attention has been devoted to fishery management problems that arise because capital embodied in fishing fleets is often nonmalleable, having few if any alternative uses. This problem of irreversible investment was analyzed by Clark et al. (1979), using a deterministic model. In reality, however, most investment decisions must be made within an uncertain environment. This paper describes recent efforts to account for uncertainty in analyzing the problem of optimal fishery investment, where the uncertainty is caused by stochastic variability in the resource stock from year to year.

Charles, Anthony T. and William J. Reed (1985). "A Bioeconomic Analysis of Sequential Fisheries: Competition, Coexistence, and Optimal Harvest Allocation Between Inshore and Offshore Fleets." Can J. Fish. Aquat. Sci., 42:952-962.

A bioeconomic model is developed to determine optimal harvest allocation between offshore and inshore fleets exploiting a single fish stock in sequential fisheries. The socially optimal policy for maximizing total discounted rent is determined in terms of optimal escapement levels in each fishery. Whether exclusion or coexistence of the two fleets occurs under open access and under optimal management is found to depend primarily on inshore/offshore price and cost ratios, together with biological parameters related to the age structure of the fish stock. We discuss how fishery regulations, such as separate landings taxes imposed on each fleet, can be used to jointly optimize open-access exploitation in sequential fisheries.

Charles, Anthony T., Theophilus R. Brainerd, Alicia Bermudez M., Herminigildo M. Montalvo, and Robert S. Pomeroy (1994). Fisheries Socioeconomics in the Developing World, Regional Assessments and an Annotated Bibliography. International Development Research Centre, P.O. Box 8500, Ottawa, ON, Canada, K1G 3H9, March, 163 pp.

In fisheries of the developing world, where social and economic concerns often dominate, intelligent policy making requires an adequate understanding of both "economic" and "human" factors -- the economic structure and dynamics of the fishery system, on the one hand, and the role of social, cultural, institutional and political aspects on the other. Interdisciplinary linkages between these two elements form the essence of fishery socioeconomics, that addresses a wide range of topics: analyses of management and developmental goals, income distribution, social accounting, fishery ownership and access, fisher dynamics and labor markets, the socioeconomic structure of fishing communities, economic aspects of gender differences, the nature of fishery decision making, and so on.

Despite its recognized practical importance, the fishery socioeconomic literature is widely dispersed and often inaccessible. This report presents the results of an international effort to compile this literature and to assess the "state of the art" in socioeconomic research on developing fisheries and aquaculture. The report consists of two key elements: (1) a series of regionally based assessments of fishery socioeconomics research, for each of Africa, Latin America and Asia/Pacific, and (2) an extensive annotated bibliography (on diskette) containing over 100 references from across the developing world.

Charles River Associates (1983). "Modeling the Short-Run Behavior of the New England Groundfish Industry." Final report prepared for

the New England Fishery Management Council. Charles River Associates, 200 Clarendon Street Boston, Massachusetts 02116, May, 78 pp.

This project developed a short run forecasting model of the New England groundfish industry. The model is to be used in formulating plans to manage the industry.

Charron, J.P. and G.E. Coles (1975). Costs and Earnings of Selected Fishing Enterprises, Nova Scotia, 1974. Department of Fisheries, Province of Nova Scotia and Fishing Services Directorate, Fisheries and Marine Service, Environment, Ottawa, Canada, December, 39 pp.

This report contains the results of some Nova Scotia selected fishing enterprises for the year 1974. Profiles are developed for 35 vessels in six vessel classes corresponding to hull, gear, or fishery of specialization.

Chaudhuri, Kripasindhu (1988). "Dynamic Optimization of Combined Harvesting of a Two-Species Fishery." Ecological Modeling, 41:17-25.

The problem of dynamic optimization of the exploitation policy connected with the combined harvesting of two competing fish species each of which obeys the logistic growth law is considered in this paper. The singular extremal trajectory in the phase plan is derived by taking the harvesting effort as a dynamic variable. Biological or bioeconomic interpretations of the constraints required for this singular extremal are also given.

Chauvin, William D. (1985). "The World Market, How 1985 Shrimp Production May Affect 1986 Supplies." Seafood Leader, (Winter): 81-96.

The impact of international supply and demand conditions, such as shrimp farming, on prices is discussed in this paper.

Chauvin, William D. (1992). "Asia's Aquaculture Success has Taken the World Shrimp Market By Storm." Seafood Business, (July/August): 45-89.

A market report on the impact of black tiger shrimp aquaculture on the world demand for shrimp and shrimp prices.

Chauvin, William D. and Kenneth J. Roberts (1983). "Impact of Pond-Raised Shrimp, Particularly from South America, On the U.S. Market." Report VII in Assessment of Shrimp Industry Potentials and Conflicts, Volume One, Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August, 106 pp.

This paper discusses the impact of pond raised (aquaculture) shrimp on U.S. markets with special emphasis on Ecuador and other international markets for shrimp.

Chavas, Jean-Paul, and Thomas L. Cox (1994). A Primal-Dual Approach to Nonparametric Productivity Analysis: The Case of U.S. Agriculture. Staff Paper 372, Department of Agricultural Economics, University of Wisconsin, Madison, WS, Feb, 19 pp.

Nonparametric methods for measuring productivity indexes based on bounds for the underlying production technology are presented. Following Banker and



Maindiratta, the lower bound is obtained from a primal approach while the upper bound corresponds to a dual approach to nonparametric production analysis. These nonparametric bounds are then used to estimate input-based and output-based distance functions. These radial series data on U.S. agriculture indicates a large gap between the primal lower bound and the dual upper bound. This generates striking differences between the primal and dual nonparametric productivity indexes.

Chavas, Jean-Paul, and Matthew Holt (1995). Nonlinear Dynamics and Economic Instability: The Optimal Management of a Biological Population. Journal of Agricultural and Resource Economics, 20(2): 231-46.

Assuming a competitive market, conditions are determined for when a steady state equilibrium does not exist in the optimal dynamic management of a biological population. Irregular and unpredictable behavior (called chaos ) can arise from rational economic decision making. High interest rate, adjustment costs, and an inelastic demand can contribute to market instability.

Cheng, Hsiang-tai and Oral Capps, Jr. (1987). "Demand for Disaggregate Fish and Shellfish Species in the United States." Bulletin 87-2, Virginia Agricultural Experiment Station, Virginia Polytechnic Institute and State University.

The primary objective of this research is to provide quantitative information, notably own-price, income, and household size elasticity measures, about consumer behavior relating to specific fish and shellfish products.

Cheng, Hsiang-tai and Oral Capps, Jr. (1988). "Demand Analysis of Fresh and Frozen Finfish and Shellfish in the United States." American Journal of Agricultural Economics, 70(3):533-542.

Household expenditures for at home consumption on three species of shellfish and five species of finfish were analyzed. Factors explaining the variation of expenditures on seafood commodities were own price, household income, coupon value, household size, geographic region, urbanization, race, and seasonality. Own-price elasticities ranged from -0.45 (flounder/sole) to -1.13 (oysters). Expenditures on fishery products were more sensitive to changes in household size than to changes in household income. Cross-price effects of red meat and poultry were not statistically significant. For comparison purposes, estimates of own price, income, and household size elasticities from the literature were made with this set of elasticities.

Chester, A.J., J. Braun, F.A. Cross, S.P. Epperly, J.V. Merriner, and P.A. Tester (1994). "AVHRR Imagery and the Near Real-Time Conservation of Endangered Sea Turtles in the Western North Atlantic." Proceedings of the WMO/IOC Technical Conference on Space-Based Ocean Observations, September, 1993 (WMO/TD-No. 649). Bergen, Norway, pp. 184-189.

Surface seawater temperature imagery from the Advanced Very High Resolution Radiometry (AVHRR) sensor of the U.S.A.'s NOAA-11 polar orbiting satellite is being used to reduce the impact of commercial trawl fishing on populations of threatened and endangered sea turtles off the east coast of the U.S.A. During late autumn and early winter, southerly migrating summer flounder (Paralichthys dentatus) and sea turtles co-occur on the narrow continental shelf in the vicinity of Cape Hatteras, North Carolina. All five sea turtle species found in this area are protected under the Endangered

Species Act (PL93-205); four of the five are known to be captured and drowned in flounder trawl nets. Superimposition of sea turtle positions (from aerial surveys and at sea observers) on AVHRR imagery demonstrate that risks to sea turtles are greatest when water temperatures are 11° or greater. Seawater temperatures in this area, documented by AVHRR imagery, are highly influenced by the position and activity of the Gulf Stream, both of which are unpredictable on time scales necessary for the management of sea turtle/fishery interactions. During the past three fishing seasons, turtle conservation measures, such as tow time restrictions and turtle excluder devices, have been imposed on the fishery. AVHRR imagery is being used to evaluate and modify, in near real-time, the duration and geographic extent of existing regulations, so that sea turtles receive adequate protection and the fishery, with reasonable restrictions, can continue to operate.

Cheung, Steven N.S. (1970). "The Structure of a Contract and the Theory of a Non-Exclusive Resource." Journal of Law and Economics, 13(April):49-70.

A common property externality is defined using the right of contract concept. The absence of contractual stipulations governing resource use that would exist if the fishing ground were private property, alters the constraint of competition and affects resource allocation in a number of ways. The alleged externalities in fisheries are thus attributable to the absence of the right to contract.

Chin-Hwa Sun (199?). Optimal Number of Fishing Vessels for Taiwan's Offshore Fisheries - A Comparison of Different Fleet Size Reduction Policies. Preliminary Draft, Institute of Fisheries Economics, National Taiwan Ocean University, 2 Pei-Ning Road, Keelung, Taiwan, Republic of China, 32 pp.

This study compares the harvest capacity of Taiwan's offshore fishing fleet to sustainable yields of offshore fisheries and evaluates different legislative strategies designed to reduce the fishing fleet. Aggregate fisheries resource dynamic movement and harvest functions are specified and estimated. Results show that the resource stock of the offshore fisheries in Taiwan starts to decline since 1973. Based on dynamic simulations, this study shows that neither the Program to Restrict the Building of New Vessels nor a combination of this program with the Vessel Retirement and Buyback Program is sufficient to avoid the downward trend in fisheries harvests and the deteriorating state of fisheries resource stocks. While reducing fishing effort to maximum sustainable yields (MSY) might suffice as an initial vessel reduction measure, attaining MSY within 5 to 10 years seems preferable over one year approach. The long-run economic situation would be further improved by an additional reduction of fishing effort to the optimal yield (OY) level.

Chittenden, Mark E., Jr. and John D. McEachran (1976). "Composition, Ecology, and Dynamics of Demersal Fish Communities on the Northwestern Gulf of Mexico Continental Shelf, with a Similar Synopsis for the Entire Gulf." TAMU-SG-76-208, Department of Wildlife and Fisheries Sciences, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843, July, 104 pp.

Relative biomass was much higher on the brown shrimp grounds than on the white shrimp grounds. Relative biomass was much higher in summer than during winter, especially on the white shrimp grounds. Overall, 11.35 volumes of discard were landed to one volume of headed shrimp. We estimate that about 219,050 metric tons of fish were discarded annually in the Gulf by Texas-based

shrimp trawlers during the period 1962-71. Typical life spans appear to be only one or two years, so that these fishes must mature rapidly. Their theoretical total annual mortality rates are about 90-100%, so that there must be a rapid turnover of biomass on the shrimp grounds. Fishes with this type of life cycle tend to withstand extensive fishing without danger of over harvesting, so that they apparently have great fisheries potential. The Gulf shrimp fishery at present does not appear to be over harvesting the demersal fishes.

Chopin, Frank, Yoshihiro Inoue, Y. Matsushita, and Takafumi Arimoto (1997). Sources of Accounted and Unaccounted Fishing Mortality. In Solving Bycatch, Considerations for Today and Tomorrow, Alaskan Sea Grant College Program Report No. 96-03, University of Alaska, Fairbanks, Alaska, 322 pp.

Discarding of nontarget species and sizes of fish by commercial fishing vessels is a common practice in many fisheries around the world and is currently estimated at 27 million tons globally. Efforts to reduce discarding through mechanical selection were started over 100 years ago and were the precursor to mesh selectivity research in many European countries. The release of fish through mechanical selection is now a preferred management tool in many fisheries. In recent years, research into fish mortality after escape has shown that mortalities vary by gear type and species, may be immediate or delayed, and may be due to injuries or stressors associated with capture-escape trauma. In addition to escape mortality, there are other unaccounted mortalities associated with different capture technologies. This paper reviews sources of unaccounted fishing mortality, presents a general model of the capture process, and proposes a set of conservation technology penalties for discards, ghost fishing, and escape mortalities for each gear type and fleet sector. An effective conservation philosophy for reducing resource waste must include a shift of research to the commercial sector and a review program to allow for penalty reductions when new technologies are introduced.

Christensen, Laurits R. (1977). "Estimating U.S. Consumer Preferences for Meat with a Flexible Utility Function." Journal of Econometrics, 5:37-53.

Direct and indirect translog utility functions provide budget share equations that are both flexible and consistent with the theory of utility maximization. These forms are attractive for modeling consumer behavior. Because of their flexibility they are ideal for testing hypotheses such as additivity of preferences. In this paper, we use the translog methodology to analyze U.S. consumption of the four principal categories of meat-fish, beef, poultry, and pork. We decisively reject the hypothesis of additivity. However, further testing for partial additivity reveals that (beef) and (fish, poultry, pork) are additively separable subgroups of meat.

Christensen, Laurits R., Dale W. Jorgenson, and Lawrence J. Lau (1975). "Transcendental Logarithmic Utility Functions." American Economic Review, 65(3):367-383.

A test of the theory of demand is developed that does not employ additivity of homotheticity as part of the maintained hypothesis. Secondly, the duality between prices and quantities in the theory of demand is exploited. The indirect utility function is represented by functions that are quadratic in the logarithms of ratios of prices to total expenditure, paralleling the treatment of the direct utility function. The resulting indirect utility functions provide a local second-order approximation to any

indirect utility function.

Christensen, Steen and Niels Vestergaard (1993). "A Bioeconomic Analysis of the Shrimp Fishery of Greenland in the Davis Strait." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

Shrimp (Pandalus borealis) is by far the most important species in the Greenland fisheries and the present basis of Greenland's economy (90% of total exports and 30% of the world supply of cold water shrimp). To provide guidance on the effects of yield from management measures designed to reduce the quota by 20% for 1993, this paper presents a bioeconomic analysis based on estimates of the total mortality, growth, discard, and the 1991 operating costs that determines the resource rent and optimum effort of the shrimp fishery in the Davis Strait. Effort must be reduced by at least 40% compared to the 1991 level to obtain MEY. The gain in economic rent is estimated to be at least 19% compared to the economic rent of 1991.

Christensen, Steen and Niels Vestergaard (1993). "A Bioeconomic Analysis of the Greenland Shrimp Fishery in the Davis Strait." Marine Resource Economics, 8(4):345-365.

This paper presents a bioeconomic analysis determining the resource rent and optimum effort of the shrimp (Pandalus borealis) fishery in the Davis Strait taking into account the discard behavior of the fleet. It is demonstrated that from an economic point of view the shrimp stock in the Davis Strait is substantially overfished. To obtain the maximum economic yield, the effort must be reduced by at least 40% compared to the effort level of 1991. The gain in resource rent by reducing effort is estimated to be at least 20% compared to the resource rent of 1991.

Christmas, J.Y. and David J. Etzold (eds.) (1977). "The Shrimp Fishery of the Gulf of Mexico United States: A Regional Management Plan." Technical Report Series, No. 2, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, August, 128 pp.

The regional Gulf of Mexico shrimp fishery management plan documents the problems and lists the goals and objectives necessary to manage the shrimp resources of the Gulf of Mexico and provide optimum sustained benefits for the nation. The fishery is described, shrimp producing zones of the region are identified for preservation and improvement, and statistics collection is facilitated. The report promotes research in bio-social-economic model development, development of a regional management plan, and extension education of shrimp fishermen.

Christmas, J.Y., David J. Etzold, Larry B. Simpson, and Stephen Meyers (eds.) (1988). "The Menhaden Fishery of the Gulf of Mexico United States: A Regional Management Plan." Number 18, Published by the Gulf States Marine Fisheries Commission, Ocean Springs, Mississippi, November.

The first regional management plan (Christmas and Etzold, 1977) was adopted and implemented by the Gulf State-Federal Fishery Management Board in 1977. Results of ongoing review and evaluation of research and management achievements warranted a revised management plan. The goal of the plan is to develop a gulf menhaden management strategy that will allow an annual maximum harvest that protects the stock from overfishing on a continuing basis.

Christy, Francis T. (1964). Efficiency in the Use of Marine Resources.

Reprint Number 49, Resources for the Future, Inc., 1755 Massachusetts Avenue, NW, Washington, D.C., September, 8 pp.

This paper discusses the economic consequences of common property natural resources and suggests some economic criteria that may help to provide the basis for improvements in the efficient exploitation of marine resources. First, different kinds of common property resources and the reasons why use of these resources is shared rather than appropriated by individuals or firms are identified. Second, some of the more damaging consequences of common property exploitation are discussed with particular emphasis on economic inefficiency. The need for public control and that the choice of objectives for control measures should include economic criteria is pointed out. Finally, policy and research problems that need to be solved if marine resource exploitation is to become more efficient in an economic sense are raised.

Christy, Francis T. (1996). The Death Rattle of Open Access and the Advent of Property Rights Regimes in Fisheries. Marine Resource Economics, 11(4):287-304.

This paper is an attempt to collate the new paradigm of property rights management for fisheries. The paper begins with a discussion of the present paradigm of common property or open access fisheries management and the costs associated with maintaining them. It then postulates the future paradigms as a basis for setting the goals towards which we should be striving and for identifying the most significant obstacles in the path. The forces at work that are leading to the new paradigms are discussed. The paper concludes with an identification of some of the challenges for administration and research. An excellent paper.

Christy, Francis T. (1996). Over-Capacity in Fisheries: Problems and Approaches. Draft Report, IMARIBA, June, 31 pp.

Some suggestions are made for steps that might be followed to facilitate the task of reducing over-capacity. Basic to the approach is the need to provide the institutions and create the conditions that will give the fishermen the incentives to control their investment. Over the long run, the best solution to problems of fisheries will occur when the fishermen assume the responsibilities for management.

Christy, Francis T. (1997). The Development and Management of Marine Fisheries in Latin America and the Caribbean. Policy Research Paper No. ENV-110, July, 82 pp.

There is a global and regional awareness that marine fisheries resources have been mismanaged. It is becoming clear that although proper management of fisheries is a difficult task, it can succeed in capturing economic rents that were formerly dissipated, and in achieving sustainable use of the resources. This paper attempts to provide the background information necessary for the development of a new strategy for the International Development Bank (IDB) and offers some suggestions for its formulation and implementation.

Christy, F. and A.D. Scott (1965). The Common Wealth in Ocean Fisheries. The Johns Hopkins Press, Baltimore, Maryland. 281 p.

The authors explore the problems of ocean resources to determine if contributions toward solutions can be made by social scientists. A better understanding of the nature of the fisheries of the high seas and the legal and economic problems stemming from the common property characteristic has to be the starting point for improvements in national policy and international

cooperation.

Chu, D.K.Y. (1986). Government Policies, Economic Development, and Possible Environmental Effects at the Land-Water Interfaces of Guangdong Province, China. Marine Resource Economics, 3(1):29-44.

The coastal zone of South China is characterized by many features that are shared by other developing countries. It is a long inhabited area with lengthy coastlines, dotted by several modern cities and a large number of fishing ports. Because of heavy population pressure, large demand for food, and the drive to develop modern industries, extensive embankment and reclamation schemes are undertaken, leading to many ecological feedbacks, such as heavy silting of the estuaries, pollution of coastal waters, and depletion of fishery resources nearby. The recent development of offshore oil and gas fields on the continental shelf of the South China Sea has further complicated the issue. On the other hand, one can anticipate rapid economic development along the coast; on the other, there is higher risk of environmental disasters. It is thus necessary to strengthen the present environmental surveillance system and the research effort on the environmental economics of the area.

Cicchetti, Charles J., Anthony C. Fisher, and V. Kerry Smith (1976). "An Econometric Evaluation of A Generalized Consumer Surplus Measure: The Mineral King Controversy." Econometrica, 44(6):1259-1276.

This paper develops a household production model of individual behavior to focus on the choice of recreational activities. This framework is used to propose a generalized approach for measuring the consumer surplus associated with a natural resource development project. The model is applied to the proposed Mineral King project in California. The results indicate that the project is unlikely to yield a positive net present value.

Ciriacy-Wantrup, S.V. and Richard C. Bishop (1975). "Common Property as a Concept in Natural Resources Policy." Natural Resources Journal, 15(October):713-727.

A discussion of the common property concept in natural resource policy and its misuse by analysts to mean open access resources. Common property institutions to regulate fugitive resources include total quotas and may work well to conserve resources for the future.

Clark, Allen L. and Jennifer Cook Clark (1986). Marine Metallic Mineral Resources of the Pacific Basin. Marine Resource Economics, 3(1):44-62.

In the 1970's and 1980's, the ocean became a focus of attention for mineral producers and consumers. This paper surveys that trend with particular emphasis on several specific metals and types of resource deposit. In particular, the known and speculative details of manganese nodules, cobalt rich manganese crusts, and polymetallic massive sulfides are discussed and analyzed in an economic context.

Clark, Colin W. (1973). "The Economics of Overexploitation." Science, 181:630-633.

Severe depletion of renewable resources may result from high discount rates used by private exploiters.

Clark, Colin W. (1973). "Profit Maximization and the Extinction of

Animal Species." J. Polit. Econ., 81:950-961.

In this paper, a simple mathematical model for the commercial exploitation of a natural animal population is constructed and analyzed. The model takes into account the response of the population to harvesting pressure, the increasing harvesting costs associated with decreasing population levels, and the preference of the harvesters for present over future revenues. The principle conclusion of the analysis is that, depending on certain easily stated biological and economic conditions, extermination of the entire population may appear as the most attractive policy, even to an individual resource owner.

Clark, Colin W. (1979). "Towards a Predictive Model for the Economic Regulation of Commercial Fisheries." Resources Paper No. 40, Department of Economics, University of British Columbia, Vancouver, Canada V6T 1W5.

A model of the commercial fishery, incorporating the microeconomic decisions of individual vessel operation, is developed and employed to predict the consequences of various methods of regulation, including: (i) total catch quotas; (ii) limited entry; (iii) taxes on catch (or effort); (iv) allocated catch (or effort) quotas. Among the principal predictions of the analysis are: (a) total catch quotas do not improve the economic performance of an open-access fishery; (b) limited entry results in distortion of inputs unless every input is controlled; (c) taxes and allocated transferrable catch quotas are theoretically equivalent to one another in terms of economic efficiency, and both are capable in principle of optimizing exploitation of the common-property fishery.

Clark, Colin W. (1980). "Towards a Predictive Model for the Economic Regulation of Commercial Fisheries." Can. J. Fish. Aquat. Sci., 37:1111-1129.

A model of the commercial fishery, incorporating the microeconomic decisions of individual vessel operation, is developed and employed to predict the consequences of various methods of regulation, including: (i) total catch quotas; (ii) vessel licenses; (iii) taxes on catch (or effort); (iv) allocated catch (or effort) quotas. Among the principal predictions of the analysis are: (a) total catch quotas do not improve the economic performance of an open access fishery; (b) limited entry results in distortion of inputs unless every input is controlled; (c) taxes and allocated transferable catch quotas are theoretically equivalent to one another in terms of economic efficiency, and both are capable in principle of optimizing exploitation of the common property fishery.

Clark, Colin W. (1980). "Restricted Access to Common-Property Fishery Resources: a Game-Theoretic Analysis." Chapter 7 in P.T. Liu (ed.) Dynamic Optimization and Mathematical Economics, New York: Plenum Press.

This paper addresses the case of limited access in a fishery where there are N sole owners of the resource whose inputs are constrained under various limited access management scenarios.

Clark, Colin W. (1985). The Effect of Fishermen s Quotas on Expected Catch Rates. Marine Resource Economics, 1(4):419-427.

Fishermen s quotas have the effect of truncating catches at the catch limit. Hence the expected catch is smaller than the quota. A simple search

model is developed that provides an estimation of the factor by which expected catches are reduced.

Clark, Colin W. (1990). Mathematical Bioeconomics, The Optimal Management of Renewable Resources, Second Edition. John Wiley & Sons, Inc., New York.

This book is concerned with the Economics of the sustainable use of biological resources and with understanding why such resources have often been used in a nonsustainable manner.

Clark, C.W. and G.P. Kirkwood (1979). "Bioeconomic Model of the Gulf of Carpentaria Prawn Fishery." J. Fish. Res. Board Can. 36:1304-1312.

A bioeconomic model of the Gulf of Carpentaria prawn fishery that employs 21 parameters to describe the performance of two classes of vessels exploiting several stocks of prawns is developed. The model predicts the number of vessels of each class entering the fishery under free access, and is also used to estimate the economically optimal number of vessels of each type.

Clark, Colin W. and R. Lamberson (1982). "An Economic History and Analysis of Pelagic Whaling." Marine Policy, April:103-120.

Following the introduction of sea going factory vessels by Norwegian whalers in the 1926 season, the international whaling industry underwent a large expansion that ultimately resulted in depletion of many valuable stocks of whales. Attempts at conservation under the auspices of the International Whaling Commission met with limited but growing success, until a new management policy was adopted in 1975. By 1980 the killing of most species of baleen whales had been prohibited. The authors review the economic history of pelagic whaling during this period, and present a corresponding economic analysis. A brief survey of mathematical models of the whaling industry is given in the Appendix.

Clark, Colin W. and Marc Mangel (1979). "Aggregation and Fishery Dynamics: A Theoretical Study of Schooling and the Purse Seine Tuna Fisheries." Fishery Bulletin, 77(2):317-337.

This paper describes mathematical models of exploited fish stocks under the assumption that a certain portion of the stock becomes available through a dynamic aggregation process. The surface tuna fishery is used throughout as an example. The effects of aggregation on yield-effort relationships, indices of abundance, and fishery dynamics are discussed. The predictions of the theory are notably different from those obtained from general production fishery models, particularly in cases where the available substock has a finite saturation level. Possible effects include fishery "catastrophes" and lack of significant correlation between catch per unit effort statistics and stock abundance. Various management implications of the models are also discussed.

Clark, Colin W., Frank H. Clarke, and Gordon R. Munro (1979). "The Optimal Exploitation of Renewable Resource Stocks: Problems of irreversible Investment." Econometrica, 47(1):25-47.

This paper studies the effects of irreversibility of capital investment upon optimal exploitation policies for renewable resource stocks. It is demonstrated that although the long term optimal sustained yield is not affected by the assumption of irreversibility (except in extreme cases), the



short term dynamic behavior of an optimal policy may depend significantly upon the assumption. It is suggested that the results may have profound implications for problems of rehabilitation of overexploited fisheries and other renewable resource stocks.

Clark, Colin, Gordon Edwards, and Michael Friedlaender (1973). "Beverton-Holt Model of a Commercial Fishery: Optimal Dynamics." J. Fish. Res. Board Can., 30:1629-1640.

The problem of optimal regulation of a fishery is discussed. Of special interest is the problem of regulating an overexploited fishery by reducing effort to allow the fish population to build up to a suitable level.

Clark, Colin W., Anthony T. Charles, John R. Beddington, and Marc Mangel (1985). "Optimal Capacity Decisions in a Developing Fishery." Marine Resource Economics, 2(1):25-53.

The problem of estimating optimal fishing capacity for a developing fishery is discussed, using the methods of Bayesian decision analysis. The results obtained indicate that quite good decisions can often be made on the basis of limited prior information as to fish stock productivity, particularly if a conservative approach allowing for subsequent increases in capacity is employed.

Clark, I.N., P.J. Major, and N. Mollett (1988). "Development and Implementation of New Zealand's ITQ Management System." Marine Resource Economics, 5(4):325-349.

In 1986 an individual transferable quota management system was introduced into the New Zealand finfish fisheries. This article describes the ITQ system and provides an analysis of its successes and shortcomings to date.

Clark, I.N., P.J. Major, and N. Mollett (1989). "The Development and Implementation of New Zealand's ITQ Management System." Pages 117-145 in P.A. Neher, R. Arnason, and N. Mollett (eds.) Rights Based Fishing Dordrecht: Kluwer Academic Publishers.

In 1986 an individual transferable quota management system was introduced into the New Zealand finfish fisheries. This article describes the ITQ system and provides an analysis of its successes and shortcomings to date.

Clark, Jerry and Richard S. Johnston (1986). "Open Access, Market Structure, Optimality and Entrepreneurship in the Fishery." Proceedings, International Conference of Fisheries, Universite du Quebec a Rimouski, Rimouski, Canada, August 10 to 15, pp. 429-437.

Since the seminal papers of Gordon and Scott, fishery economists have attempted to (1) understand resource use under conditions of open access and (2) devise prescriptions for improved resource use under the notion of social optimality. Much more effort has been given to (2) than to (1). In this paper, we argue for a reallocation of effort.

Clark, Joy Lynn McCoy (1988). "The Economic Impact of Proposed Ted Regulations on Texas Shrimp Fishermen." Dissertation, Department of Agricultural Economics, Texas A&M University, College Station, TX, 185 pp.

Shrimp fishermen trawling in the Gulf of Mexico and south Atlantic inadvertently capture and kill turtles that are classified as endangered

species. Recent legislation requires the use of a Turtle Excluder Device (TED) that when placed in the shrimp trawl prevents turtle mortality. The impact of the TED on shrimp production is not known. Analysis of TED regulations using an annual firm level simulation model indicated that the average gulf fleet had a low probability of being an economic success before enacting the regulations. An assumption that the TED regulations result in decreased production aggravated this condition, while an analysis assuming a positive impact on production slightly improved the economic viability of the firm. When an analysis was conducted on a monthly basis considering industry wide interaction between landings per vessel in one time period and available shrimp stock the next, the impact of the TED regulations was mitigated. A decrease (increase) in effective effort each time period, as the result of using a TED, increased (decreased) available stock in succeeding time periods and reduced the negative (positive) impact upon production. In both analyses, a negative impact of the TED on shrimp production resulted in a decline in the economic viability of the firm. Likewise, a positive impact improved the firm's economic viability.

Clark, Joy L. (1996). The Gulf of Mexico: An Introduction. The Southern Business and Economics Journal, 19(4):242-245.

An introduction to a special issue designed to represent some of the conflicts that are occurring in the use of Gulf of Mexico resources. Each article provides insight into the Gulf of Mexico from which many people want to extract revenue. With the growth of the population within the surrounding states and the growth in the recreation and retirement communities, the conflict over the use of these resources is sure to increase.

Clark, Joy L. and H. Dean Moberly (1996). Identification and Evaluation of Alternative Enterprises for a Representative Producer in the Alabama Shrimp Fishery. The Southern Business and Economics Journal, 19(4):293-302.

Alternatives available for a representative shrimp producer in the Alabama Gulf Coast are considered. Alternatives include captaining and charter vessel operations. Using a 10 year mixed integer linear program, a switch from shrimp would not occur unless returns to shrimping declined by 50 percent. The result confirms the tendency for shrimp fishing assets to remain in the industry long after returns have begun to decline. The paper first describes a representative producer and the alternative uses of this shrimp producer's resources. Then, a linear programming model is developed and is then used to evaluate changes in the fishery.

Clark, Joy and Wade Griffin (1987). "Costs and Returns of Seven Texas Shrimp Vessels." Natural Resources Working Papers Series, Natural Resource Workgroup, Department of Agricultural Economics, Texas A&M University, College Station, Texas 77843.

This report presents summaries of costs and returns information for seven categories of vessels shrimping off the Texas coast. This information can be compared with a vessel of similar type. Trends of revenue, variable costs and pounds landed for these categories are also presented.

Clark, Joy, Wade Griffin, Jerry Clark, and James Richardson (19??). "Economic Impact of TED on the Shrimp Industry in the Gulf of Mexico." Draft report, Texas A&M University, College Station, Texas.

The purpose of this paper is to estimate the costs and returns to

individual gulf vessels of using a turtle excluder device, a key issue in the ongoing debate over whether TEDs should be used. The results of four scenarios indicated a decline for negative impacts and an increase for positive impacts on shrimp production.

Clark, Joy, Wade Griffin, Jerry Clark, and James Richardson (1991).

"Simulated Economic Impact of TED Regulations on Selected Vessels in the Texas Shrimp Fishery." Marine Fisheries Review, 53(2):1-8.

Shrimp fishermen trawling in the Gulf of Mexico and south Atlantic inadvertently capture and kill sea turtles that are classified as endangered species. Recent legislation requires the use of a Turtle Excluder Device (TED), that when in place in the shrimp trawl, reduces sea turtle mortality. The impact of the TED on shrimp production is not known. This intermediate analysis of the TED regulations using an annual firm level simulation model indicates that the average Texas shrimp vessel had a low probability of being an economic success before regulations were enacted. An assumption that the TED regulations resulted in decreased production aggravated this condition and the change in Ending Net Worth and Net Present Value of Ending Net Worth before and after a TED was placed in the net was significant at the 5 percent level.

However, the difference in the Internal Rate of Return for the TED and non-TED simulations was not significant unless the TED caused a substantial change in catch. This analysis did not allow for interactions between the fishermen in the shrimp industry, an assumption that could significantly alter the impact of TED use on the catch and earnings of the individual shrimp vessel.

Clarke, Raymond P. and Stacey S. Yoshimoto (1990). "Application of the Leslie Model to Commercial Catch and Effort of the Slipper Lobster, Scyllarides squammosus, Fishery in the Northwestern Hawaiian Islands." Marine Fisheries Review, 52(2):1-7.

Commercial catch and effort data were fit to the Leslie model to estimate preexploitation abundance and the catchability coefficient of slipper lobster, Scyllarides squammosus, in the Northwestern Hawaiian Islands (NWHI). A single vessel fished for 34 consecutive days in the vicinity of Laysan Island and caught 126,127 total slipper lobster in 36,170 trap hauls. Adjusted catch of legal slipper lobster dropped from a high of 3.70 to 1.16 lobster per trap haul. Preexploitation abundance at Laysan Island was an estimate 204,000 legal slipper lobster, which was extrapolated to yield an estimate of  $1.2 \times 10^6$  to  $3.8 \times 10^6$  lobster for the entire NWHI slipper lobster fishery.

Clark, Simon and Donald A.R. George (1990). "Investment in the British Fishing Industry." Economics Research Papers, No.10, Sea Fish Industry Authority, Fisheries Economics Research Unit, Sea Fisheries House, 10 Young St., Edinburgh EH2 4JQ.

Vessel length or horsepower are used as proxies for firm size in an applied study of the capital investment level for each new boat that enters the fishing industry. The price of fish although statistically insignificant in the linear model had a positive effect on the level of new investment. Fuel prices and the interest rate were not statistically significant in the model due to the nature of the data or the behavior of fishermen, respectively. The grant rate was highly significant in determining the level of investment in a new boat. However, this may have been a dominate variable in the regression equation causing other important variables to appear insignificant.

Clark, Stephen H. and Charles W. Caillouet, Jr. (1973). "White Shrimp (Penaeus setiferus) Population Trends in a Tidal Marsh Pond. Marine Fisheries Review, 35(3-4):27-29.

Ketchen's modification of the Leslie fishing success method was used to estimate initial population and rates of immigration, fishing, and other losses (emigration and natural mortality) in a white shrimp population in a Texas tidal marsh pond. The significant decline in catch rates of marked and unmarked shrimp during the experiment was due to fishing and other causes (emigration and natural mortality), but the reduction due to fishing was less than that due to other causes. We believe that this or similar methods offer considerable promise in future studies of this nature.

Clark, Stephen H. and William J. Overholtz (1979). "Review and Assessment of the Georges Bank and Gulf of Maine Haddock Fishery." Laboratory Reference No. 79-05, January, NOAA, NMFS, NEFC, Woods Hole Laboratory, Woods Hole, Massachusetts 02543.

Haddock (Melanogrammus aeglefinus) constituted New England's most important groundfish resource for many decades and from the early 1920's to the mid-1960's was one of the most valuable fishery resources in the United States; total landed value averaged between 10 and 12 million dollars from 1940-1960 and increased to a record high of 13.9 million dollars in 1966 (Lyles, 1968), before declining in subsequent years. Prior to 1900, this species was of minor importance, being inferior to cod (Gadus morhua) for salting purposes, and consequently it was little utilized in historical times although use of ice aboard some of the bank vessels towards the close of the 19th century resulted in development of a limited fishery (Smith and Olson, MS, 1976). Introduction of filleting and freezing methods, however, resulted in an expanded market for haddock (Schuck, 1951) and with the introduction of otter trawls and diesel engines, the USA haddock fishery expanded rapidly. Landings from all areas reached an all-time high of 132,300 metric tons in 1929 before declining to an average of 66,000 tons from 1931-1965; subsequently landings declined precipitously with the collapse of the Georges Bank haddock fishery in the late 1960's. Total USA landings averaged approximately 5,000 tons from 1972-1976; provisional statistics for 1977 indicate a total USA catch of 12,900 tons, and preliminary estimates for 1978 indicate a USA catch of 17,700 tons.

Clawson, Marion (ed.) (1977). Research in Forest Economics and Forest Policy. Research Paper R-3, Resources for the Future, Washington, D.C.

Papers from the symposium are intended to cover all aspects of forest economics and forest policy.

Clay, Douglas (1989). "A Comparison of Two Stratification Schemes Used in Sampling Canadian Atlantic Cod, Gadus morhua." Marine Fisheries Review, 51(1):33-38.

Sampling is a key element in the assessment of any fish stock. It is often one of the most expensive activities of the management process; thus, improved efficiency can result in significant cost savings. In most cases a two phase sampling strategy is employed. Two commonly used versions of such stratified random schemes were simulated using a test population based on Atlantic cod, Gadus morhua. A 1 otolith per 1 cm length frequency currently used for many flatfish and some smaller gadoids and a 3 otolith per 3 cm length frequency currently used for many of the larger gadoids. No difference was detected in the age composition or mean length at age for either scheme;

however, 10 percent fewer otoliths were collected in 1 for 1 sampling than 3 for 3. There was an improvement of between 30 and 60 percent in the coefficient of variation of the estimated catch numbers at age using the 1 for 1 compared with the 3 for 3 stratified sampling. For these reasons and other operations considerations, the 1 for 1 stratified random design of sampling appears to be superior.

Clay, Patricia M. (1993). "Fisheries Social Science Gathering: Informal Roundtables on Current Research." Economics Investigation, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, Massachusetts, October, 50 pp.

A roundtable discussion of the uses of social science in the fisheries management process. Topics included nonmarket valuation, comanagement, individual transferable quotas, social impact assessment, and policy formulation.

Clay, Patricia M. (1994). "Social and Cultural Considerations with Regard to Limited Access." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA, October.

The paper considers the issues of equity, lifestyle, and community in regards to limited access management.

Clay, Patricia M. (1998). "Guidelines for Routine Capture Fishery Data Collection." Prepared for the United Nations Food and Agriculture Organization, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA, April.

This report outlines for fisheries managers some of the critical policy questions and management issues, describes performance indicators useful in evaluating policies, and describes general data types required for effective management. This general overview can then serve as the basis for developing specific data collection and analysis programs appropriate to particular nations and regions.

Clement Associates, Inc. (1989). "Shrimp Trawling Requirements" Rulemaking: Initial Technical Review." Report prepared by Clement Associates, Inc., 9300 Lee Highway, Fairfax, Virginia 22031, September 14, 16 pp.

An analysis of the data and analysis underlying the shrimp trawling requirements proposed by NMFS that indicates the technical basis for the rule is not solid and additional analysis and data collection is necessary before trawl time limitations and TED regulations be imposed on the industry.

Clinton, William (1993). Regulatory Planning and Review. Executive Order 12866, Federal Register, 58(190): 51735-51744.

With this executive order, the Federal Government begins a program to reform and make more efficient the regulatory process.

Coan, Atilio L., Jr., Kenneth E. Wallace, and Alan R. Jackson (1992). "Differences in Dolphin Mortality Rates in Night and Day Sets for the U.S. Eastern Tropical Pacific Tuna Purse Seine Fishery." Marine Fisheries Review, 54(2):7-14.

Because dolphins sometimes travel with yellowfin tuna, Thunnus albacares, in the eastern tropical Pacific (ETP), purse seiners use the dolphins to locate and capture tuna schools. During the process of setting the purse seine nets, dolphins often become entangled and drown before they can be released. Data for the U.S. purse seine fleet in the ETP during 1979-88 show that dolphin mortality rates in sets made during the night are higher than mortality rates in sets made during the day. Even with efforts to reduce night set mortality rates through the use of high intensity floodlights, night set mortality rates remain higher. The data are also used to simulate a regulation on the fishery aimed at eliminating night sets and show that dolphin mortality rates would decrease.

Coase, R.H. (1960). "The Problem of Social Cost." The Journal of Law and Economics, 3:1-44.

This paper is concerned with those actions of business firms that have harmful effects on others. The real question is whether A should be allowed to harm B or should B be allowed to harm A with the avoidance of the more serious harm. What answer should be given is not clear unless we know the value of what is obtained as well as the value of what is sacrificed to obtain it. The problem has to be looked at in total and at the margin.

Coase, R.H. (1992). "The Institutional Structure of Production." American Economic Review, 82(4):713-719.

Presentation given on receipt of the 1991 Nobel prize in Economic Sciences.

Cobb, Stephen P., Charles R. Futch, and David K. Camp (1973). "The Rock Shrimp, Sicyonia Brevirostris Stimpson, 1871 (Decapoda, Penaeidae)." Memoirs of the Hourglass Cruises, Vol. III, Part I, February, 38 pp.

Rock shrimp were collected monthly from the west Florida shelf during Project Hourglass. A total of 973 rock shrimp were weighted, measured, sexed, and examined for morphological variation. Ovaries of 463 females were removed and classified and studies of carapace length for males and females were conducted. Rock shrimp is a generalize carnivore feeding primarily on mollusks and crustaceans. Feeding activity is nocturnal and occurs yearlong. No economically important concentrations of rock shrimp were found in the study area, but populations with apparent economic potential have been reported off Cape St. George, Florida, Cape Canaveral, and Isla Contoy, Mexico.

Cochran, William G. (1963). Sampling Techniques, 2<sup>nd</sup> Edition. John Wiley & Sons, Inc.

The purpose of this book is to present a comprehensive account of sampling theory as it has been developed for use in sample surveys, with illustrations to show how the theory is applied in practice and with a supply of exercises to be worked by the student.

Cody, Terry J., Paul C. Hammerschmidt, Gary C. Matlock, C.E. Bryan, Jerry E. Clark, and R. Page Campbell (1989). "Fishery Management Plan for the Shrimp Fishery in Texas Waters. Texas Parks and Wildlife Department, Coastal Fisheries Branch, 4200 Smith School Road, Austin, Texas 78744.

A proposed shrimp fishery management plan for the Texas territorial sea.

Coelli, Tim (1994). A Guide to FRONTIER Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation. Draft Working Paper, Department of Econometrics, University of New England, Armidale, NSW, 2351, Australia, October, 38 pp.

This paper describes a computer program which has been written to provide maximum likelihood estimates of the parameters of a number of stochastic production and cost functions. The stochastic frontier models considered can accommodate (unbalanced) panel data and assume firm effects that are distributed as truncated normal random variables. The two primary model specifications considered in the program are an error components specification with time-varying efficiencies permitted (Battese and Coelli, 1992), which was estimated by FRONTIER Version 2.0, and a model specification in which the firm effects are directly influenced by a number of variables (Battese and Coelli, 1993). The computer program also permits the estimation of many other models which have appeared in the literature through the imposition of simple restrictions. Asymptotic estimates of standard errors are calculated along with individual and mean efficiency estimates.

Coelli, Tim (1996). A Guide to DEAP Version 2.0: A Data Envelopment Analysis (Computer) Program. CEPA Working Paper 96/08, Centre for Efficiency and Productivity Analysis, Department of Econometrics, University of New England, Armidale, NSW, 2351, Australia, 50 pp.

This paper describes a computer program which has been written to conduct data envelopment analyses (DEA) for the purpose of calculating efficiencies in production. The method implemented in the program are based upon the work of Rolf Fare, Shawna Grosskopf, and their associates. Three principle options are available in the computer program. The first involves the standard CRS and VRS DEA models (that involve the calculation of technical and scale efficiencies) which are outlined in Fare, Grosskopf, and Lovell (1994). The second option considers the extension of these models to account for cost and allocative efficiencies. These methods are also outlined in Fare et al. (1994). The third option considers the application of Malmquist DEA methods to panel data to calculate indices of total factor productivity (TFP) change; technological change; technical efficiency change; and scale efficiency change. These latter methods are discussed in Fare, Grosskopf, Norris, and Zhang (1994). All methods are available in either an input or an output orientation (with the exception of the cost efficiencies option).

Coelli, Tim (1996). A Guide to DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program. CEPA Working Paper 96/08, Centre for Efficiency and Productivity Analysis, Department of Econometrics, University of New England, Armidale, NSW, 2351, Australia, 50 pp.

This paper describes a computer program which has been written to conduct data envelopment analyses (DEA) for the purpose of calculating efficiencies in production. The method implemented in the program are based upon the work of Rolf Fare, Shawna Grosskopf, and their associates. Three principle options are available in the computer program. The first involves the standard CRS and VRS DEA models (that involve the calculation of technical and scale efficiencies) which are outlined in Fare, Grosskopf, and Lovell (1994). The second option considers the extension of these models to account for cost and allocative efficiencies. These methods are also outlined in Fare et al. (1994). The third option considers the application of Malmquist DEA methods to panel data to calculate indices of total factor productivity (TFP) change; technological change; technical efficiency change; and scale efficiency change. These latter methods are discussed in Fare, Grosskopf, Norris, and Zhang (1994). All methods are available in either an input or an

output orientation (with the exception of the cost efficiencies option).

Coelli, Tim (1998). A Multi-Stage Methodology for the Solution of Orientated DEA Models. Draft to appear in Operations Research Letters, Centre for Efficiency and Productivity Analysis, Department of Econometrics, University of New England, Armidale, NSW, 2351, Australia, November, 16 pp.

The majority of DEA studies use a two-stage linear programming (LP) process to solve orientated DEA models. There are two significant problems associated with the second stage of this process. The first is that the sum of slacks is maximized rather than minimized and hence will identify not the nearest efficient point but the furthest efficient point. The second problem is that it is not invariant to units of measurement. In this paper, we propose a multi-stage DEA methodology which involves a sequence of radial LP s. We observe that this new approach will identify more representative efficient points and that it is also invariant to units of measurement. The methodology is illustrated using a simple example.

Coggins, Jay S. and John R. Swinton (19??). The Price of Pollution: A Dual Approach to Valuing SO<sub>2</sub> Allowances. Forthcoming J. Environmental Economics and Management.

Under the 1990 Clean Air Act Amendments, a market-based scheme to reduce U.S. sulfur dioxide emissions takes effect in 1995. Indications are that participation in the market will be light and allowance prices will be lower than was once expected. Using an output distance function approach, for Wisconsin coal-burning utility plants we estimate the shadow price of SO<sub>2</sub> abatement, which should approximate the allowance price. The estimated average shadow price is above the prices at which the few observed allowance trades have occurred. Wisconsin s stringent state SO<sub>2</sub> legislation may explain a portion of this divergence.

Coglan, Louisa, Sean Pascoe, and Simon Mardle (199?). DEA Versus Econometric Analysis of Efficiency in Fisheries. Department of Economics, University of Portsmouth, UK.

Economists have often used econometrics to estimate stochastic production frontiers to assess the level of efficiency of individual enterprises. Data Envelopment Analysis (DEA) has been proposed as an alternative approach to measure the relative efficiency of individual enterprises. A key advantage of DEA is that, unlike econometric approaches, it does not require a specific production function to be imposed. In this paper, DEA is used to estimate the relative efficiency of demersal trawlers operating in the English Channel. The results from this analysis are compared to the results of an econometric analysis using the same data. Conclusions about the relative benefits of the approaches are presented. The results suggest that the econometric production frontier approach may result in some efficient boats appearing as inefficient.

Cohen, Maurie J. (1995). Technological Disasters and Natural Resource Damage Assessment: An Evaluation of the Exxon Valdez Oil Spill. Land Economics, 71(1):65-82.

Ex post analysis can enhance assessment of the social costs of technological disasters. This paper employs a market model to evaluate the economic losses of the 1989 Exxon Valdez oil spill on south central Alaska s fisheries. The upper bound of the accident s first year social costs on these resources is \$108 million, approximately 27 percent of exvessel value. Second



year effects may have been as high as \$47 million. More probable estimates of the oil spill's actual social costs are likely less than these amounts. Precise determination of the accident's impacts is constrained by the dynamic interaction of numerous biological and economic variables.

Collie, Jeremy S. and Paul D. Spencer (1994). Modeling Predator-Prey Dynamics in a Fluctuating Environment. Canadian Journal of Fisheries and Aquatic Sciences, 51(12):2665-2672.

Large fluctuations in the abundance of marine fish are revealed in scale deposits from before the twentieth century and are thought to be environmentally induced. We investigate how a fluctuating environment and predation may combine to cause abrupt shifts in fish abundance on decadal time scales. For example, the biomass of Pacific herring (Clupea pallasii) off Vancouver Island appears to be negatively related to sea surface temperature (SST) and the abundance of its predator, Pacific hake (Merluccius productus). We used first-order differential equations to develop a two species, predator-prey model faced with stochastic variability. A nonlinear, predator functional response potentially gives rise to multiple equilibrium abundance levels. Environmental variability was simulated as red noise (variance is a decreasing function of frequency) with a spectrum derived from SST data. Stochastic variations caused the predator-prey abundances to shift between high and low equilibrium levels. Fishing the prey population can precipitate collapses to the low equilibrium level and prolong the time to recovery. When run with actual catches and SST anomalies from 1951 to 1988, the model simulated prey abundances with a pattern similar to the observed herring biomass.

Collins, Elaine V., Maureen Woods, Isobel C. Sheifer, and Janice Beattie (1994). Bibliography of Synthesis Documents on Selected Coastal Ocean Topics. Decision Analysis Series No. 3, NOAA Coastal Ocean Program, Coastal Ocean Office, National Oceanic and Atmospheric Administration, 1315 East West Highway (Sta. 15140), Silver Spring, MD, October.

This bibliography is subdivided into four main topics or sections; ecosystems, coastal water body conditions, natural disasters, and resource management. In the ecosystems section, emphasis is placed on organisms in their environment on the major coastlines of the U.S. In the second section, coastal water body conditions, the environment itself is emphasized. References were found for the Alaskan coast, but none were found for Hawaii. The third section, coastal water body conditions, the environment itself is emphasized. References were found for the Alaskan coast, but none were found for Hawaii. The third section, on natural disasters, emphasizes environmental impacts resulting from natural phenomena. Guidelines, planning and management reports, modeling documents, strategic and restoration plans, and environmental economics related to sustainability are included in the fourth section, resource management. Author, geographic, and subject indices are provided.

Comins, H.N. and M.P. Hassell (1979). "The Dynamics of Optimally Foraging Predators and Parasitoids." Journal of Animal Ecology, 48:335-351.

The paper bridges the gap between optimal foraging models and predator-prey or parasitoid-host population models. The parasitoid optimal foraging model that we derive assumes each individual parasitoid to maximize its rate of encounter with healthy hosts in a patchy environment. The model is used to generate the searching strategy of a population of parasitoids, from which their overall searching efficiency can be calculated. We then explore the

dynamics of a difference equation population model in which the parasitoids forage optimally. The conditions for local stability are derived and some global properties discussed. Although optimal foraging is important to parasitoid reproductive fitness, the resulting dynamics are qualitatively similar to those produced by the model of Hassell & May (1973) in which the parasitoids do not forage optimally but have a fixed aggregation strategy.

Commission of the European Communities (1993). Statistical Study of the Fish and Aquaculture Processing Sector in the European Community, European Review. Directorate-General for Fisheries, Directorate Structures, Cofrepeche, 165, Rue Jean-Jacques Rousseau, F-92138 Issy-Les-Moulineaux Cedex.

This report updates information on the European Communities aquaculture and fishery products processing industry dealing with products for human consumption using a statistical study of the 1982-1991 time period. The study covers all processed products and summarizes 11 national surveys.

Comptroller General (1985). "Early Assessment of Interior's Area-Wide Program for Leasing Offshore Lands." Report to the Chairman, Subcommittee on Oversight and Investigations Committee On Energy and Commerce House of Representatives of the United States, GAO/RCED-85-66, July 15, 102 pp.

This report discusses the impact of recent area-wide sales for leasing offshore lands. The report also discusses the Interior Department's new bid-acceptance procedures for ensuring that it receives fair market value for leased offshore lands and Interior's streamlined presale planning process for providing states and others affected by offshore activities an opportunity to participate in the process.

Conand, Chantal and Maria Byrne (1993). "A Review of Recent Developments in the World Sea Cucumber Fisheries." Marine Fisheries Review, 55(4):1-13.

Sea cucumbers (Holothuridae and Stichopodidae) have been harvested commercially for at least 1,000 years. The world fisheries for sea cucumbers, however, are not well documented and in general are poorly managed. Depending upon the species exploited, there are two processing procedures for the sea cucumber product. Some species are eaten raw, while most commercial species are processed into a dry product called beche-de-mer or trepang. This dry product is exported to a central market such as Hong Kong and then re-exported to the consumers. In this review, recent statistics on the world sea cucumber fisheries, collected from different services, are detailed for each major fishing area. Case studies for each fishing area are also presented. Recent major changes in the Indo-Pacific fishery include the participation of new producer countries, the shift in the species being exploited, and an increase in the Chinese market. The expansion of the largely monospecific temperate North Pacific fisheries is also described. Statistics from Hong Kong, Singapore, Taiwan, and the Food and Agriculture Organization provide valuable information on the producer and importer countries. Particular attention is paid to the reciprocal trade of beche-de-mer between Hong Kong and Singapore. An evaluation of the world sea cucumber landings and beche-de-mer production is presented. Recent developments include an expansion of the Hong Kong market due to increased demand by China, the importance of Indonesia as a major world producer, and an increase in the fisheries of Tropical Pacific nations. This increase is best documented for New Caledonia and Fiji. Ways to improve the access and the reliability of the statistics for the sea cucumber fishery are discussed, as is the potential for management of

artisanal fisheries.

Condrey, Richard E. (198?). "Shrimp Population Models and Management Strategies: Potentials for Enhancing Yields." Draft report, Coastal Fisheries Institute, Center for Wetland Resources, Louisiana State University, Baton Rouge, Louisiana 70803-7503.

The use of models in management of the U.S. Gulf of Mexico shrimp fishery is reviewed and deficiencies discussed. The historical use has been primarily limited to a continuing reevaluation of two narrowly constructed management measures that were designed to provide moderate increases in yield. Areas of major social or ecological concern and areas in which yield can be dramatically enhanced have received little attention. Specific examples discussed include wetland loss, the use of TEDs, and the excessive growth-overfishing that occurs in some states.

Condrey, Richard E., James G. Gosselink, and Harry J. Bennett (1972). "Comparison of the Assimilation of Different Diets By Penaeus setiferus and P. aztecus." Fishery Bulletin, 70(4):1281-1292.

Juvenile penaeid shrimp showed high and comparable assimilation efficiencies (80-85%) on a variety of plant and animal diets. In general assimilation efficiencies for proteins and lipids were consistently high; for carbohydrates, low. Organic assimilation per gram organic weight of white shrimp, Penaeus setiferus, proceeded at 3.7 mg hr<sup>-1</sup> on an axenic diatom and 8.4 mg hr<sup>-1</sup> on an artificial diet. The assimilation efficiency was lower for shrimp feeding on the algal mat coating Spartina alterniflora than on two components of the mat. Feeding mechanisms and probable natural diets are discussed as a basis for further study.

Congress (1996). Sustainable Fisheries Act. An Act, 104<sup>th</sup> Congress of the United States of America, Second Session, Washington, D.C.

An Act to amend the Magnuson Fishery Conservation and Management Act to authorize appropriations, to provide for sustainable fisheries, and for other purposes.

Conklin, James E. and William C. Kolberg (1996). Chaos For the Halibut? Marine Resource Economics, 9(2):159-182.

A generalized method for analyzing stability potential in discrete time renewable resource models subject to market driven harvest is discussed. Two means by which harvest activity can influence dynamical properties of renewable resource models are identified: the growth factor and the market response effect. The growth factor is a systematic influence on stability tied to changes in the position of the bioeconomic equilibrium point along a given open access supply locus. The market response effect involves variation in harvest in response to stock level changes. Enhancing the harvest response by changing the slope of the demand schedule can thrust the model into instability, chaos, and extinction without changing the bioeconomic equilibrium point for the Pacific Halibut Fishery Model based on a modified discrete time version of the traditional Schaefer model. Enhancing harvest response via slope preserving increases in market demand can push the model into instability, chaos, and even extinction. Finally, similar adjustments in market demand may be capable of eliminating instability and chaos rooted in powerful intrinsic growth of the stock.

Conrad, Jon M. (1982). "Management of a Multiple Cohort Fishery: The Hard Clam in Great South Bay." American Journal of Agricultural

Economics, 64(3):463-474.

This paper develops a reasonably general multiple cohort model and derives conditions for optimal harvest and age structure based on a discrete time control problem that maximizes the present value of net revenues subject to recruitment and spawning constraints. The model is applied to the hard clam resource in Great South Bay, that is located on Long Island, New York. The steady state optimum calls for exclusive harvesting of the younger, and more valuable, "littleneck" cohorts; leaving the older, and less valuable, "cherrystone" and "chowder" cohorts to specialize in regeneration.

Conrad, Jon M. (1985). "Residuals Management: Disposal of Sewage Sludge in the New York Bight." Marine Resource Economics, 1(4):321-345.

This paper discusses a problem facing New York and several other coastal cities: how and where they should dispose of the sludge produced in the treatment of municipal and industrial wastewater. A dynamic model of sludge accumulation is constructed that identifies conditions under which it is optimal to cease and switch or dispose simultaneously at both near shore and offshore sites. Environmental conditions in the New York bight are discussed along with incidents occurring during the summer of 1976 that galvanized public concern over the amount and types of contaminants entering the bight. While sludge-related were not a major factor in either incident, the cost of sludge-related degradation, particularly if inner bight fisheries were well managed, is probably sufficient to warrant disposing of sludge at the more distant 106 mile site. It is important to institute ecological and economic monitoring of both the offshore and near shore sites if the role of ocean disposal in residuals management is to be better defined.

Conrad, Jon M. (1987). "The Magnuson Fisheries Conservation and Management Act: An Economic Assessment of the First 10 Years." Marine Fisheries Review, 49(3):3-12.

The Magnuson Fisheries Conservation and Management Act was enacted in 1976 and implemented in 1977. In an analysis of data collected by the National Marine Fisheries Service one observes a significant increase in the landings of fish and shellfish and in nominal and real ex-vessel revenue. The present value of net variable revenues for the 1968-76 period was estimated at \$1.1 billion compared with \$3.8 billion for the 1977-85 period. The increase in net revenues, however, appears to be declining due to the increase in the number of vessels in the U.S. domestic fleet. The time path for net revenues suggests that the industry is headed toward a new (purely domestic) open access equilibrium where revenue equals cost and the imputed value of the resource is driven to zero (rent dissipation). It is well known that open access results in welfare losses to both consumers and the fishing industry. If these welfare losses are to be avoided, the eight regional management councils and the Department of Commerce must adopt policies that will reduce yield in the short run (thereby allowing stocks to increase) and efficiently harvest optimum yield in the long run. Transferable quotas for single species fisheries and transferable effort quotas (rights) in multispecies fisheries are attractive because they encourage efficient (least cost) harvest and afford flexibility in a world where the stocks of individual species are subject to fluctuation. Discussion by Ivar Strand.

Conrad, Jon M. (1993). "Bioeconomic Models of the Fishery." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

A survey on the recent literature on bioeconomics in five sections;

introduction and overview of commercial fishing, an open access model, harvest and effort as control variables, two empirical studies on North Sea herring and Pacific whiting, and contrasting with biological management techniques.

Conrad, Jon M. and Richard Adu-Asamoah (1986). "Single and Multispecies Systems: The Case of Tuna in the Eastern Tropical Atlantic." Journal of Environmental Economics and Management, 13(1):50-68.

The commercial tuna fishery in the Eastern Tropical Atlantic is based on harvests from three species of tuna: Yellowfin, Skipjack, and Bigeye. Two models are developed to examine the bioeconomics of this fishery. In the first model, species are presumed ecologically independent and selectively harvested. In the second model, two of the species (Yellowfin and Skipjack) are assumed to be interspecific competitors and jointly harvested independent of the third species (Bigeye). Data on landings, effort, cost, and revenue are assembled allowing estimates of the bioeconomic parameters for the model where all species are independent and selectively harvested. Open access and bioeconomic equilibria are identified for a combination of cost and discount rates. The pristine, open access, and bioeconomic equilibria are also determined for the multispecies model based on parameters from the single species (independent) models and plausible values for interaction and joint production coefficients. Equilibria are compared, and management policies from a single and multispecies perspective are explored.

Conrad, Jon M. and Colin W. Clark (1987). Natural Resource Economics. Cambridge University Press, Cambridge.

The text deals with resource allocation and optimization, renewable and nonrenewable resources, environmental management, and stochastic resource models in a dynamic context. It is intended to fill the perceived gap between theoretical analysis and empirical applications of that theory using the solution to numerical problems approach.

Conrad, Jon M., Dale Squires, and Jim Kirkley (1984). "Lectures on the Economics of Fisheries Production." NOAA Technical Memorandum NMFS F/NWC-60, U.S. Department of Commerce, National Ocean and Atmospheric Administration, National Marine Fisheries Service, July, 93 pp.

These lectures are an attempt to review the relatively recent advances in dynamic modeling and production theory as they relate to the economic management of single and multiple species fisheries. They will also assess the impediments to applying modern production theory when estimating bioeconomic parameters. The first lecture reviews the relationship between the production function, the growth function, and the yield effort function for the single species fishery and extends these concepts to the multispecies fishery using the multiple output production function. In the second lecture, the early literature on fisheries production is reviewed. The assumptions underlying duality based estimation techniques as they relate to multispecies production are examined in greater detail. The third lecture discusses recent empirical work on the New England trawler fleet.

Conroy, Patricia D. and John R. Poffenberger (1986). "Estimated Impacts of Texas Closure Regulation on Ex-Vessel Prices and Value of Shrimp, 1983 and 1984." NOAA Technical Memorandum NMFS-SEFC-171, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL, February, 16 pp.

The Fishery Conservation Zone (FCZ) off the coast of Texas has been closed to shrimping since 1981 (mid May to mid July) to coincide with the closure of the Texas territorial sea. These areas were closed to increase the size of commercially harvested brown shrimp. The econometric analysis of brown shrimp supply-demand relationships for three shrimp sizes (small: more than 67 tails per pound; medium: 31-67 tails per pound; and large: less than 31 tails per pound) estimated the changes in ex-vessel prices associated with simulated changes in landings. The estimate 0.4 million pound increase in landings due to the FCZ closure resulted in an increase in revenue of \$6.7 million for May 1983 through April 1984. Preliminary estimates of the closure effect for May-August 1984 show a decrease in landings of 0.8 million pounds with an increase in revenue of \$5.8 million. Changes in landings and value are due to the estimated decrease in catch of lower valued small shrimp with an increase in higher valued medium and large shrimp. The combined closure of the Texas territorial sea and the Texas FCZ in 1983 was estimated to have increased brown shrimp landings by 3.5 million pounds, with a resulting increase in revenue of \$31.7 million for May 1983 through April 1984.

Considine, T.J., T.D. Mount, and T.J. Tyrrell (1980). "The Application of Linear Logit Models to Input Demand Studies: A More General Formulation." College of Agriculture and Life Sciences at Cornell and the Agricultural Experiment Station at the University of Rhode Island Contribution #1970.

Linear logit models have been criticized by t.H. Oum (1979) on the grounds that they imply rigid a priori restrictions of the cross-price elasticities and on the elasticities of substitution. The purpose of this paper is to show that Oum's results are attributed solely to the restrictive model specifications identified by the author and not to the analytical properties of linear logit models. A more general formulation of a multinomial logit model for cost shares is presented, and with this specification, the price elasticities and elasticities of substitution do not depend on the selection of the base mode. Furthermore, predicted expenditures are always positive. In addition, the adding up properties that are characteristic of a multinomial problem are automatically satisfied. The model also provides considerable flexibility since the inclusion of noneconomic explanatory variables does not affect the economic properties of the model.

Coogan, Colleen (1995). Incidental Take Statement. Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL, December, 3 pp.

Incidental take level and terms and conditions necessary to minimize and monitor takes in the swordfish longline fishery are established.

Coogan, Colleen (1996). Incidental Take Statement. Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL, December, 3 pp.

Incidental take level and terms and conditions necessary to minimize and monitor takes in the drift gillnet fisheries are established.

Cook, B.A. (1988). "Discount Effects and Canada's PACIFIC Halibut Fishery." Marine Resource Economics, 5(1):71-77.

In a recent edition of this journal, we undertook a static bioeconomic analysis of Canada's Pacific halibut fishery, and optimal harvesting levels were established according to different optimizing criteria, including the

maximization of the sum of inframarginal and resource rents, the maximization of the social surplus, and the maximization of resource rent. This paper extends the analysis to a dynamic framework.

Cook, B.A. and Parzival Copes (1987). "Optimal Levels for Canada's Pacific Halibut Catch." Marine Resource Economics, 4(1):45-61.

The exclusion from U.S. waters since 1981 has greatly reduced the harvest potential for Canada's Pacific halibut fleet, making it particularly important that halibut resources in the Canadian zone be exploited at optimal levels. This paper provides a bioeconomic analysis of the joint-stock fishery in Area 2 convention waters. Using Canadian cost and revenue relationships, optimal harvesting levels are established according to three different criteria, including not only the maximization of resource rent, but also the maximization of a more inclusive social surplus and the maximization of benefits for the harvesting sector. Estimates are made of halibut demand, as well as yield-effort and cost-effort relationships to calculate the various optima. The implications of this analysis for a Canadian fleet confined to the Canadian 200 mile zone of Area 2 are then discussed.

Cook, Harry L. and M. Alice Murphy (1971). "Early Development Stages of the Brown Shrimp, Penaeus aztecus Ives, Reared in the Laboratory." Fishery Bulletin, 69(1):223-239.

The larval and first postlarval stages of the brown shrimp, Penaeus aztecus Ives, reared from eggs spawned in the laboratory, as well as the eggs themselves, are described and illustrated. The larvae and first postlarva are compared with those of the pink shrimp, P. duorarum Burkenroad, and white shrimp, P. setiferus (Linn.).

Cook, Jonathan and Ali Hashim (1994). "Fiscal Alternatives for the Fisheries Sector." Draft, EPCS Economic Paper No. 4, Third Fisheries Project, Fisheries Economics and Statistics Program, Economic Planning and Coordination Section, Ministry of Fisheries and Agriculture, Male, Republic of Maldives, November, 33 pp.

This study reviews the Maldives' overall fiscal situation and assesses the likely contribution of the fisheries sector in the medium term. Options for increasing revenues are discussed. The main recommendations are (1) the current exemption of fishing vessels from paying the vessel registration fee should be eliminated; (2) The 120 day rule should likewise be eliminated. A parallel regulation to ensure continued provision of landings data to the island clerks would be required, with loss of the fishing license imposed as a sanction in the event of non-reporting; (3) MIFCO currently provides about 40 percent of the catching sector's fuel supplies. The company has recently been granted exemption from fuel excise. Since this will provide an unfair advantage compared to private sector suppliers, it is suggested that the exemption be extended to all fuel supplies to the fishing industry; (4) While an export tax on processed fish represents a straight forward method of revenue generation it is not recommended, based on both economic efficiency and social criteria. Overall, the government's options with respect to increasing revenues from the sector appear to be limited.

Cooke, Larry (1985). "Introduction." Chapter 1 in Estimates of Undiscovered, Economically Recoverable Oil and Gas Resources for the Outer Continental Shelf as of July, 1984. U.S. Department of Interior, Minerals Management Service, Washington, D.C., pp. 1-19.

This report presents estimates of the undiscovered economically

recoverable oil and gas resources for Federal offshore areas and describes the methodology used to derive them.

Cooper, Christopher (1991). "Shrimpers Search for Inexpensive and Simple Fish Excluder." National Fisherman, January:40-43.

Shrimpers on the East and Gulf coasts have been given a three year breather. They have until at least 1994 to develop a way to reduce finfish bycatch.

Cooter, Robert and Elhanan Helpman (1974). "Optimal Income Taxation for Transfer Payments Under Different Social Welfare Criteria." The Quarterly Journal of Economics, (Nov):656-670.

The distributive branch of government must calculate the income tax for optimal redistribution by maximizing a social welfare function constrained by technology and the announcement effects of the tax. A partial equilibrium analysis that takes into account the announcement effect upon work effort shows that the marginal tax rate that is optimal for any particular social welfare function increases with inequality in the distribution of productive skill. The ranking of social welfare functions by size of optimal marginal tax rate was Rawls > Nash > Bentham > Elitist, regardless of the distribution of productive skill or the elasticity of substitution. The inverse of this ranking did not always correspond to the ranking of social welfare functions by the size of the Gini coefficient. The social welfare function implicit in actual U.S. government transfer activity under Musgrave's best assumption and the intermediate ability distribution was democratic, as predicted by the median rule.

Copes, P. (1970). "The Backward-Bending Supply Curve of the Fishing Industry." Scottish Journal of Political Economy, 17(1):69-77.

The economic theory of fisheries has emphasized the common property nature of the fishery resource that generally leads to an over exploitation and dissipation of the rent that the resource could have yielded. The literature stresses on the supply side the relationship of output to the amount of fishing effort and hence to cost. But the consequences of these and other relationships in terms of conventional supply and demand analysis do not appear to have been treated exhaustively. This article demonstrates that the long run supply curve of a fishery may be expected to exhibit a negative slope for higher price ranges. A few of the consequences of this phenomenon are explored.

Copes, P. (1972) "Factor Rents, Sole Ownership, and the Optimum Levels of Fisheries Exploitation." The Manchester School, 40:145-163.

Economic theory as applied to common property resources such as fisheries holds that rents will be dissipated resulting in losses to society using maximum net economic yield as a measurement criteria. This article applies conventional welfare maximization to balance the considerations of resource rent with that of competing social benefits that may be derived from the exploitation of a fishery; focusing on consumer and producer surplus accruing to factors other than the fishery resource itself.

Copes, P. (1986). "A Critical Review of the Individual Quota as a Device in Fisheries Management." Land Economics, 62(3), pp. 278-291.

The author presents many sound arguments against the use of individual



quotas as a fisheries management instrument citing the results of actual applications. Individual quotas are not useful in the fisheries "rationalization" process unless they are transferable. However individual transferable quotas have unsightly equity and income reallocation effects. The question that remains unanswered in the paper is whether ITQ's are preferable to the common property or open access fishery scenario.

Copes, Parzival (1997). "Social Impacts of Fisheries Management Regimes Based on Individual Quotas." In Gisli Palsson and Guthrun Petursdottir (eds.), Social Implications of Quota Systems in Fisheries, 61-90. Proceedings of the Workshop on Social Implications of Quota Systems in fisheries, Vestman Islands, Iceland, May 1996, Copenhagen: Nordic Council of Ministers.

The objective of this paper is to present an analytical description and classification of observable impacts that individual quota (IQ) regimes may have on social conditions affecting fishers and fishing communities. The pursuit of greater net benefits to society that is the purported purpose of IQ regimes, suggest compatibility with a general goal of greater social welfare. However, there are a number of reasons why IQ regimes may fail in this regard and instead may be the cause of adverse impacts on social welfare. Three reasons are conceptual exclusion, conventional disregard, and injection of negative externalities. In choosing a fisheries management system, the challenge now is to reach consensus on a multiobjective decision-making process which will give agreed weights in trading off measures of economic efficiency and social desirability that need to be taken into account.

Corbett, Michael G. (1970). "Machine for Separating Northern Shrimp, Pandalus borealis, from Fish and Trash in the Catch." Fishery Industrial Research, 6(2):53-62.

Because of the labor required in separating northern shrimp from the unwanted components of the catch that are taken along with it, this valuable resource in the Gulf of Maine is not harvested to the extend possible. Consequently, a machine was developed to separate the shrimp from the bulk of groundfish and other species taken in trawl catches during exploratory and commercial fishing. Its use eliminates the laborious task of sorting the catch by hand. Yet the separator recovers about 95 percent of the shrimp that are fed into it, while eliminating about 90 percent of the trash.

Corkett, C.J. (1997). Managing the Fisheries By Social Engineering: A Re-Evaluation of the Methods of Stock Assessment. J. Appl. Ichthyol, 13:159-170.

This paper criticizes the management of the world s fisheries that are based upon the use of positive predictions derived from fisheries models, an instrumentalist approach that is illustrated by the practical application of Graham-Schaefer models constructed according to the verificationist s view of science. It is proposed that Karl Popper s technological social science, designed to solve problems of social tradition of which overfishing is an example would fill this lacuna. This technology would employ the services of a social engineer, a modern fisheries manager, who should use the pre-scientific method of trial and error and the negative guidance of bold pattern predications to re-evacuate the institutions of fisheries management.

Cornes, Richard and Todd Sandler (1983). "On Commons and Tragedies." American Economic Review, 73(4):787-792.

This paper extends the study of the commons to include a nonzero

conjectural variation regarding what one exploiter thinks will be the effect of his exploitation on the exploitation efforts of others. The resulting analysis indicates that the degree of over- or underexploitation of the commons depends on the particular conjecture and the underlying technology. For a representative commons model we show that consistent conjectures, those that conform with reality, cannot characterize standard Nash equilibria. Additionally, non-Nash behavior is shown to be inconsistent in all but one case, a case corresponding to zero profits even in the instance of a finite number of firms.

Cornwell, Christopher and Peter Schmidt (1996). Production Frontiers and Efficiency Measurement. Chapter 32 in The Econometrics of Panel Data: A Handbook of the Theory with Applications, 2<sup>nd</sup> Revised Edition, Dordrecht: Kluwer Academic Publishers.

This chapter concentrates on the estimation of production frontiers and the measurement of technical inefficiency relative to them.

Costanza, Robert and Stephen C. Farber (1986). "The Economic Valuation and Management of Wetlands." Presented at the National Wetland Symposium on Mitigation of Impacts and Losses, October 8-10, International Hotel, New Orleans, LA.

A willingness-to-pay and energy analysis valuation techniques were used to estimate the value of an acre of Louisiana wetlands. It seems clear that no amount of effort will produce very precise estimates of wetland values and we suspect this is also the case for several other classes of natural resources. One school of thought holds that until precise estimates of wetland values are available we should not attempt to evaluate these resources at all, or should use only the market price. A second school holds that wetlands are priceless, their real value can never be even imprecisely quantified and we should therefore spare no expense in preserving them. We contend that there are rational methods for dealing with this imprecision and uncertainty without taking either of these extreme positions. We elaborate a Wetlands Trust Fund system that would solve most of the problems.

Coste, Sharon (1995). "News Release." South Atlantic Fishery Management Council, 1 Southpark Circle, Suite 306, Charleston, S.C., February, 16.

Update on issues affecting the south Atlantic fisheries. Live Rock Aquaculture permit system approved by Council. Wreckfish TAC status quo maintained. Rock shrimp final action deferred.

Cox, D.R. (1970). The Analysis of Binary Data, Chapman and Hall, London.

This monograph concerns the analysis of binary or quantal data, i.e. data in which an observation takes one of two possible forms, e.g. success or failure. The central problem is to study how the probability of success depends on explanatory variables and groupings of the material.

Coxhead, Ian and Sisira Jayasuriya (1995). Trade and Tax Policy Reform and the Environment: The Economics of Soil Erosion in Developing Countries. American Journal of Agricultural Economics, 77(3):631-644.

The widespread view that trade reform is bad for the environment has rarely been subjected to close scrutiny. In a developing country model we trace general equilibrium impacts of tax and tariff policy changes on upland resource allocation and, by implication, on the rate of erosion. Our analysis

highlights the role of domestic market linkages as conduits between lowland and upland economies. When economy wide effects are taken into account, indirect policies such as tariff reforms may in some cases provide better means for reducing upland erosion than would direct environmental policies.

Crabbe, Philippe J. (1983). "The Contribution of L.C. Gray to the Economic Theory of Exhaustible Natural Resources and Its Roots in the History of Economic Thought." Journal of Environmental Economics and Management 10:195-220.

This paper opens with an assessment of natural resources economics up to 1913-14 when Gray published two pioneering articles in natural resource economics (Part I). an in depth study of Gray, weighing his contribution to the microeconomic theory of the mine and the macroeconomic theory of conservation against current literature, constitutes the main body of the paper (Part II). Gray and Hotelling's contributions to the theory of the mine are compared (Part III). The paper concludes with a comparison drawn between the author's findings and the scant attention previously paid to Gray's contributions to natural resource economics.

Crabbe, Philippe J. and Ngo Van Long (1989). "Optimal Forest Rotation under Monopoly and Competition." Journal of Environmental Economics and Management, 17:54-65.

The two main propositions of the paper establish sufficient conditions for the optimal rotation to be invariant to market structure whether monopolistic, competitive, or maximizing the temporal sum of consumer's surpluses. A corollary to the second proposition yields sufficient conditions for the monopolistic rotation to be actually longer than the competitive one.

Cragg, John G. (1971). "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods." Econometrica, 39(5):829-844.

Several models for limited dependent variables are examined. Estimation in and discrimination among the various models are considered, followed by a small sampling experiment into the procedures and an example of their application.

Cramer, Deborah (1995). "Troubled Waters." Atlantic Monthly, June: 22-26.

Throughout the world fisheries have been ravaged to near extinction. A look at one of the most badly depleted sites: to save it, thousands of fishermen will have to lose their jobs.

Crean, Kevin and David Symes (1994). "Social Objectives, Social Research and the Recalibration of Management Policies in Fisheries: The Case of the European Union." C.M. 1994/T:21, International Council for the Exploration of the Seas, Annual Science Conference, St. John's Newfoundland, Canada, September.

Within most fisheries policies, social objectives have hitherto been unstated, non-specific or unprioritized. The policies have, in effect, been driven by conservation and economically orientated goals. Trends in the North Atlantic fisheries have necessitated the down scaling of fishing effort and the schemes for reducing fishing capacity carry profound implications for the social welfare of fishing communities and fishery dependent regions. Within the European Union's Common Fisheries Policy, serious consideration is now

being given to the formulation of social objectives. A key question is whether those objectives should be internalized within the fisheries management strategies or remain externalized and devolved to other policy sectors (social policy, regional policy, etc.). The paper explores the scope for incorporating social objectives in alternative management strategies and develops an agenda for policy related social science research. It draws upon the proceedings of an European Union funded international workshop held in Brussels in May, 1994.

Criddle, Keith R., and Arthur M. Havenner (1989). "Forecasting Halibut Biomass Using System Theoretic Time-Series Methods." American Journal of Agricultural Economics, (May):422-431.

A new procedure introduced by Masanao Aoki uses the ideas of linear systems theory to identify and estimate time-series models. A slightly modified version of this procedure is used to forecast halibut biomass in total and by regulatory area and subarea, and the out-of-sample forecasts are evaluated for eight years. All models produce highly accurate forecasts of biomass, with errors well within the bounds required for setting catch limits in the following year.

Cronin, Francis J. (1982). Valuing Nonmarket Goods Through Contingent Markets. Prepared for the U.S. Environmental Protection Agency by Battelle, Pacific Northwest Laboratory.

To estimate the value of public good externalities and thus determine their efficient levels of production, several researchers have recommended the use of interview techniques. In fact, contingent market valuations of externalities have recently been employed in studies of recreational activity and visibility. Furthermore, because of the limitations inherent in other techniques and society's increased concern with allocation efficiency, contingent market valuation is likely to become an important tool in determining the types and levels of public goods produced.

Despite the recent spate of studies employing contingent markets, uncertainties remain regarding the existence and impacts of biases often associated with this technique. Included among these are hypothetical bias, strategic bias, information bias, and interviewer bias. If the results of contingent market valuation are to be credible, the uncertainties surrounding these biases must be resolved. If no biases exist, no actions need be taken; if biases do exist, however, methods to mitigate their impacts or to estimate their influences must be developed.

This paper estimates the extent and significance of three biases associated with contingent market analysis - strategic bias, information bias, and interviewer bias. The contingent market analyzed is that for improved water quality. The values households place on improved water quality are obtained from a random sample of almost 2,000 households in Washington, D.C. metropolitan reach of the Potomac River. Thus, the analysis also provides information necessary to select the optimal level of water quality.

The findings indicate that the value attached to improved water quality is substantially higher than that estimated in prior studies. Perhaps of more general importance, the findings support the hypothesis that respondents engage in strategic behavior. Respondents who were given incentives to bias their revealed value downward were found to have mean bids significantly lower than households who were given incentives to bias their revealed values upward. In addition, statistically significant evidence supporting the existence of both information and interviewer bias was found.

Crookshank, Steven L. (1991). "The Economics of Wetland Valuation." Report prepared for the National Marine Fisheries Service.

This report describes the basic concepts of economics and the tools used to answer the question of how much wetlands should be preserved and what is the value of the land in its natural state, and the methods used to estimate demand curves for wetlands. These methods are then divided into those that adhere to economic theory and those that were developed outside of the paradigm of economics.

Cropper, Maureen L. (1988). "A Note on the Extinction of Renewable Resources." Journal of Environmental Economics and Management, 15:64-70.

This paper presents two sets of conditions under which a sole owner of a renewable resource stock who maximizes a nonlinear benefit function would find it more profitable to harvest the stock to extinction than follow a continuous harvesting strategy. When the minimum viable resource stock is positive, extinction is optimal as long as the initial resource stock is sufficiently small, regardless of the discount rate. When the minimum viable resource stock is zero and the discount rate exceeds the growth potential of the species extinction is optimal for sufficiently small initial stocks.

Cropper, Maureen L. and Wallace E. Oates (1992). "Environmental Economics: A Survey." Journal of Economic Literature, 30(2):675-740.

The evolution of environmental policy has inevitably brought economic issues to the fore. Our survey of environmental economics is structured with an eye toward its policy potential. For this purpose, we have tried to distinguish between environmental economics that deals with (1) the regulation of polluting activities and (2) the valuation of environmental amenities and natural resource economics that deals with the intertemporal allocation of renewable and nonrenewable resources.

Crothers, Grant T. (1986). "Individual Transferable Quotas: the New Zealand Experience." Draft Report, Ministry of Agriculture and Fisheries, Wellington, New Zealand.

A historical overview of fisheries management in New Zealand with special emphasis on individual transferable quotas. The introduction of ITQ established long term economic principles which have created a new fisheries management environment. Within certain conservation constraints, allocation of fisheries resources is now largely dictated by market forces. To appreciate New Zealand's market oriented management approach, it is necessary to view the commercial fishery in its physical and historical context.

Crouch, Ben M. (1989). "Mexican Shrimp, Texas Shrimpers, and Maritime Conflict: The Creation of a White Collar Crime." Deviant Behavior, 10:211-232.

Though not its specific intent, the 1981 amendment of the Lacey Act transformed a traditional practice among south Texas shrimpers--fishing in Mexican waters--into a violation of federal maritime law. Prior to the amendment this practice was overlooked by U.S. authorities and only sporadically controlled by Mexican authorities. Federal strategies for Lacey Act enforcement in the northern Gulf of Mexico and shrimper reactions to them led to an escalation of conflict between U.S. fishermen and authorities. Drawing on official documents and extensive interviews with both shrimpers and federal agents, the analysis examines federal authority and shrimper interaction over time and applies Turk's theory of normative-legal conflict to explain the course of that interaction.

Crouse, Deborah T., Larry B. Crowder, and Hal Caswell (1987). A Stage-Based Population Model for Loggerhead Sea Turtles and Implications for Conservation. Ecology, 68(5):1412-1423.

Management of many species is currently based on an inadequate understanding of their population dynamics. Lack of age specific demographic information particularly for long lived iteroparous species, has impeded development of useful models. We use a Lefkovich stage class matrix model, based on a preliminary life table developed by Frazer (1983), to point to interim management measures and to identify those data most critical to refining our knowledge about the population dynamics of threatened loggerhead sea turtles (Caretta caretta). Population projections are used to examine the sensitivity of Frazer's life table to variations in parameter estimates as well as the likely response of the population to various management alternatives. Current management practices appear to be focused on the least responsive life stage, eggs on nesting beaches. Alternative protection efforts for juvenile loggerheads, such as using turtle excluder devices (TEDs) may be far more effective.

Crowley, Thomas J. (1996). "Remembrance of Things Past: Greenhouse Lessons from the Geological Record." Consequences, 2(1):3-12.

Were the earth to warm by the 2° C given in the middle range of the consensus projections of the Intergovernmental Panel on Climate Change, the mean surface temperature would climb to higher values than any known in the last two million years. Were the amount of carbon dioxide in the air to double, the surface temperatures would rise even higher. We have now consumed about 5 percent of the total reservoir of fossil fuels, predominantly coal, that is still in the ground. Were we to burn all or most of what remains, the carbon dioxide released to the air could drive global surface temperatures to levels last known about 100 million years ago, at the time of the dinosaurs. While questions remain regarding possible, ameliorating feedbacks from other elements of the climate system, all that is known from the record of the past confirms a direct connection between greenhouse gases and surface temperature.

Crutchfield, James A. (1956). "Common Property Resources and Factor Allocation." Canadian Journal of Economics and Political Science, 22(3):292-300.

Two recent articles by Gordon and Scott present an interesting analysis of the conditions for economic maximization in a renewable resource industry the primary raw material for which is drawn from the public domain. While their criticism of the concepts that now govern fishery conservation programs will be generally accepted among the handful of economists dealing with the fishing industry, some aspects of the problem call for additional consideration. In this paper I should like to elaborate and modify the general outlines of the analysis, largely in terms of a specific and important case: the Pacific halibut fishery.

Crutchfield, James A. (1961). "An Economic Evaluation of Alternative Methods of Fishery Regulation." Journal of Law and Economics, 4:131-43.

The time is ripe to take a careful look at our techniques of fishery management from the standpoint of their economic effects. Accepting without further inquiry the fact that rational utilization of the major Pacific Coast fish populations requires limitation of fishing mortality, let us turn to two equally significant questions: how can this limitation of catch be made effective, and which of the alternative methods will minimize the long run

cost of any given level of output selected?

Crutchfield, James A. (1973). "Economic and Political Objectives in Fishery Management. Trans. Am. Fish. Soc., 102(2):481-491.

On the ground that no discussion of objectives is meaningful except in terms of their inherent social goals and of our actual capacity to achieve them, this paper is somewhat broader in coverage than its title suggests. Section II reviews the changes in attitude toward the objectives of fishery management over the past decade and indicates the need for further development in this critical area. The third section evaluates briefly recent extensions of the bioeconomic theory of fishing under open entry and under institutionally constrained conditions. The final section deals with changes in the political and administrative environment, with particular reference to modification of objectives and of management techniques in specific programs.

Crutchfield, James A. (1979). "Economic and Social Implications of the Main Policy Alternatives for Controlling Fishing Effort." J. Fish. Res. Board Can., 36:742-752.

Discussion of the need for economic rationalization has led to increasing interest in alternative strategies to control fishing effort in efficient ways. Three basic alternatives are considered: taxation, control of fishing inputs ("limited entry"), and direct limitation of output through individual fisherman quotas. Each is analyzed in terms of specified elements of economic efficiency, distribution effects, freedom to choose fishing methods and strategies, and administrative feasibility. It is noted that in practice all would be used in combination with other direct measures to assure flexible control over fishing mortality. A number of common objections to economic rationalization of open access fisheries (e.g. creation of monopoly power, unemployment, failure to reduce consumer prices, and nonmonetary values associated with fishing) are analyzed and rejected as largely invalid. While the inherent short-term instability of commercial fishing and data problems preclude any "maximizing" model of a rationalized fishery, the prospects for workable programs leading to improved economic performance without adverse societal impacts are excellent.

Crutchfield, J.A. and Giulio Pontecorvo (1969). The Pacific Salmon Fisheries, A Study of Irrational Conservation. Resources for the Future, Johns Hopkins Press, Baltimore, Maryland.

This book demonstrates the consequences of open access and irrational conservation, develops a model that can be used in other case studies, and sets the framework for control of access and for the establishment of effective conservation rules and efficient economic measures.

Crutchfield, J.A. and A. Zellner (1961). "Economic Aspects of the Pacific Halibut Fishery." Fishery Industrial Research, Vol 1., No. 1, Washington D.C.: U.S. Department of Interior. 173 p.

Under international regulation by the Canadian and United States governments, the Pacific halibut fishery, that once faced depletion, has been restored to a high level of productivity. Although the stocks of halibut now are adequately protected, economic weaknesses in the fishery prompted the study reported here that discusses the basic theory of the regulation, analyzes its economic effects, and presents the conclusions drawn from the analysis and their implications for public policy.

Crutchfield, Stephen R. (1986). "Personal Computer Simulations of Two

New England Trawl Fisheries." Fisheries Research, 4:157-165.

This paper outlines the basic components of two personal computer based bioeconomic simulators for New England otter trawlers and presents selective results illustrating their use for policy analysis. It has proved difficult to monitor the economic status of commercial fisheries because of technical, bureaucratic and cost considerations associated with survey procedures, and the difficulty of timely acquisition of biological and harvest data. The author has developed an alternative approach that combines information from various data bases, including periodic surveys, and integrates them in a budgeting or economic engineering approach. The result of these adaptations is a tool useful for extension education as well as for research policy evaluation.

Crutchfield, Stephen R. (1986). "The Off-Farm Impacts of Agricultural Runoff on Commercial Fisheries." Report prepared for presentation at the Annual Meetings of the Western Economic Association, Vancouver, July, 43 pp.

To date, little empirical or theoretical work has been done on the external impact of agricultural activities on marine commercial fisheries. In part, this has been due to the difficulty of establishing quantifiable links between the two sectors. In this paper, we present a preliminary analysis of the effects of agricultural nonpoint source pollution on commercial fishing, an indication of the magnitude of the problem, and a conceptual framework with which to address this issue.

Crutchfield, Stephen R. (1986). "U.S. Demand for Selected Groundfish Products, 1967-80: Comment." American Journal of Agricultural Economics, 68(4):1018-1020.

Criticisms of Tsoa, Schrank, and Roy (1982) paper on groundfish demand.

Crutchfield, Stephen R. (1987). "Development and Application of Financial Simulators for the Fishing Industry." Computers and Electronics in Agriculture, 1:309-319.

This paper outlines the basic components of the vessel simulator for otter trawlers and presents selective results illustrating its use for policy analysis. It has proven difficult to monitor economic status of commercial fisheries because of technical, bureaucratic, and cost considerations associated with survey procedures and the difficulty of timely acquisition of biological and harvest data. The author has developed an alternative approach that combines information from various data bases, including periodic surveys, and integrates them in a budgeting or 'economic engineering' approach. The result of these adaptations is a tool useful for extension education as well as for research policy evaluation. As an example the simulation program is used to evaluate the economic performance of the New England otter trawl fishing fleet during the period after the 200 mile limit was imposed. Other applications are suggested for financial advisors and investors.

Crutchfield, Stephen R. and John M. Gates (198?). "The Impact of Extended Fisheries Jurisdiction on the New England Otter Trawl Fleet." Draft Report, Department of Resource Economics, University of Rhode Island, Kingston, RI.

Prior to the enactment of the Fisheries Conservation and Management Act of 1976, it was widely anticipated that extension of fisheries jurisdiction to 200 miles by the United States would result in substantial economic benefit to



the domestic fishing industry. This paper examines the economic consequences of extended jurisdiction on the New England otter trawl fleet. The traditional analyses of exploited fisheries show that in the absence of controls on entry into the domestic fishery exclusion of foreign fleets will only yield temporary economic surpluses as rents will eventually be dissipated by additional domestic fishing effort. Using a simulation program for this fishery, revenues and costs for representative vessels from four major New England ports from 1976 to 1982 are calculated, and net economic returns to owners, captains, and crew are estimated. For three of the four ports considered, the estimated real economic surplus for the typical vessel peaked in 1977-78 and declined dramatically through 1982. While this result is consistent with rent dissipation through overfishing, other factors indicate that this decline in economic surplus may be due to exogenous factors.

Crutchfield, Stephen R. and John M. Gates (1985). "The Impact of Extended Fisheries Jurisdiction on the New England Otter Trawl Fleet." Marine Resource Economics, 2(2):153-173.

During the introduction of the Magnuson Fisheries Conservation and Management Act (MFCMA) of 1976 it was widely anticipated that extension of fishery jurisdiction to 200 miles by the United States would result in substantial economic benefits to the domestic fishing industry. The traditional analyses of exploited fisheries show that in the absence of controls on entry into the domestic fishery, exclusion of foreign fleets will only yield temporary economic rents which will eventually be dissipated by additional domestic fishing effort. This paper examines post-MFCMA trends for the New England Otter Trawl fleet to determine the extent to which this hypothesis holds. By using a simulation program for this fishery, revenues and costs for representative vessels from four major New England ports from 1976 to 1982 were calculated and factor rents to owners, captains, and crew were estimated. For three of the four ports considered, the estimated real economic surplus for the typical vessel peaked in 1977-1978 and declined dramatically through 1982. While this finding indicates that some of the potential rents from the fishery may have been dissipated by a substantial increase in fleet size, other indicators show that this decline in economic surplus may have been due to exogenous factors and not rent dissipation as predicted by standard models.

Cumberland, John H. (1987). "Need Economic Development be Hazardous to the Health of the Chesapeake Bay?" Marine Resource Economics, 4:81-93.

This paper adds environmental and mass balance relationships to an economic model to explore the welfare implications of alternative patterns of regional development. It concludes that improvements in welfare can be achieved by selecting those types of economic activity that yield high ratios of economic benefit per unit of pollution generated. Methods are examined for achieving selectivity in designing economic development programs to capture the benefits of development while protecting environmental resources.

Cummins, Robert C., Jr. and Albert C. Jones (1973). "Distribution of Commercial Shrimp off the Northeastern Coast of South American." Marine Fisheries Review, 35(3-4):31-35.

A report on the RV Oregon II survey of the shrimp fishing grounds off the coasts of Guyana, Surinam, and French Guiana in June and July of 1972.

Cummings, N.J. and T.W. Chewning (1986). "Recent Catch and Catch per Unit of Effort of the Gulf of Mexico Red Snapper and Grouper

Fisheries." National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL, March, 36 pp.

This report provides 1) nominal commercial landings by U.S. fishermen of red snapper and groupers (groupers are unclassified as to species in the reporting statistics except for warsaw grouper (*E. nigritus*) and jewfish (*E. itajara*) from the Gulf of Mexico for 1962-1985, 2) estimates of catches of red snapper, red grouper, gag grouper, and black grouper by U.S. recreational fishermen for 1978-1985, and 3) results of a preliminary CPUE analysis of daily fishing logs of recreational charterboats catching red snapper, red grouper, gag grouper, and black grouper.

Cummings, R.G., D.S. Brookshire, W.D. Schulze, and D.L. Coursey (1984). "Valuing Environmental Goods: A State of the Arts Assessment of the Contingent Valuation Method." USEPA research project #CR-811077-01-0.

This report summarizes a larger work by the authors that has as its focus an assessment of the state of the art of the Contingent Valuation Method.

Cunningham, Jeffrey J. (1986). "Status of the Developing Fresh Yellowfin Tuna Industry in the Southeast Region, 1980-85." Draft report, National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Blvd., St. Petersburg, FL, 7 pp.

An assessment of the yellowfin tuna fishery in the southeastern United States for the 1980-85 time period. Two major factors explaining the rise in yellowfin tuna production are the increased demand for sashimi and sushi in this country and falling rates of return in alternative opportunities such as swordfish longlining.

Cunningham, Stephen (1993). "Fishermen's Incomes and Fisheries Management." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

The improvement of fishermen's income is one objective of fishery management systems especially in developing countries. Yet, it is difficult to find cases where such an objective has been attained. The purpose of this paper is to consider the reasons for the widespread failure to achieve a sustainable improvement in fishermen's incomes and to make policy proposals designed to improve the chances of achieving this goal in the future. The conclusions reached seem likely to be especially relevant to developing countries, but may also apply to developed countries with regions that are dependent on fishing.

Cunningham, Stephen (1994). "Fishermen's Incomes and Fisheries Management." Marine Resource Economics, 9(3):241-252.

The improvement of fishermen's income is often a central objective of fisheries management programs, especially in developing countries. This paper considers the determinants of fishermen's incomes and discusses the way in which different management methods may be expected to affect incomes. Stress is laid upon the difference between wealth and income. It is argued that many management measures are likely to have a significant effect on wealth but little, if any, on income. In designing management systems which have income improvement as a goal, care needs therefore to be taken if a sustainable

improvement in incomes is to be achieved rather than a, perhaps unintended, wealth redistribution.

Currie, John Martin, Andrew Schmitz (1971). "The Concept of Economic Surplus and Its Use in Economic Analysis." The Economic Journal, 81(324):741-799.

Over the years considerable discussion has been directed towards making the economic surplus concept as precise as possible. The first part of this paper summarizes the major theoretical developments that have taken place since the concept was first suggested. The second part considers some of the more significant applications of the concept of economic surplus. Finally, the reasons for the controversy surrounding this concept are discussed.

Curtis, Rita (1997). The Effect of Aggregation in Fishery Supply Models. Draft, Department of Agricultural Economics, University of Maryland, College Park, Maryland, August, 22 pp.

Three assumptions in fisheries economics may give rise to misleading estimates of supply; aggregate fishing effort, single species analyses of multispecies fisheries, and aggregating fishing days to the trip level. This paper focuses on the third assumption using Hawaii's multispecies pelagic longline fishery as an empirical example. Using a revenue function approach, aggregation consistency is tested and rejected for all trip classifications. Hence a policy maker relying on results generated from the trip level model would draw the erroneous conclusion that economic factors do not influence production, that production is strictly biologically determined.

Curtis, Rita (1998). The Effect of Temporal Aggregation in Fishery Production Models. Draft, Department of Agricultural Economics, University of Maryland, College Park, Maryland, August, 28 pp.

Aggregation theory is reviewed and the implications for fishery economics is discussed. This is followed by a characterization of nonjointness in multispecies production and the relationship between aggregation and input price nonjointness. To further ground this discussion, an empirical example using data from Hawaii's longline fishery is then provided in the third section. Temporal aggregation consistency is tested and rejected for all three trip classifications. Hence a policy maker relying on results generated from the trip level model would draw the erroneous conclusion that economic factors do not influence production, that production is strictly biologically determined. The importance of accurate supply measures is demonstrated by comparing a hypothetical individual transferable quotas program that might arise using results from the aggregated model against an ITQ program based on disaggregate results. Overall, the ITQ program based on the aggregate model results in unnecessarily stringent catch restrictions.

Dahlman, Carl J. (1979). "The Problem of Externality." The Journal of Law and Economics, 22:141-162.

This paper provides a systematic analysis of exactly what kinds of transaction costs are necessary to generate externalities and studies the relationship between the Coase theory of externalities and the standard Pigou tradition.

Dahlstrom, W.A. (1973). "Status of the California Ocean Shrimp Resource and Its Management." Marine Fisheries Review, 35(3-4):55-59.

The development and history of regulation and management for ocean shrimp (Pandalus jordani) fishery off the U.S. Pacific coast are described. Biological data on distribution, migration, life history, size, age, growth, and mortality is summarized. The status of the resource is questionable with low yields expected in the future.

Dailey, James (1989). "Fish Stocking in Texas Bays: 1975-1988." Management Data Series No. 10, Texas Parks and Wildlife Department, Fisheries Division, 4200 Smith School road, Austin, Texas 78744.

In 1988, 67 million red drum (Sciaenops ocellatus) eggs, fry and fingerlings were stocked into Texas Bays. Matagorda Bay received 14 million fry and fingerling spotted seatrout (Cynoscion nebulosus). Galveston Bay received 4 million striped bass (Morone saxatilis) fry and 313 thousand fingerlings. The Brazos River received 570 striped bass fingerlings.

Daly, Herman E. (1987). "The Economic Growth Debate: What Some Economists Have Learned But Many Have Not." Journal of Environmental Economics and Management, 14:323-336.

This paper examines the biophysical and ethicosocially limits to growth and the nature of the welfare losses that come about when each limit is stressed by growth.

Dalton, Rod (1995). "Options for Establishing an Interim Permit Moratorium and Eligibility Criteria for the Atlantic Swordfish Fishery." Discussion paper, National Marine Fisheries Service, Highly Migratory Species Division, 1315 East-West Highway, Silver Spring, MD, January, 17 pp.

This paper discusses possible options for controlling access to the Atlantic swordfish fishery via a permit moratorium.

Dandelski, John R. and Eugene H. Buck (1998). Marine Dead Zones: Understanding the Problem. CRS Report for Congress, Environment and Natural Resources Policy Division, Congressional Research Service, Library of Congress, November, 8 pp.

The largest hypoxic area affecting the United States is in the northern Gulf of Mexico near the mouth of the Mississippi River, but others also exist. Research has been conducted to better identify the human activities that contribute to increasing the intensity and duration of, as well as the area affected by, hypoxic events, and to begin formulating control strategies. This report presents an overview of the causes of hypoxia, the U.S. areas of most concern, relevant federal research programs, and legislation in the 105<sup>th</sup> Congress to authorize and fund additional research.

Danville Research Associates, Inc. (1982). "Work Plan for the Development of Cost, Revenue and Income Profiles for the Gulf and South Atlantic Shrimp Fleets." Contract No. NA82-GA-C-00041, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida 33149, December 1.

A work plan for developing statistically sound data on the operating costs and revenues of the Gulf of Mexico and south Atlantic shrimp fleets.

Danville Research Associates, Inc. (1983). "Mackerel Vessel Enumeration Study." Contract No. NA82-GA-C-00026, National Marine Fisheries

Service, Southeast Fisheries Center, 75 Virginia Beach Drive,  
Miami, Florida 33149, October 10.

The primary objective of this project was to conduct a census of the commercial mackerel vessels active in either the king or Spanish mackerel fishery using an observation technique. Additional project objectives included monitoring the fleet during the primary season with respect to the level of activity, vessel mobility, and vessel gear or fishery flexibility; develop and test a non-survey, unobtrusive methodology for monitoring the fleet; and recommend a data collection methodology for efficiently collecting similar data on a regular basis.

Danville Research Associates, Inc. (1984). "Survey of the Shrimp Processing Industry in the Southeast." Chapter 3, Draft final report, Contract No. NA84-WC-C-06032, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida 33149, September 30, 1984.

Summary of data set collected under contract for a study of shrimp processors in the Southeast Region.

Darcy, George H. (1984). "Problems in the United States Shrimp Industry: Are Import Restrictions the Answer." Draft report.

Because of fluctuating and generally decreasing profitability of producers (fishermen) in the U.S. shrimp industry, the industry has requested that import restrictions be placed on foreign shrimp. The analysis that follows considers the problem of profitability, attempts to identify the underlying causes, addresses the issue of import restrictions, and suggests alternative means for solving the economic problems of the industry.

Darcy, George H. (1998). "Draft Report to Congress on the Shrimp trawl Bycatch Program." Draft report, Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Spring, MD, May, 73 pp.

A draft report on the southeast regions finfish bycatch reduction program for the Gulf of Mexico and southern Atlantic states shrimp fishery. It summarizes the observer and bycatch reduction gear modification program and presents the cost benefit analysis developed to satisfy a request from Congress requiring a comprehensive analysis of this fishery problem.

Dasgupta, Partha and Geoffrey Heal (1974). "The Optimal Depletion of Exhaustible Resources." Review of Economic Studies, Symposium on the Economics of Exhaustible Resources, 3:3-28.

This paper explores the problems that appear to arise naturally when the existence of exhaustible resources is incorporated into the study of intertemporal plans.

Dasgupta, Partha, Richard J. Gilbert, and Joseph E. Stiglitz (1982). "Invention and Innovation Under Alternative Market Structures: The Case of Natural Resources." Review of Economic Studies, 49:567-582.

This paper examines the interactions between market structure and resource allocation over time when there is endogenous technical progress. The structures considered are a planned economy, pure monopoly, and competition with patent rights. In an efficient allocation the date of invention coincides with the date of innovation (the date at which technology

is used). This is also true with a pure monopoly, but monopoly retards technical progress relative to the efficient level. Competition for patents rights to a new technology results in excessively rapid technical progress if the resource endowment of the economy is sufficiently large. Also, competition may lead to sleeping patents, where invention strictly precedes the date of innovation.

David, Elizabeth L. (1971). "Public Perceptions of Water Quality." Water Resources Research, 7(3):453-457.

Water pollution is perceived by the general public to be of increasing concern as a major problem facing the state. From a survey of a representative sample of adults in Wisconsin, it was shown that the public has rather definite ideas about what constitutes a description of pollution. The respondents mentioned algae and murky, dark water but did not often mention attributes such as chemicals or disease germs that are not detected by the human sensory system. When the respondents were asked to name water in the state that they felt was polluted, they named waters that in fact have the characteristics they described when defining pollution. The most widely used indicators of water pollution seem insufficient in light of the public definition of, and concern about, water pollution.

Davidse, W.P., K. Cormack, E. Oakeshott, H. Frost, C. Jensen, H.S. Rey, F. Foucault, and C. Tall (1993). Costs and Earnings of Fishing Fleets in Four EC Countries. Onderzoekverslag 110, Department Fishery, Agricultural Economics Research Institute (LEI-DLO), P.O. Box 29703 2502 LS, The Hague, The Netherlands, June.

This report contains a harmonized presentation and calculation of costs and earnings of fishing vessels in the Netherlands, Denmark, France, and the United Kingdom. This harmonization will facilitate the development of sectoral fleet models. Current costs and earnings investigations in the four countries show big differences in calculation of the bottom line figure. Uniformity in collecting and calculating costs and earnings is important in view of the construction of economic fleet models. This uniformity was one to the main aims of the study.

Davis, Gary E. (1980). "Juvenile Spiny Lobster Management or How to Make the Most of What You Get." Fisheries, 5(4):57-59.

Larval production and survival, equitable allocation and efficient harvest among fishermen and maximization of yield per postlarval recruit are identified as three major elements amenable to management actions in spiny lobster fisheries. Minimum harvestable lobster size, habitat protection and enhancement, trap escape vents, and nursery sanctuaries are some of the means of improving yield per postlarval recruit.

Davis, Gary E. (1989). "Designated Harvest Refugia: The Next Stage of Marine Fishery Management in California." CalCOFI Rep., 30:53-58.

Marine fishery management has traditionally been based on the biology and population dynamics of individual target species. Management controls are generally exercised through limits on individual fish sizes, seasons of harvest, catch limits, and restrictions on gear efficiency designed to protect reproductive stocks. Distance from port and depth provided de facto refugia from harvest during the first century of modern exploitation, but recently few California nearshore demersal fisheries have been able to sustain high yields using traditional species specific management strategies.

Designated harvest refugia, or fisheries reserves, should now be

evaluated as management tools to enhance or sustain these coastal fisheries. In other parts of the world, designated harvest refugia provide recruits to adjacent harvest zones, protect the genetic diversity of wild stocks, and serve as experimental controls for determinations of potential yield. This concept could be adapted to California's coastal ecosystems by applying accepted theories from ecology and conservation biology. Hypotheses regarding the optimum number, size, and distribution of fishery reserves in relation to harvested zones should be empirically tested in existing marine parks and reserves and in additional protected areas set aside especially for this purpose.

Davis, Gary E. and Jon W. Dodrill (1989). Recreational Fishery and Population Dynamics of Spiny Lobsters, Panulirus Argus, in Florida Bay, Everglades National Park, 1977-1980. Bulletin of Marine Science, 44(1):78-88.

Florida spiny lobsters, Panulirus argus, occupied the southern two-thirds of Florida Bay in Everglades National Park. Field studies of 3,570 tagged lobsters revealed that they pass through Florida Bay, using it for less than three years as juveniles, between their planktonic larval stages in the open ocean and adulthood on coral reefs. Lobsters from the bay support commercial and recreational fisheries outside of Everglades National Park from Dry Tortugas to Pacific Reef near Miami. Growth rates of juvenile lobsters in Florida Bay are the highest on record, which may be a reflection of optimum habitat with abundant food and shelter. Reportedly, the average-sized lobster taken by commercial bulley netters in the bay prior to 1965 was 90-95 mm carapace length. The park's recreational harvest in 1978-1979 was about 20,000 lobsters with a mean size of 83 mm CL, and about 44,000 lobsters (x 88 mm CL) in the 1979-1980 season. The fishery also provided 7,500 to 8,000 person-days of recreation each year for about 1,000 persons. In 1980, a lobster nursery sanctuary was created in the Everglades National Park portion of Florida Bay to restore the natural conditions of the bay and provide more lobsters for harvest in adjacent fisheries.

Davis, Gary E. and Jenifer E. Dugan (1994). Applications of Marine Refugia or Replenishment Zones to Fisheries Management. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Marine resources appear to be particularly vulnerable to the tragedy of the commons wherein uncontrolled access to commonly owned renewable resources results in the depletion of those resources. Current fishery management regimes based on single species that use maximum sustainable yields, size and bag limits, seasonal closures, and limited entry approaches appear to offer little hope for the restoration of impacted fisheries and marine ecosystems. New approaches are critically needed. Marine fishery refugia, areas unaltered by harvest that serve as sources of replenishment, offer hope for the restoration and stabilization of yields for coastal marine fisheries and communities. Although most reserves were not designed for fishery management purposes, our review of studies of these small unharvested areas indicate that increases in the abundance, individual size and reproductive potential of target species, and increases in species diversity occurred within reserves of various sizes, shapes, and histories in marine communities ranging from coral reefs to kelp forests. In a few cases, yields were higher in areas surrounding the reserves. Our preliminary results indicate that fishery refugia should be further examined as a management option, particularly for long lived coastal species.

Day, Susan Virginia (1988). "Estimating the Non-Consumptive Use Value of Whale Watching: An Application of the Travel Cost and Contingent Valuation Techniques." Chapters 3, 4, 6, Appendix A, and the Bibliography of a Masters Thesis, Department of Natural Resource Economics, University of Rhode Island, Kingston, Rhode Island.

This thesis measures the non-consumptive use value of whale watching using travel cost and contingent value techniques. The consumer surplus estimate of \$23.00 from the travel cost techniques was approximately equivalent to the contingent value technique estimate of \$21.11 or a capitalized value between \$66 and \$118 million.

De Sylva, Donald P. (1954). "The Live Bait Shrimp Fishery of the Northeast Coast of Florida." Technical Series, No. 11, Marine Laboratory, University of Miami, Coral Gables 34, Florida.

This investigation studied the biological and economic aspects of the fishery in relation to the shrimping areas involved, the species of shrimp caught, fishery methods and gear, catch composition ecology of the shrimp area, effects of certain gear on the ecology of shrimp areas, especially pushnets, statistics and economics of the fishery, and methods of holding and transporting live shrimp. During this three month study from June to August, 1953, 47 fishermen and dealers were interviewed and field studies were conducted to collect and observe the fishing methods.

Deacon, Robert T. (1989). "An Empirical Model of Fishery Dynamics." Journal of Environmental Economics and Management, 16:167-183.

The multiple-cohort approach to population dynamics is seldom used for empirical analysis of catch and effort data due to the complexity of the resulting models and to limitations on available data. The present paper addresses these problems by adopting a discrete time framework and simplifying assumptions for growth, mortality, and recruitment. The result is a readily estimated econometric model of the commercial catch that is consistent with the multiple-cohort paradigm. This model is applied to catch and effort data for the California abalone fishery and the estimates obtained are used to analyze policy.

Deaton, Angus and John Muellbauer (1980). "An Almost Ideal Demand System." American Economic Review, 70(3):312-326.

A new model is proposed and estimated that is of comparable generality to the Rotterdam and translog models but that has considerable advantages over both. This model, called the Almost Ideal Demand System (AIDS), gives an arbitrary first-order approximation to any demand system; it satisfies the axioms of choice exactly; it aggregates perfectly over consumers without invoking parallel linear Engel curves; it has a functional form that is consistent with known household budget data; it is simple to estimate, largely avoiding the need for nonlinear estimation; and it can be used to test the restrictions of homogeneity and symmetry through linear restrictions on fixed parameters. Although many of these desirable properties are possessed by one or other of the Rotterdam or translog models, neither possesses all of them simultaneously.

Deaton, Angus and John Muellbauer (1980). Economics and Consumer Behavior. Chapters 6, 12, 13, and 14. Cambridge University Press, New York.



The theory of market demand, the consumption function and intertemporal choice, the demand for durable goods, and choice under uncertainty are included in these chapters.

DeGeorge, Frank (1992). "North Pacific Fisheries Amendments Lack Adequate Support." U.S. Department of Commerce, Office of the Inspector General, Office of Audits, NOAA Division.

The economic analysis of amendments 18 and 23 - Proposed Inshore/Offshore Allocation to the Fishery Management Plans for the Groundfish Fishery of the Bering Sea and Aleutian Islands and the Gulf of Alaska was inadequate because the council did not apply a cost-benefit framework to the analysis in spite of legal requirements and sound economic principles. Moreover, the economic model applied by the council was inappropriate and produced unreliable results. Our conclusions of the economic analysis are consistent with assessments made by the council's own committee of scientific and statistical experts and NMFS economists.

Degner, Robert L., Charles M. Adams, and Susan D. Moss (1989). "An Analysis of Potential Regulatory Changes on the Economic Structure of the Eastern Gulf of Mexico Finfish Industry Centered in Florida." Department of Food and Resource Economics, University of Florida, Gainesville, FL.

Long term and seasonal production and market trends for mullet and seatrout in Florida are analyzed. Annual boat level earnings profiles for fishermen producing mullet, seatrout, and complementary species are estimated. Economic impacts on fishermen resulting from alternative resource management policies are analyzed on a statewide basis and also for individual counties. For the mullet industry, basic elements of market structure and concentration are examined, and market channels and product flows for mullet in the round, red and white roe, and other mullet products are described.

Dellenbarger, Lynn E. and Alvin R. Schupp (1987). "Socio-Economic Factors Influencing Catfish Consumption." Paper submitted to the Journal of The World Aquaculture Society.

Catfish are a major aquacultural species in the United States. As production expands through increased acreage and improved production practices, additional knowledge of market opportunities for catfish is needed to direct further expansion of the industry. This study analyzes the socio-economic characteristics associated with home consumption of catfish. Data were obtained through a questionnaire mailed to residents in seven metropolitan areas in 1986. A logit analysis, that determines the relationship between family size, race, income, occupational status, and location of the household, and the probability of catfish consumption was conducted. Results of the analysis indicate that family size, family income, and occupational status of the household head positively influence the probability of at home catfish consumption., Presence of children in the household was a characteristic found to reduce the probability of household catfish consumption.

Demsetz, Harold (1967). "Toward a Theory of Property Rights." American Economic Review, 57(May):347-359.

The paper discusses the concept and role of property rights in social systems, offers guidance for investigating the emergence of property rights, and sets forth some principles relevant to the coalescing of property rights into particular bundles and to the determination of the ownership structure

that will be associated with these bundles.

Dennis, Karen C., Robert J. Nicholls, and Stephen P. Leatherman (1991). "Reconnaissance Level Survey." U.S. EPA Coastal Land Loss Studies, Laboratory for Coastal research & center for Global Change, University of Maryland, College Park, MD 20742, July 22.

A proposal to develop a methodology that will provide a better estimate of the potential impacts and cost of accelerated sea level rise and help to fulfil the IPCC (1990) aim of quantifying the impacts and possible responses of a one meter rise in sea level.

DeReynier, Yvonne and Gerry Hadden (1995). To Catch or Not to Catch: Fishing Selectively for Salmon. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

Different gear modifications and educational programs are discussed to reduce bycatch, discarding, and mortality in the salmon fishery by species and gear type.

Deseran, Forrest A. (1997). Louisiana Shrimp Fishermen and Local Economies: A Survey. Sea Grant, Louisiana State University, January, 24 pp.

This paper reports the findings of a telephone survey of Louisiana shrimp fishermen. It is part of a study that examines the social and economic implications of changes occurring in Louisiana s coastal industries. The purpose is to learn more about shrimp fishermen, their families, and their communities.

Desvousges, William H. and Venetia A. Skahen (1987). Techniques to Measure Damages to Natural Resources. Final report, EPA contract Number 68-01-7033, Interior Purchase Order No. A072286A-000, RTI Project Number 3142-05-FR, 3589-01-FR, Center for Economics Research, Research Triangle Institute, Research Triangle Park, North Carolina prepared for CERCLA 301 Task Force, U.S. Department of the Interior, Washington, D.C.

This report pertains to estimating damages for injuries to natural resources in a type B assessment (alternative protocols for conducting assessments in individual cases of loss). This document describes techniques and helps guide trustees through the selection of techniques for measuring damages to natural resources covered under CERCLA. Familiarity with basic economic valuation concepts and the techniques or approaches economics use to measure damages will help trustees anticipate the key valuation questions. However, this document is not meant to supply all information a trustee would need to perform the damage determination phase of a type B natural resource damage assessment. In implementing the concepts and techniques described in this information document, trustees should obtain the services of a economist knowledgeable in the fields of environmental or resource economics.

Desvousges, William H. and V. Kerry Smith (1983). Benefit-Cost Assessment Handbook for Water Programs. Prepared for U.S. Environmental Protection Agency, Economic Analysis Division, Washington, DC 20460.

This book provides suggestions about how to evaluate the economic aspects of a proposed policy as a regular part of the decision process. These evaluations can identify water quality policies that have highest priority, sot hat society's resources can be directed to the areas that will have the

greatest benefits. They also can serve as one of several analyses that support the decision process for any specific water quality policy. Case studies are used to clarify points. Data needs, key assumptions, and other relevant points are covered for different ways of determining the relationship between desirable and undesirable effects of a program decision.

Desvousges, William H., V. Kerry Smith, and Matthew P. McGivney (1983). A Comparison of Alternative Approaches for Estimating Recreation and Related Benefits of Water Quality Improvements. EPA Contract No. 68-01-5838, U.S. Environmental Protection Agency, Economic Analysis Division, Washington, D.C. 20460.

The results of this project strongly support the feasibility of measuring the recreation and related benefits of water quality improvements. Moreover, the benefits measurement approaches - several contingent valuation formats and the travel cost method - show consistent results for comparable changes in water quality. Indeed, the range of variation is generally less than that expected in models used to translate the effects of effluents in a water body into the corresponding water quality parameters. In addition, the results also clearly show that the intrinsic benefits of water quality improvements, especially option values, can be measured and that they are a sizable portion (greater than half) of the total recreation and related benefits total.

Desvousges, William H., Alicia R. Gable, Richard W. Dunford, and Sara P. Hudson (1993). "Contingent Valuation: the Wrong Tool to Measure Passive-Use Losses." Choices, 2nd Quarter: 9-11.

Passive use values have no associated behavior to use in estimation of existence value of unique natural resources.

Devadoss, S. and William H. Meyers (1987). "Relative Prices and Money: Further Results for the United States." American Journal of Agricultural Economics, 69(4):838-842.

Empirical results support the hypothesis that agricultural prices respond faster than manufactured product prices to a change in money supply in the United States. Sims' vector autoregression (VAR) technique was applied in examining this hypothesis. The monte carlo integration method was used to test the significance of the impulse responses generated by the VAR technique.

Devadoss, Stephen, Jurgen Kropf, and Thomas Wahl (1995). "Trade Creation and Diversion Effects of the North American Free Trade Agreement of U.S. Sugar Imports from Mexico." Journal of Agricultural and Resource Economics, 20(2): 215-230.

A world sugar model consisting of 21 countries was developed to determine the effects of NAFTA on U.S. and Mexican sugar markets and to quantify the trade creation and diversion effects on U.S. imports from Mexico. Mexican sugar production increases under NAFTA, causing Mexico to become a net exporter. NAFTA induces sugar imports from Mexico to displace U.S. production, to meet demand expansion, and also to divert U.S. imports from other foreign suppliers to Mexico. Effects of NAFTA on the U.S. sugar market are small because of the side agreements which limit Mexican exports and which include corn sweetener consumption when computing Mexico's production surplus.

DeVoretz, Don and Richard Schwindt (1985). Harvesting Canadian Fish and Rents: A Partial Review of the Report of the Commission on Canadian Pacific Fisheries Policy. Marine Resource Economics, 4(1):347-367.

The Canadian Pacific fisheries currently suffer from excess harvesting capacity. A recent Royal Commission has recommended a joint scheme of royalties on the catch and a novel license auction plan to alleviate the problem. This paper investigates the impact of these two policies. First, the total royalty revenue is measured and then the royalty incidence across fishermen, processors, and consumers is estimated. Next, we analyze the license auction scheme to calculate the costs of these two policies. First, the total royalty revenue is measured and then the royalty incidence across fishermen, processors, and consumers is estimated. Next, we analyze the license auction scheme to calculate the costs of purchasing the licenses to the fishermen and the net costs of purchasing the licenses to the fishermen and the net proceeds to the government after the retirement of one-half the fleet under alternative possible selling strategies of fishermen. We conclude that the royalty scheme would finance the retirement of the fleet in 13 years and that the incidence of the royalty would vary greatly across species/gear type. The license auction scheme, in contrast, is a potent policy measure which under several scenarios could fully fund the buy-back program and contribute significantly to public revenue.

Deweese, Christopher M. (1989). Assessment of the Implementation of Individual Transferable Quotas in New Zealand's Inshore Fishery. North American Journal of Fisheries Management, 9(2):131-139.

In 1986, New Zealand implemented an individual transferable quota system (ITQ) for selected inshore fish species to promote conservation of stocks and to improve the economic efficiency of the fishing industry. The objectives of this study were to assess perceived problems and benefits of this new system and its effect on the fishing industry. Data were obtained through interviews with 62 industry participants from the Auckland region and 14 Ministry of Agriculture and Fisheries staff. Over 75% of the fishermen were making significant changes in their business because of ITQs. These changes included minimization of costs and maximization of price received for their catch, practices consistent with economic theory about ITQs. Industry and management agency interviewees generally recognized ITQ benefits of reduced competition, resource conservation, increased retirement security, reduced economic risk, possession of a valuable asset, improved ability to plan, and the professionalization of fishing. Problems with the system included discarding of catches not included in an individual's quota, discarding of the lower priced portion of catches of some species, enforcement, accuracy of total allowable catch quotas, quota aggregation by companies, and high cost to youths interested in entering the fishery. After 6 months under ITQs, 56% of the fishermen and 100% of the agency staff interviewed felt this new system of managing fisheries would be successful.

Deweese, Christopher M. and Glenn R. Hawkes (1988). Technical Innovation in the Pacific Coast Trawl Fishery: The Effects of Fishermen's Characteristics and Perceptions on Adoption Behavior. Human Organization, 47(3):224-234.

The adoption/nonadoption of technical innovations was examined in the Pacific Coast Trawl fishery using a model based on recent conceptual issues raised in the innovation diffusion literature. Included in the model were variables measuring each fisherman's personal characteristics and situation, attitudes about fishing, and perceptions of each innovation's characteristics. Data were collected in 83 personal interviews during spring 1984, a period of economic crisis in the fleet. The results indicate that a different subset of independent variables explained the adoption of each innovation. This appears to be due to the innovation-by-innovation differences in the match between the potential adopter and the innovation. The effect of variables on

adoption/nonadoption varied across innovations. The characteristics of potential adopters and the characteristics of the innovations, as perceived by the potential adopters, were both important determinants of adoption/nonadoption.

Di, Jin (1994). Multimedia Waste Disposal Optimization under Uncertainty with an Ocean Option. Marine Resource Economics, 9(2):119-139.

Many communities face a waste management crisis. An increase in waste generation and decline in available landfill capacity have led to rapid increases in waste management costs. Using sewage sludge management in coastal New York and New Jersey as an example, this paper examines optimal multimedia waste disposal under cost uncertainty. Using expected value variance analysis, the study looks at the effects on the optimal disposal strategy of uncertainty associated with waste management cost and the community's risk preferences. The results indicate that, based on available cost data, the optimal strategy of a moderately risk averse decision maker is to manage sludge through land based facilities. These results hold over a wide range of risk aversion parameters and even at low levels of cost uncertainty. Thus, the Ocean Dumping Ban Act of 1988 is consistent with such results.

Di, Jin and Hauke L. Kite-Powell (1995). Environmental Liability, Marine Insurance and An Optimal Risk Sharing Strategy for Marine Oil Transport. Marine Resource Economics, 10(1):1-19.

Recent changes in the U.S. liability regime for oil pollution damage are precipitating a potential insurance crisis for oil carriers operating in U.S. waters. While liability rules can be useful in causing the oil transport industry to internalize the costs of oil pollution, unlimited liability combined with uncertainty in damage valuation can result in great costs to society, including the possible disruption of oil supplies. We formulate a model to determine an optimal level of risk-sharing for oil pollution damage between the public and the foreign tanker industry, and show how a socially optimal limit to liability can be determined.

Di, Jin, Eric Thunberg, Hauke L. Kite-Powell, and Kevin Blake (2000). Total Factor Productivity Change in New England Fisheries: 1964-1993. Draft Report, Marine Policy Center, Woods Hole Oceanographic Institution, Woods Hole, February, 42 pp.

New England fisheries have experienced dramatic changes in management institutions and instruments during the past 30 years. The recent collapse of several important commercial fish stocks has heightened public debate over fisheries management. We develop estimates of total factor productivity (TFP) change in New England fisheries from 1964 to 1993, using a procedure similar to Squires' (1992) method, which extends standard TFP measurement by including the effect of fluctuations in open access fish stocks. The results indicate that TFP increased on average by 4.8 percent per year from 1964 to 1993. A higher average rate of increase was achieved from 1964 to 1983, possibly due to new technologies (e.g., fish finders). TFP declined at 0.12 percent annually from 1984 to 1993, due to stringent output and effort control measures. A healthy level of resource stocks is a precondition for sustained productivity growth in the fishing industry. Failure to consider the stock factor in an open access resource industry can cause policies intended to promote productivity growth to drive the stock to extinction. To achieve productivity growth while maintaining a sustainable stock level, it is necessary to reduce fleet size.

Diaby, Souleymane (1996). Economic Impact Analysis of the Ivorian Sardinella Fishery. Marine Resource Economics, 11(1): 31-42.

A bioeconomic simulation model of the Ivorian sardinella fishery is developed to identify and quantify welfare effects stemming from resource exploitation controlled by a fishermen's monopoly. The biological and economic components are modeled to include multicohorts and multispecies, the demand facing the industrial sector, and a heterogeneous fishing fleet under exploitation conditions with and without cycles. A profit maximization scenario indicates that management of the fishery under the current fleet structure is not socially optimal. The analysis is extended to include the competition from an expanding artisanal sector of the fishery. Any changes in public policies leading to the expansion of the artisanal fishery would result in increases in consumer benefits from the fishery, while the benefits to the syndicate decrease.

Diamond, Peter A. and Jerry A. Hausman (1994). "Contingent Valuation: Is Some Number Better than No Number." Journal of Economic Perspectives, 8(4):45-64.

The evidence supports the conclusion that to date, contingent valuation surveys do not measure the preferences they attempt to measure. Moreover, reasons are present for thinking that changes in survey methods are not likely to change this conclusion. Viewed alternatively as opinion polls on possible government actions, these surveys do not have much information to contribute to informed policy making. Thus, reliance on contingent valuation surveys in either damage assessments or in government decision making is basically misguided.

Dickie, L.M. (1973). "Management of Fisheries; Ecological Subsystems." Transactions of the American Fisheries Society, 2:470-480.

In this paper, I wish to set forth some views of the present state of knowledge of fishery related ecosystems. I wish to particularly emphasize what appear to me to be apparently contradictory results of the application of various logical model systems employed in fisheries research and management. I will then explore some of the limitations of these concepts and attempt to describe the alternative consequences they imply for management practices. Finally, I will use this occasion to outline briefly what seem to me to be some promising recent developments that may take us in the direction of reconceptualizing our theoretical systems and that may be leading us towards the kinds of scientific observations that will permit better prediction: hence management.

Dickie, L.M. (1979). "Perspectives on Fisheries Biology and Implications for Management." J. Fish. Res. Board Can., 36:838-844.

Descriptions of fisheries systems for purposes of management often seem to imply a naturally predetermined biological structure and functioning of the resource. However, such basic characteristics as stock definition, species composition, levels of production, and biological efficiency are parameters that have generally been adapted to suit particular fishery conditions and in any case are variables that interact with both environment and the nature of industrial exploitation. In the interests of economic or social analyses in fisheries these biological descriptors should normally be amenable to redefinition or redescription without prejudice to their reliability as indices of natural production.

Dietz, Elizabeth (1994). "Measuring Employee Bonuses: A Review of Test Surveys." Compensation and Working Conditions, 46(5):13-17.

Responding to the development of non-wage cash payments in the work force, the Bureau of Labor Statistics (BLS) tested the feasibility of collecting data on non-wage cash payments. Preliminary tests were conducted in various occupational wage surveys in 1989 and 1990. BLS plans to resume testing in its Occupational Compensation Survey Program as part of a major survey redesign slated to begin in 1995. This article describes the preliminary test surveys, discusses their results, and identifies issues involved in collecting reliable, statistically sound data on non-wage cash payments.

Dietz, Elizabeth and John Steinmeyer (1994). "Testing Joint Collection of Wage and Demographic Data." Compensation and Working Conditions, 46(10):7-11.

This article summarizes the Bureau of Labor Statistics' experience in conducting the 1989 and 1990 test studies of Occupational Wage Surveys to determine if earnings inequality among race, sex, age, and other demographic groups existed. It also relates how the test survey results fell short of objectives and describes some of the pitfalls of demographic data collection.

Diewert, W.E. (1971). "A Note on the Elasticity of Derived Demand in the N-Factor Case." Econometrica, (May):192-198.

Hicks formula for the price elasticity of derived demand for a factor of production in terms of the price elasticity of demand for the product, the price elasticity of supply of a competing factor, the first factor's share and the elasticity of substitution between the two factors is tested when the number of factors is greater than two.

Diop, Hamady and Richard F. Kazmierczak, Jr. (1996). Technology and Management in Mauritanian Cephalopod Fisheries Marine Resource Economics, 11(2):71-84.

If the technology in a multispecies fishery is such that there is jointness in inputs and nonseparability between inputs and outputs, then management on a species basis may lead to unintended outcomes, including over exploitation of the resource. This study investigates the nature of the technical and economic relationships underlying the 1989-90 Mauritanian cephalopod fishery by estimating a system of dual output supply functions derived from a generalized Leontief revenue function. Model results indicate the existence of jointness in inputs and nonseparability between inputs and outputs in the fishery. Cross price elasticities indicated a number of substitute and complementary relationships, with these relationships changing in magnitude across years. Taken together, the results suggest that any attempts to economically manage the resource should be based on multiproduct production theory, not single species biological response functions. Besides ruling out single species management, the dominance of substitute relationships in the Mauritanian cephalopod fishery precludes the use of key species management of the entire resource.

Dirlam, Joel and Daniel Georgianna (1994). "Recent Adjustments in New England Fresh Groundfish Processing." Marine Resource Economics, 9(4):375-384.

A review of the New England fish processing industry since the introduction of the Magnuson Act in 1977. Rising production has been replaced

with the collapse of the domestic fishery due to stock depletion. Foreign imports have replaced domestic production. With the collapse of Canadian stocks, processing firms in New England have begun to exit the industry. Along with this concentration, larger, more diversified firms are dominating the processing industry as smaller firms are forced to exit. Lower priced substitute species will not alleviate the financial crisis faced by processors due to the groundfish shortage problem.

Ditton, Robert B. and Thomas L. Goodale (1973). "Water Quality Perception and the Recreational Uses of Green Bay, Lake Michigan." Water Resources Research, 9(3):569-579.

How people perceive Green Bay as a recreation resource, how perceptions differed between groups, and how these perceptions related to recreation use patterns, are identified. Whereas seven of ten household heads interviewed participated in boating, or swimming, only three of the ten used Green Bay during the preceding 12 months, indicating that Green Bay was not a focal point of water based recreation among residents of the five county study area. Chi square test groups differed significantly on most comparisons when used to describe the Bay and its most bothersome physical and water quality characteristics. Generally, participants and those who use the Bay were less apt to cite unpleasant smell and dead fish as major problems and more apt to cite such problems as winds, waves, and cloudiness. Comparisons between three user groups (fishermen, boaters, and swimmers) indicated swimmers and boaters differed most in their perception of the Bay and its troublesome characteristics, with fishermen occupying a position between the two groups.

Ditton, Robert B. and Anthony J. Fedler (1989). "Importance of Fish Consumption to Sport Fishermen: A Reply to Matlock et al. (1988)." Fisheries, 14(4):4-6.

The authors concerns with the Matlock et al. paper include the authors failed methodologically, other reasons exist for the observed behavior, poor literature review, and the paper exhibits little understanding of human dimensions concepts.

Ditton, R.B. and Mark R. Fisher (1990). "Characteristics, Behavior, Attitudes, Expenditures, Harvest, and Management Preferences of Billfish Tournament Anglers." Final report prepared for the Billfish Foundation, Miami, Florida. Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843.

A mail survey of 1,984 billfish anglers was completed in 1989-1990 based on 27 tournaments held in the U.S. western Atlantic Ocean with a response rate of 62%. Sociological analysis is presented that identify the user groups and describe their characteristics, such as age, income level, and education level. A technical appendix is also included under separate cover.

Ditton, Robert B. and Jeffrey D. Vize (1987). "Business Turnover in the Texas Charter Fishing Industry, 1975-85." Marine Fisheries Review, 49(2):162-165.

This paper follows the guidelines used in Ditton and Loomis (Marine Fisheries Review, 47(1):43-47, 1985) and continues the temporal analysis of the charter fishing industry using a third inventory to analyze turnover and stability between 1975 and 1985. Comparing the study findings from 1980 to 1985 with those from 1975 to 1980 shows that the Texas charter fishing industry continues to have high turnover rates and overall instability. Of



the original 1975 population of charter boat operators, only 25 percent were in operation during 1985. In addition to a more complete understanding of the Texas charter fishing industry, this paper presents an approach that can be used elsewhere to understand charter industry trends.

Ditton, R.B., D.A. Gill, and C.L. MacGregor (1991). "Understanding the Market for Charter and Headboat Fishing Services." Marine Fisheries Review, 53(1):19-26.

Published and unpublished research findings regarding charter and headboat fishing customers from 11 studies were reviewed to provide a marketing data base for operators and to guide further research efforts. Generally charter/headboat fishing is a male-oriented activity. Customers were between 30 and 55 years of age. Although both groups of anglers considered themselves to be experienced, charter boat anglers had fished for more years. Charter anglers fished more often with their families and headboat anglers more often with their friends. Charter boat anglers reported higher incomes than headboat anglers. Relaxation, having fun, and escaping from daily pressures were generally more important to both groups of anglers than motives relative to catching fish. Most anglers indicated that the skills and performance of the captain and crew contributed heavily to the overall evaluation of their fishing experience. Anglers were more heavily influenced to choose a particular captain or boat by informal advertising methods (i.e. word of mouth recommendations, reputation, and visits to the marina) than formal methods (i.e. advertisements, brochures, radio, and television). Charter anglers relied more on word-of-mouth recommendations and headboat customers were more influenced by previous experiences. Implications for further research are discussed.

Ditton, Robert B., Stephen M. Holland, and Duane A. Gill (1991). "The U.S. Gulf of Mexico Party Boat Industry: Activity Centers, Species Targeted, and Fisheries Management Opinions." Paper submitted to the Marine Fisheries Review, February 25.

In addition to providing an overview of the party boat fishery in the U.S. Gulf of Mexico, a management oriented methodology is presented that can be used elsewhere to assess regulatory impacts. Party boat operators were interviewed to determine species targeted, percent time committed to targeting each species, and opinions of current catch restrictions. Over two thirds of the fleet was located on the west coast of Florida. Overall, most boats targeted less than 5 species. Four species accounted for 90 percent of the estimated effort by party boats in the U.S. Gulf of Mexico: snapper, grouper, amberjack, and king mackerel. Party boat effort in Texas was devoted primarily to snapper whereas in Florida most effort was devoted to snapper and grouper collectively. Party boat operators were diverse in their opinions of management regulations in force when interviewed. Results revealed why major opposition would be expected from Texas party boat operators for red snapper bag limits and other restrictions proposed by the Gulf of Mexico Fishery Management Council.

Ditton, Robert B., Stephen M. Holland, and Duane A. Gill (1992). "The U.S. Gulf of Mexico Party Boat Industry: Activity Centers, Species Targeted, and Fisheries Management Opinions." Marine Fisheries Review, 54(2):15-20.

In addition to providing an overview of the party boat fishery in the U.S. Gulf of Mexico, a management oriented methodology is presented that can be used elsewhere to assess regulatory impacts. Party boat operators were interviewed to determine species targeted, percent time committed to targeting

each species, and opinions of current catch restrictions. Over two thirds of the fleet was located on the west coast of Florida. Overall, most boats targeted less than 5 species. Four species accounted for 90 percent of the estimated effort by party boats in the U.S. Gulf of Mexico: snapper, grouper, amberjack, and king mackerel. Party boat effort in Texas was devoted primarily to snapper whereas in Florida most effort was devoted to snapper and grouper collectively. Party boat operators were diverse in their opinions of management regulations in force when interviewed. Results revealed why major opposition would be expected from Texas party boat operators for red snapper bag limits and other restrictions proposed by the Gulf of Mexico Fishery Management Council.

Ditton, Robert B., David K. Loomis, Alan D. Risenhoover, Seungdam Choi, Maury F. Osborn, Jerry Clark, Robin Riechers, and Gary C. Matlock (1990). "Demographics, Participation, Attitudes, Expenditures, and Management Preferences of Texas Saltwater Anglers, 1986." Management Data Series No. 18, Texas Parks and Wildlife Department, Fisheries Division, 4200 Smith School Road, Austin, Texas 78744.

Results of a survey of Texas saltwater fishermen concerning demographics, attitudes toward management tools, fishing motivations, species preferences and annual expenditures.

Ditton, Robert B., John R. Stoll, and Duane A. Gill (1989). "The Social Structure and Economics of the Charter and Party Boat Fishing Fleets in Alabama, Mississippi, Louisiana, and Texas." Department of Wildlife and Fisheries Sciences and Department of Agricultural Economics, Texas A&M University, College Station, Texas, January, 323 pp.

This project provides federal and state fisheries managers with aggregated information about charter and party boat operators and their businesses in the four state study region. Beyond a current listing of charter and party boat operators in the Gulf of Mexico, there has been a need for social and economic baseline data on these fisheries to evaluate the effects of management rules prior to implementation.

Division of Economic Research (1970). "Basic Economic Indicators: Shrimp, Atlantic and Gulf, Master Plan Fishery 50 10 27." Working Paper No. 57, Bureau of Commercial Fisheries, May, 70 pp.

Pertinent economic, technological, and biological data are assembled in this report for the Atlantic and Gulf of Mexico shrimp fishery for the years 1947 to 1968.

Division of Marine Fisheries (1990). Super Shooters Pass Test. News Release, North Carolina Department of Environment, Health, and Natural Resources, Morehead City, N.C. 2 pp.

A report on the successful testing of the super shooter turtle excluder device in Pamlico Sound.

Dixit, Avinash (1989). "Entry and Exit Decisions Under Uncertainty." Journal of Political Economy, 97(3):620-638.

A firm's entry and exit decisions when the output price follows a random walk are examined. An idle firm and an active firm are viewed as assets that are call options on each other. The solution is a pair of trigger prices for

entry and exit. The entry trigger exceeds the variable cost plus the interest on the entry cost, and the exit trigger is less than the variable cost minus the interest on the exit cost. These gaps produce "hysteresis." Numerical solutions are obtained for several parameter values; hysteresis is found to be significant even with small sunk costs.

Dixit, Avinash and Albert S. Kyle (1985). "The Use of Protection and Subsidies for Entry Promotion and Deterrence." The American Economic review, 75(1);139-152.

The aim of this paper is to begin analysis of the functioning of international markets and the role of policies towards them. To model the issues adequately, the potential for strategic behavior on part of both governments and firms must be taken into the account. Furthermore, it is important to recognize that the strategies of governments interact with those of firms. The appropriate model is therefore a game-theoretic one, with the governments and the firms as the players.

Dixon, Robert L. and Gene R. Huntsman (198?). "Catches and Fishing Effort Associated with the United States South Atlantic Headboat Fleet, 1972-1982." United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Beaufort Laboratory, Beaufort, NC.

This report presents estimates of the catch made and effort expended by anglers fishing from headboats that have operated along the U.S. south Atlantic coast since 1972. The estimates result from data collected through the south Atlantic headboat survey. The survey, conducted by the Beaufort Laboratory, Southeast Fisheries Center, National Marine Fisheries Service and begun in 1972, was designed to provide such indices of the quality of reef fishing as a measure of the annual catch, of the catch per unit of effort and of the mean size by species. Additionally, survey personnel collected biological materials to support studies of growth, diet and reproduction of important reef fishes.

Dodd, C. Kenneth, Jr. (19??). "Nesting of the Green Turtle, Chelonia mydas, in Florida - A Hopeful Trend?" Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C.

Except for accounts of Audubon and Brice in the 1800's, reliable records of the nesting of the green turtle do not occur in the literature. Even these accounts focus on populations in the Keys and the Cape Sable region. Beginning with the report of two nests prior to 1959, the number of nests recorded in Florida has steadily increased; at least 366 nests were confirmed in 1980. The majority of nests occurred from Merritt Island south to Key Biscayne, most of which were laid on relatively undisturbed beaches. Five reasons can be advanced for this apparent increase: increased surveillance of nesting beaches, increased awareness of sea turtles and their problems, protective legislation, the success of a head starting program located on Hutchinson Island, and the possibility that some turtles are immigrating from populations further south. While better surveillance and public awareness may be responsible for perception of an increasing turtle population, it is likely that the increase is real and has resulted from a combination of the latter three reasons. A review of the level of historical green turtle nesting, as well as a year by year record of nesting since 1959, is provided.

Dol, Wietse (1995). Flatfish 2.0: A Spatial Bio-Economic Simulation Model for the Dutch Beam Trawl Fishery. In, Bio-Economic Modelling in the

EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7,(AIR CT94 1489), Workshop, Edinburgh, October: 2-30.

This paper will discuss a spatial bio-economic simulation model for plaice and sole, aimed at sustainable use and improvement of aqua living environment. This paper will focus on the economic part of the bio-economic model. A description is given of the objectives of the model, the data used, discuss the relations in the simulation model, discuss the problems we had to overcome, and present some results.

Doll, John P. (1972). "An Econometric Analysis of Shrimp Ex-Vessel Prices, 1950-1968." American Journal of Agricultural Economics, 54(August):431-440.

A five equation demand model of the U.S. shrimp market was estimated using annual data for the period from 1950 to 1968. Prices, consumption, and ending stocks were the jointly determined variables; predetermined variables were shrimp supplies and consumer income. Ex-vessel price variations resulted largely from variations in domestic landings. Imports reduced the general level of ex-vessel prices but did not contribute substantially to price variability except in isolated instances. Large price drops occurred during periods of recession when increases in demand were slowed and stocks began to build, while landings and imports increased substantially over the previous year.

Doll, John P. (1985). "An Economics Research Plan for the Northeast Fisheries Center." Program Review Report prepared for the National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA, January, 55 pp.

A plan to develop an economics research program for the Northeast Fisheries Center.

Doll, John P. (1988). "Traditional Economic Models of Fishing Vessels: A Review With Discussion." Marine Resource Economics, 5(2):99-128.

Vessel production functions, cost curves, and related short-run concepts in the fishery economics literature are reviewed and microeconomic theory assumptions are invoked to develop applications for vessels operating in a trawl fishery. Suggested extensions included relaxing the certainty assumption and developing a dynamic process to determine trip duration.

Doll, John P. and Sean B. Chin (????). "A Use for Principal Components in Price Analysis." Research Notes, ?:591-593.

The purpose of this note is to show how principal components can be used as an aid in understanding the nature of the fluctuations present in several series of annual shrimp prices.

Dore, Ian (1993). "Shrimp Futures." American Seafood Institute Report, 4(7):23-25.

A basic description of hedging in the newly opened shrimp futures market.

Dorfman, Robert (1969). "An Economic Interpretation of Optimal Control Theory." American Economic Review, 46:817-831.

The main thesis of this paper is that optimal control theory is formally identical with capital theory, and that its main insights can be attained by strictly economic reasoning. This thesis will be supported by deriving the principal theorem of optimal control theory, called the maximum principle, by means of economic analysis.

Doubleday, W.G. and D. Rivard (eds.) (1981). Bottom Trawl Surveys, Proceedings of a Workshop held at Ottawa, November 12-14, 1980, Canadian Special Publication of Fisheries and Aquatic Sciences 58, Department of Fisheries and Oceans, Ottawa, 1981.

This publication contains the proceedings of a Workshop on bottom trawl surveys, as applied to the assessment of groundfish and shrimp stocks. The Workshop reviewed the history of trawl surveys in the Northwest Atlantic and discussed problems associated with survey design, abundance estimation and sampling techniques. The value of research survey data has been clearly demonstrated and the benefits of improved accuracy and efficiency are now evident. Finally, the proceedings contain specific recommendations on various aspects of survey design, abundance estimation and trawl technique to form a basis for improved surveys in the future.

Doumar, Robert, Judge (1998). Summer Flounder Decision. Civil Action No. 2:97cv339, United States District Court for the Eastern District of Virginia, Norfolk Division.

Order and opinion over turning the summer flounder quota regulations set by the National Marine Fisheries Service.

Dow, Robert L., Frederick W. Bell, and Donald M. Harriman (1975). "Bioeconomic Relationships for the Maine Lobster Fishery with Consideration of Alternative Management Schemes." NOAA Technical Report NMFS SSFR-683, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, WA, March, 44 pp.

The objectives of this study are to measure the biological factors that determine the trend and fluctuations in abundance and production of the Maine American lobster; to analyze the impact of such economic forces as the demand for lobster and cost of operations on the production of lobster from this biological resource; to measure the returns to lobster boat owners operating in the fishery; to establish a model for evaluating the economic - biological interrelationships so important to fisheries management; to analyze the impact on fishermen and the lobster resource of alternative management schemes designed to prevent excessive capitalization of the fishery; to determine if the economy and fishing industry will be improved by better fishery management.

Dower, Roger C. and Paul F. Scodari (1987). "Compensation for Natural Resource Injury: An Emerging Federal Framework." Marine Resource Economics, 4:155-174.

This paper provides an overview of the emerging "Superfund" natural resource damage assessment and compensation framework and a review of several economic and legal issues that are likely to affect the ability of the framework to achieve its objectives. The Superfund Act as amended establishes a federal regulatory structure that provides a legal "legitimization" for the use of economic based nonmarket valuation techniques in judicial proceedings involving natural resource injuries resulting from oil and hazardous waste

spills and releases. While the regulations have the potential to foster more appropriate compensation as well as prospective incentives to limit damages to natural resources, several controversial elements, definitions, and assumptions built into the damage assessment regulations appear to have the potential to undermine the efficiency and equity of damage assessments. These issues reflect the difficulty of integrating economic concepts of natural resource value and their estimation into the legal environment.

Dressel, David M., Donald R. Whitaker, and The-Wei Hu (1983). "The U.S. Oyster Industry, An Economic Profile for Policy and Regulatory Analysis." Final report, Saltonstall/Kennedy Project, National Fisheries Institute, Washington, D.C.

The oyster industry, which encompasses 18 of the 21 coastal states, has the broadest geographical distribution in the seafood industry. It is the economic focus of many rural coastal communities and provides direct employment for watermen and plant processing personnel in addition to supporting numerous marine-related businesses. The amount of formal integration between the harvesting, processing, and marketing sectors of the industry is limited. However, vertical integration is found in large processing operations that obtain supply through aquaculture and from private oyster grounds.

Drynan, Ross G. and Frances Sandiford (1985). Incorporating Economic Objectives in Goal Programs for Fisheries Management. Marine Resource Economics, 2(2):175-195.

Allowing for the biological and economic complexities pertaining to a particular fishery requires a phased, hierarchical approach to fishery management. Mathematical programming models, particularly goal programs are applicable to this type of management problem because they can readily accommodate the constraints and targets set in previous phases as well as any new ones that may be required. There are a number of goal programming formulations that may be useful for modeling the objectives of fishery management problems. Furthermore, economic objectives can be interpreted in different ways. The purpose of this paper is to illustrate a range of goal programming specifications into which alternative economic objectives have been incorporated.

DuBose, William P., IV and Gilbert C. Radonski (1984). "Problems Confronting the Marine Recreational Fishing Industry." Chapter 8 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

In an effort to better understand the recreational fishing industry, the authors describe and evaluate repetitive and non-repetitive fishing related expenditures and their timing.

Duffy, John, Jr. and David B. Johnson (1979). "Study of Costs and Earnings of Bay Shrimp Fishermen in Louisiana." Contract Number 03-7-042-35132, Louisiana State University, Baton Rouge, Louisiana.

This survey was conducted to develop 1977 economic data on the inshore shrimping industry located in the Louisiana parishes of St. Mary, Lafourche, and Terrebonne. Economic information was gathered on mean average landings of shrimp for various boat sizes, as well as mean family size and total family

income due to shrimping. Data were also gathered on total variable costs, total fixed costs, and net revenue by vessel size. Other data gathered included information on marketing channels, and subjective appraisals of the problems confronted by recreational and commercial shrimpers. Although much data were obtained, and despite elaborate measures taken to obtain the cooperation of the interviewees, there was considerable reluctance on the part of the shrimpers to reveal catch, income, or even cost data.

Dugan, J.E., and G.E. Davis (1993). Applications of Marine Refugia to Coastal Fisheries Management. Can. J. Fish. Aquat. Sci., 50:2029-2042.

Marine fisheries refugia, unaltered areas that serve as sources of replenishment, can potentially compensate for recruitment and ecosystem over fishing and enhance fishery yields for some coastal stocks. The efficacy of Refugia in fisheries management is virtually untested, despite the existence of many marine parks and reserves. Evidence from existing marine reserves indicates that increased abundance, individual size, reproductive output, and species diversity occurred in a variety of marine species in refuges of various sizes, shapes, and histories in communities ranging from coral reefs to temperate kelp forests. Fishery yield enhancement in areas surrounding refuges occurred in the few studies where yields were examined. The export of propagules required to enhance fisheries in areas surrounding refugia adds a level of complexity to the design of fishery refugia beyond that of terrestrial reserves. Fishery refugia design should consider species life histories, oceanographic regimes, habitat quality, and socioeconomic factors. Further evaluation of existing marine refuges and the investigation of experimental refugia over appropriate time spans will help resolve questions of optimal sizes, shapes, and distribution of fishery refugia.

Dugas, Ron, Rick Leard, and Mark Berrigan (1991). A Partial Bibliography of Oyster Cultch Materials and Resource Management Projects. Gulf States Marine Fisheries Commission, P.O. Box 726, Ocean Springs, MS, July, 12 pp.

This bibliography primarily focuses on research and management projects dealing with the use of various clutch materials and planting methods. It also includes citations of past management projects.

Dumas, Chris and Troy Schmitz (1995). Measuring the Impact of Environmental Regulations. American Journal of Agricultural Economics, 77(5):1172-1176.

In this paper, we examine the domestic welfare effects of environmental regulations in the context of distorted trade markets.

Dunham, Denis (1992). Food Cost Review. Agricultural Economic Report No. 672, Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture, 1301 New York Avenue, N.W., Washington, D.C., 46 pp.

Food prices, as measured by the Consumer Price Index (CPI), increased 1.2 percent in 1992, less than half the 1991 price increase of 2.9 percent. The 1992 increase was the lowest since 1967, when the index rose 0.9 percent. Higher charges for processing and distribution mainly accounted for the 1992 increase. The prices farmers received for commodities, as measured by the farm value of USDA's market basket of foods, declined 2.5 percent. The farm value share of the food dollar spent in grocery stores in 1992 was 26 percent, down from 27 percent in 1991. The farm-to-retail price spread of USDA's market basket of foods rose 2 percent, partly reflecting higher prices of inputs, such as labor.

Dunn, James W. and James S. Shortle (1988). "Agricultural Nonpoint Source Pollution Control in Theory and Practice." Marine Resource Economics, 5(3):259-270.

The theory of efficient policy instruments for agricultural pollution control has been evolving. Some new developments suggest that policies using financial incentives to encourage desirable farming practices are superior to those focusing on runoff directly or restrictions of farming practices. However, the theoretical models used to derive such results make assumptions about conditions that may not hold. As a result, implementation of the findings of such models is not necessarily routine. This article attempts to summarize these studies and interpret their implications for agricultural nonpoint source pollution control for the Chesapeake Bay.

Dupont, D.P. (1987). "Input Substitution and Rent Dissipation in the British Columbia Commercial Salmon Fishery." Draft report, University of British Columbia.

The paper presents a short run model of a fishing firm in a limited entry fishery subject to vessel level input restrictions. Cross sectional data from the British Columbia commercial salmon fishery are used to test for the presence of input substitutability. Inferences may then be made about the ability of the fisherman to dissipate rent from the fishery. The choice of this fishery is appropriate, since it was one of the first to adopt limited entry licensing to combat the problems generated by years of open access fishing.

Dupont, D.P. (1990). "Rent Dissipation in Restricted Access Fisheries." Journal of Environmental Economics and Management, 19:26-44.

Restricted access fisheries, created to solve the open access problem of rent dissipation, have not been successful. Three common sources of dissipated rent are input substitution, fleet redundancy, and fleet composition. Regulators on the west coast of Canada have focused on finding solutions for the first source. This paper questions the wisdom of past policy by developing and implementing a method for measuring rent dissipation in restricted access fisheries. Results from the British Columbia salmon fishery suggest that regulators should concentrate instead on improving fleet composition and removing excess vessels.

Dupont, D.P. (1991). "Testing for Input Substitution in a Regulated Fisheries." American Journal Agricultural Economics, February, 155-164.

Input restrictions are commonly used to prevent rent dissipation in fisheries. This paper examines whether these schemes are successful by calculation the degree of input substitution between restricted and unrestricted inputs. Conventional elasticities of substitution cannot be used when the firm faces controls on the use of some inputs. In this case, the appropriate measure of substitution, the elasticity of intensity, must be used. Data from the British Columbia salmon fishery provide evidence of input substitution possibilities for two vessel types. These results call into question the usefulness of input control schemes.

Dupont, D.P. (1993). "Price Uncertainty, Expectations Formation and Fishers' Location Choices." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

This paper deals with the effects of uncertain output prices upon



fishers' location choices. It employs ARIMA models to construct the price forecasts used by fishers in a model that generates expected profits for three fishing locations in the British Columbia salmon fishery. A random utility model of fishing location choice is then estimated using two different sets of regressors. The first is expected seasonal profit and its variability. The second is expected wealth and its variability, where expected wealth is taken to be the sum of the known preseason wealth and the expected profitability of a given fishing location. Results show that expected profitability is a significant determinant of fishing location choice but that expected wealth plays an even bigger role. This suggests that there is a type of income or stock effect present in decisions made by fishers. The results also provide evidence that the variability of profits or wealth is generally a less significant component in regard to fishing location choice. In fact, some fishers thrive on greater variability, thereby providing some evidence of the risk loving behavior typically attributed to fishers. This is not the case, however, for all fishers since some are found to be risk neutral and even risk averse.

Dupont, D.P. (1993). "Price Uncertainty, Expectations Formation and Fishers' Location Choices." Marine Resource Economics, 8(3):219-247.

This paper deals with the effects of uncertain output prices upon fishers' location choices. It employs ARIMA models to construct the price forecasts used by fishers in a model that generates expected profits for three fishing locations in the British Columbia salmon fishery. A random utility model of fishing location choice is then estimated using two different sets of regressors. The first is expected seasonal profit and its variability. The second is expected wealth and its variability, where expected wealth is taken to be the sum of the known preseason wealth and the expected profitability of a given fishing location. Results show that expected profitability is a significant determinant of fishing location choice but that expected wealth plays an even bigger role. This suggests that there is a type of income or stock effect present in decisions made by fishers. The results also provide evidence that the variability of profits or wealth is generally a less significant component in regard to fishing location choice. In fact, some fishers thrive on greater variability, thereby providing some evidence of the risk loving behavior typically attributed to fishers. This is not the case, however, for all fishers since some are found to be risk neutral and even risk averse. Given the finding that fishers do respond to economic incentives, one policy implication concerns the ability of fisheries managers to alter the dispersion of fishers over fishing locations via the adjustment of the economic incentives by means of differential royalty taxes. A second policy implication results from the finding of risk loving behavior. This calls into question models that assume risk averse behavior and predict a dominance of corp sharing contracts over wage contracts.

Dupont, Diane P. and Shelley A. Phipps (1991). "Distributional Consequences of Fisheries Regulations." Canadian Journal of Economics, 24(1):206-220.

An empirical methodology for evaluating fisheries regulations in terms of both rent gains and employment losses is proposed. A royalty tax and a change in catch distribution among competing vessel types are compared with the status quo of restricted access. The case study is the British Columbia commercial salmon fishery. Results suggest that rent gains associated with the alternatives are not always sufficient to compensate for losses in fishing income.

Dybas, Cheryl Lyn (1997). Appetite for Slow-Reproducing Fish Breeds Worry Over Stocks. The Washington Post, October 27, 4 pp.

The grenadier, a deep sea, slow growing fish for which little biological information exists, off the coast of California may be overfished and is causing concern amongst fishermen and biologists.

Dyer, Christopher L. and Richard L. Leard (1992). "Folk Management in the Oyster Fishery of the United States Gulf of Mexico." Forthcoming: American Anthropologist.

This paper proposes folk management as cultural practices having a conservative function in fishery management. Folk management is defined and described and its role in the management of oysters in the U.S. Gulf of Mexico discussed. The sociocultural impact of folk management on oyster management within the states of Florida, Alabama, Mississippi, and Louisiana. Oystering communities within these states are described as natural resource communities (NRCs) and the application of folk management concepts is discussed with recognition of the unique nature of NRCs that has facilitated the development of user assisted management or comanagement.

Dyer, Christopher L. and Mark Moberg (1992). "The 'Moral Economy' of Resistance: Turtle Excluder Devices and Gulf of Mexico Shrimp Fishermen." Forthcoming: Marine Anthropological Studies.

This article examines how shrimp fishermen in two communities on the Gulf of Mexico have responded to federal regulations requiring the use of Turtle Excluder Devices (TEDs) on shrimp trawlers. Coming at a time of contraction in the fishery due to low producer prices and high operating costs, TED regulations have engendered intense opposition in many areas. Resistance to TEDs stems from shrimpers' perception that the regulations are an unjust threat to their livelihoods. Such beliefs are not unlike those underlying other spontaneous resistance movements, such as agrarian uprisings of the poor and dispossessed. Recommendations for alternatives are made that would provide incentives for conservation while lessening the economic hardship of shrimpers and their families.

Dyer, Christopher L., Duane A. Gill, and J. Steven Picou (1992). "Social Disruption and the Valdez Oil Spill: Alaskan Natives in a Natural Resource Community." Sociological Spectrum, 12:105-126.

This study presents a conceptual model for examining the social impacts of the Valdez oil spill on natural resource dependent communities. Data on social and subsistence disruption experienced by Alaskan natives are analyzed for two time periods: 1989 and 1990. The results reveal substantial uncertainty and disruption, with indications of changing patterns for long term social impacts. The study concludes with recommendations for restoration and recovery suggested from the results of our data analysis and the natural resource community model.

Eales, James and James E. Wilen (1986). "An Examination of Fishing Location Choice in the Pink Shrimp Fishery." Marine Resource Economics, 2(4):331-351.

This article analyzes fishing location choices made by pink shrimp (Pandalus jordani) fishermen fishing off the coast of northern California. Data were gathered for 17 commercial vessels making 3000 net sets over a season. A simple multiple choice logit model was used to examine whether recent information on success in various regions aids in explaining location

choice. Results suggest that fishermen do account for economic factors in a manner consistent with economic theories of choice.

Earth Council and Institute for Research on Public Expenditure (1997).

Economic Incentives for Sustainable Development. Draft Report. P.O. Box 2323-1002, San Jose , Costa Rica, and Oranjestraat 8, 2514JB The Hague, The Netherlands.

The first and imperative step for government policy in realizing the right incentive structure is to identify and reduce subsidies with adverse effects on the environment as well as on the overall efficiency of the economy. This report aims to present sound analyses of government interventions and to come forward with suggestions to promote a general policy move towards reducing environmentally damaging subsidies.

Easley, J.E., Jr. (1982). "A Preliminary Estimate of the Payoff to Investing in a Turtle Excluder Device for Shrimp Trawls." Final report prepared for Monitor International and The Center for Environmental Education in cooperation with the National Marine Fisheries Service.

This analysis looks at the economic feasibility of adoption of a turtle excluder device (TED) based on private costs and benefits. That is, can fishermen be expected to adopt the gear on its own merits. This analysis excludes social costs that affect the decision to require TED use.

Easley, J.E., Jr. (1988). "An Analysis of Recent Price Trends and Sources of Revenue in the East Coast Swordfish Fishery." Prepared for the South Atlantic Fishery Management Council, 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699.

This report summarizes recent price trends in the swordfish and related fisheries. While selected tuna prices have increased recently, deflated regional average prices, and relative prices, do not show the spectacular changes that conventional wisdom leads us to believe. This is not to dispute recent prices offered, for example, for bluefin, but suggests that quantities are still (through 1987) sufficiently small that average real prices and relative prices show something less than spectacular movement.

Based on revenue profiles, tuna are obviously important to the longline fishery, particularly in the Gulf region and the NEUS region. Bigeye and yellowfin may be increasingly important in explaining revenue in the CARB region, based on 1986-1987 changes. Additional years' revenue profiles will allow tracking the share of various species in longline trip revenue.

Easley, J.E., Jr. (1992). "Selected Issues in Modeling Allocation of Fishery Harvests." Marine Resource Economics, 7(2):41-56.

This paper examines selected issues that are likely to be important in improving economists' models of allocation of fishery harvests between commercial and recreational harvesters. Valuation in the commercial sector is emphasized with harvests of a species subject to allocation viewed as an input into production of consumer fishery goods. Substitution possibilities in production of these consumer goods, and data generally available to economists are discussed as motivations for application of the general equilibrium derived demand to valuation in the commercial sector. Conceptual and empirical problems in applying the function are discussed.

Easley, J.E., Jr. and Fred J. Prochaska (1987). "Allocating Harvests Between Competing Users in Fishery Management Decisions:

Appropriate Economic Measures for Valuation." Marine Fisheries Review, 49(3):29-33.

This paper discusses decision making by fishery managers and economists' efforts to model fisheries. Arguments and casual evidence are presented to suggest that distributional issues matter to managers. The paper concludes with a practical measure suggested as a means of achieving efficiency goals while simultaneously resolving conflicts between competing harvesting groups.

Easley, J.E., Jr., and Walter N. Thurman (1993). "Valuation of Commercial Harvests: Practical Considerations for Fishery Management of the General Equilibrium Derived Demand and a Recent Application." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

This paper focuses on multimarket welfare analysis in markets other than the vessel sector of a species in question and subject to a change in regulation. The technique to be applied is the general equilibrium (GE) or multimarket derived demand surplus analysis. The derived demand conceptual framework was developed by Hicks (1963) and by Diewert (1971). The Welfare significance of general equilibrium surplus areas was established by Just, Hueth, and Schmitz (1982). The analytical base for measurement of welfare effects in horizontally related markets (e.g. species other than the one being subjected to reduced harvests, and which substitute in production for the given species), and an early application to a fishery are discussed in Thurman and Easley (1992). The next section briefly sketches out the conceptual framework for estimating multimarket effects in a single market (e.g., the vessel level). Following this conceptual section, we present results from applying the GE derived demand model to the North Carolina flounder fishery.

Easley, J.E., Jr., Chuck Adams, Walter N. Thurman, and Joel Kincaid (1993). "The Derived Demand for Commercially Harvested Gulf and South Atlantic King Mackerel: Partial and General Equilibrium Models." Project Report to the Gulf of Mexico Fishery Management Council, March 29, 42 pp.

This study estimates both partial and general equilibrium demand models for the commercial king mackerel fishery using monthly, vessel level data covering the 1977-1991 time period in the Gulf of Mexico and south Atlantic regions. Estimated changes in consumer welfare given hypothetical shifts in commercial king mackerel harvest allocations are provided.

Easley, J.E., Jr., V. Kerry Smith, Michael K. Wohlgenant, and Walter N. Thurman (1989). "Allocating Recreational - Commercial Fishery Harvests: Literature Reviews and Preliminary Work Toward Modeling the Issue." Executive Summary, Final Report Submitted to the Gulf and South Atlantic Fisheries Development Foundation, Inc., GASAFDFI No. 37-09-28750/6000, NMFS Award No. NA88-WC-H-06070, March 24, 20 pp.

This project has reviewed the fishery economics literature relevant to valuing harvests in an allocation model. It also presents results of early exploration into many of the issues that will have to be addressed in developing a derived-demand based model for allocation of commercial and recreational harvests. At this point, we are optimistic that such a model can in fact be developed as a guide to economists and managers; however, much remains to be modeled and refined before an allocation model can be applied.

Eckert, R. (19??). The Enclosure of Ocean Resources. Chapters 1 and 2.

Sources of market failure, public ownership of resources, equity versus efficiency, and government failure and its sources.

Economics and Statistics Office (1988). "Fishing Trends and Conditions in the Southeast Region, 1988." Southeast Fisheries Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, 45 pp.

This report contains information on conditions and developments in the fishing industry in the southeastern U.S. during 1988. The information was provided by Federal and State fishery reporting specialists located in major fishing ports throughout the southeast. The landings and value data in the report are preliminary and subject to change.

Economics and Trade Analysis Division (1993). "Economic Considerations for Management of Gulf Reef Fish." National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Blvd., St. Petersburg, FL.

A review of the available data for the reef fish fishery in the Gulf of Mexico.

Economics and Trade Analysis Division (1993). "Stock Assessment and Fishery Evaluation for Coastal Migratory Pelagic Fish of the South Atlantic and Gulf Coasts." National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Blvd., St. Petersburg, FL., April.

Coastal migratory pelagics SAFE report which includes a history of federal management, the 1993 mackerel stock assessment panel report, and the socioeconomic panel report.

Economics and Trade Analysis Division (1995). "Data and Information Provided to the Gulf Council's Socio-Economic Panel." Volumes 1 and 2, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, April.

A 2 volume report summarizing existing commercial and recreational data for the coastal migratory pelagics fishery in the southeastern region.

Economic Investigations (1992). "Economic Analysis of Effort Reduction in the Multispecies Groundfish Fishery." Report to the Groundfish (Multispecies) Committee, Woods Hole Laboratory, Northeast Fisheries Science Center, National Marine Fisheries Service, April, 52 pp.

This document presents results of the economic analysis of a consent decree to rebuild groundfish stocks that included the following management scenarios for analysis: (1) 10% reductions in days at sea during each of the first 5 years; (2) 25% reductions in days at sea during 1993 and 1995; and (3) the full 50 % reduction in days at sea in 1993. Background material on basic economic concepts and evaluation methodologies is presented. Demand analyses are reported and used to predict prices, harvest revenues, and consumer benefits during 1993-2002. Revenue predictions are combined with various cost scenarios in an analysis of net economic benefits of 50% reductions in days at sea. Results are summarized and discussed.

Economic Issues Working Group (2000). Hydroelectric Project Relicensing.

Draft Phase I Report, March, 45 pp.

An assessment of economic methods to value hydroelectric relicensing applications is made in this report. The techniques used by various federal agencies to conduct analyses required by federal and state law are reviewed. A section summarizing the types of analyses that should be used is presented. The report focuses primarily on short run impacts that directly affect the river environment. One major omission is the lack of a long run or downstream impacts in the assessment of costs and benefits. The assertion that changes in national income can be used to estimate net benefits is suspect. No concise recommendations are provided nor are any multi-discipline analyses suggested.

Economic Research Laboratory (1973). "Basic Economic Indicators, Shrimp 1947-72." Current Fisheries Statistics No. 6131, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, United States Department of Commerce, Washington, D.C., June, 55 pp.

This report brings together pertinent economic, technological, and biological data that reflects the behavior of the U.S. shrimp fishery.

Economic Research Laboratory (1974). "Basic Economic Indicators, American and Spiny Lobsters, 1947-73." Current Fisheries Statistics No. 6272, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, United States Department of Commerce, Washington, D.C., August, 58 pp.

This report brings together pertinent economic, technological, and biological data that reflects the behavior of the U.S. lobster fishery.

Edwards, Steven F. (1989). "On Estimating Household Demand for Outdoor Recreation from Property Values: An Exploration." Northeastern Journal of Agricultural and Resource Economics, 18(2):140-148.

This paper explores how hedonic price analysis might be used to estimate the surplus benefits of local outdoor recreation when distance to the recreational site is captured in property values. The model is characterized by the endogenous choice of distance to a local recreational area by households in coastal property markets and by the capitalization of proximity in property values. Equilibrium occurs when the reduction in the cost of a property due to a marginal increase in distance to the recreational area equals the associated loss in recreational surplus resulting from increased travel costs. The theoretical model is applied in an exploratory analysis of the "demand" for distance to the nearest public beach from which total surplus benefits are estimated.

Edwards, Steven F. (1989). "Allocating Fish Stocks Between Commercial and Recreational Fisheries: An Economics Primer." Draft report, Economics Investigation Unit, Northeast Fisheries Center, National Marine Fisheries Service, Woods Hole, MA 02543, September 13, 111 pp.

An earlier draft of "An Economics Guide to Allocation of Fish Stocks Between Commercial and Recreational Fisheries." See below.

Edwards, Steven F. (1989). "Evidence of Structural Change in Demand for Seafood." Draft report, NEFC, Woods Hole, MA 02543.

The results from graphical and two-phase regression analyses of time series data on seafood consumption and relative prices corroborated beliefs that preferences for seafood strengthened in response to medical evidence that seafood promotes nutrition and health. The graphical analyses revealed steady increases in per capita consumption of seafood since the 1960's despite concurrent increases in the price of seafood relative to income, to all foods, and to the prices of other meats. Also, the mid-1960's and mid-1980's appeared to mark periods of accelerated change. Two-phase regression analyses of reduced form models of both per capita consumption and the price of seafood quantified these apparent trends and identified points of accelerated change. Some implications of these results for specifying demand models, for estimating consumer benefits, and for projecting fishing pressure on wild stocks were highlighted.

Edwards, Steven F. (1990). "An Economics Guide to Allocation of Fish Stocks Between Commercial and Recreational Fisheries." NOAA Technical Report NMFS 94, Nov.

The increasingly intense competition between commercial and recreational fishermen for access to fish stocks has focused attention on the economic implications of fishery allocations. Indeed, one can scarcely find a management plan or amendment that does not at least refer to the relative food and sport values of fish and to how expenditures by commercial and recreational fishermen on equipment and supplies stimulate the economy. However, many of the arguments raised by constituents to influence such allocations, while having an seemingly "economics" ring to them, are usually incomplete, distorted, and even incorrect. This report offers fishery managers and other interested parties a guide to correct notions of economic value and to the appropriate ways to characterize, estimate, and compare value. In particular, introductory material from benefit-cost analysis and input-output analysis is described and illustrated. In the process, several familiar specious arguments are exposed.

Edwards, Steven F. (1991). "A Critique of Three "Economics" Arguments Commonly Used to Influence Fishery Allocations." North American Journal of Fisheries Management, 11(2):121-130.

Three familiar "economics" arguments commonly used by commercial fishermen and anglers to influence fishery allocations are specious in the context of fishery valuation. The "market argument" and the "revenues argument" are based on incorrect notions of economic value and are focused on purely financial matters such as expenditures and revenues instead of on consumer and producer surpluses. In contrast, the "cumulative-value argument" sometimes addresses correct notions of economic value, but the values of commercial and sport fisheries are not properly compared. A conceptually correct benefit-cost analysis of allocation between the two fisheries is illustrated.

Edwards, Steven F. (1994). "An Economics History of U.S. Fisheries and Their Management." Draft report, Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA.

The history of fisheries management in the U.S. and its implications for the future. Five case studies are presented, including Gulf of Mexico shrimp, and conclusions are drawn based on the success of fisheries management in these fisheries. Overall, a bleak future is predicted for the fishing industry.

Edwards, Steven F. (1994). "Beyond ITQs." Position Paper presented at

the Limited Access Workshop, Seattle, Washington, November 1-3.  
National Marine Fisheries Service, Northeast Fisheries Science  
Center, Woods Hole, MA, October.

The paper discusses whether ITQs are a resource right or a usufructuary or harvest right. As a harvest right, the ITQ holder does not have the ability to set TAC and may still have incentives to act inefficiently; highgrading of catch. ITQ may, however, be a step toward resource rights since New Zealand ITQ holders have appropriated management rights from the government by agreeing to harvest less than the TAC, enforce rules, and fund research in the orange roughy and abalone fisheries.

Edwards, Steven F. (1994). Managing Marine Fisheries by Controlled Access: What Alternatives are Available? In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Alternatives to control (or limit) access to marine fish resources are classified on the basis of who owns the legal right of exclusion. Throughout the world, participation in some marine fisheries is controlled by the state through allocation of usufructuary rights of access or harvest. License limitation, individual transferable quotas, and area licensing are forms of usufructuary rights controlled by state regulatory regimes.

Unappreciated, though, are many instances of participation being controlled by collectives of individual harvesters. In collective choice regimes, commercial fishermen and others with interests in a marine fish resource contract access as well as usufructuary rights.

Finally, private property regimes also control access to marine fish resources. In this alternative, participation is authorized by a single, private entity. The entity could be a commercial fishing or fish processing corporation, a charter fishing enterprise, or conceivably, a conservation organization, depending on the initial allocation of rights and the opportunity to market the rights.

In addition to controlling access, the right to exclude people from a fish resource strongly favors both conservation and economic efficiency, especially when exclusion is coupled with the rights of management and market transfer and when rights are backed by the state. Judging from theory and case studies, usufructuary rights alone have yielded limited conservation and economic benefits from use of fish and other natural resources under a state regulatory regime. However, usufructuary rights are widely believed to be superior to open access, and they are a necessary phase in the evolution of potentially better collective choice or private property regimes.

Edwards, Steven F. (1994). "Ownership of Renewable Ocean Resources." Marine Resource Economics, 9(3):253-273.

Much of the recent fisheries economics literature promotes usufructuary rights policies to lessen the dissipation of resource rents. However, this literature does not count institutional inefficiencies which result from rent seeking and the principal agent problem when a centralized government controls access to renewable ocean resources. As a result, the efficiency of usufructuary rights programs, including ITQs, throughout the economy could be exaggerated. From a dynamic standpoint, though, usufructuary rights policies remain an important avenue for residual claimants to contract for less attenuated institutions of common or private property rights. These conclusions are drawn from a survey of the property rights and public choice literatures.

Edwards, Steven F. (1998). "Rent-Seeking in the U.S. Atlantic Sea



Scallop Fishery." Draft report, Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA, October, 25 pp.

Two phases of rent-seeking in the U.S. Atlantic sea scallop fishery are described. The phase that began when the Magnuson-Stevens Act was implemented in 1977 and lasted over 10 years saw harvesters overcapitalize the fishery to capture residual rents in the public domain. Rents were apparently dissipated within approximately three years after which the marginal revenue product of effort remained below the marginal cost of effort given resource abundance each year. Resource depletion and high fixed costs led to negative average vessel (accounting) profit during the mid-1980's and throughout the 1990's due, in part, to non-transferable effort quotas and closed areas beginning in 1994. Despite these dire financial circumstances, however, efforts to develop property rights in the fishery beginning during the late 1980's have been stymied by heterogeneities among fishermen, especially the potential distribution of rents if effort quotas that were implemented by Amendment 4 to the New England Fishery Management Council's Sea Scallop Fishery management Plan became transferrable. Estimates of ownership of effort quotas indicate that 75 percent of the sea scallopers own one or fewer full-time-equivalent permits compared to 5-10 permits owned by 4 percent of the quota holders. The paper concludes with a discussion of future prospects in the fishery related to exclusive areas and sea scallop culture.

Edwards, Steven F. and Glen D. Anderson (1984). "Land Use Conflicts in the Coastal Zone: An Approach for the Analysis of the Opportunity Costs of Protecting Coastal Resources." Journal of the Northeastern Agricultural Economics Council, 14:73-81.

The implicit price (hedonic) equation for the housing market in a coastal town in southern Rhode Island was estimated using a conditional Box-Cox maximum likelihood procedure. Linear, log-linear, and semi-log functional forms were rejected with 95% confidence. Estimates of marginal implicit prices for water related attributes (view of, frontage on, and proximity to a coastal salt water pond) derived from these rejected models were quite different from those determined from the optimal functional form. This result has important ramifications for public policy, as is shown in an example, since these attributes were found to be highly valued in the housing market.

Edwards, Steven F. and Cynthia Carlson (1989). "On Estimating Compensation for Injury to Publicly Owned Marine Resources." Marine Resource Economics, 6(1):27-42.

The public has an established right to use certain marine resources including fish stocks, beaches, and marine waters, for certain purposes, including recreational fishing. Rights in public resources are held in trust by federal and state governments for the public, both now and in the future. Given public rights, we not only argue that minimum willingness-to-accept-compensation (WTA) is the theoretically correct measure of economic damages when a publicly owned marine resource is injured, but that it is, in fact, feasible to measure WTA and therefore, WTA should be used to estimate compensation. Two utility theoretic approaches for welfare analysis, that use Hausman's (1981) method and the contingent valuation method, are outlined.

Edwards, Steven F. and Frank J. Gable (1991). "Estimating the Value of Beach Recreation from Property Values: An Exploration with Comparisons to Nourishment Costs." Ocean & Shoreline Management, 15:37-55.

This paper explores how the economic value of recreation at local public beaches can be estimated from nearby property values. The negative effect of distance from the nearest public beach on coastal property values was used to reveal recreational value. Estimates of recreational value were also compared to the costs of beach nourishment that were calculated from a simulation of beach erosion caused, in part, by increases in relative sea-level. Although a complete benefit-cost analysis was not feasible, the results suggest that potential losses of recreational value by local users alone could establish the efficiency of beach nourishment projects.

Edwards, Steven F. and Steven A. Murawski (1993). Potential Economic Benefits from Efficient Harvest of New England Groundfish. North American Journal of Fisheries Management, 13: 437-449.

Dissipation of economic benefits from commercial harvest of the multispecies groundfish resource in U.S. waters off New England was estimated from dynamic optimization of empirical bioeconomic models. Net economic value could be maximized by an estimate 70% reduction in fishing effort, resulting in a sevenfold increase in the size of the harvestable resource and a threefold increase in sustainable yield. Under these conditions, fishers, seafood industries, and consumers could benefit from an estimated US\$150 million increase in sustainable net economic value each year, including about \$130 million in resource rent. Consumers in the region could profit further from the nutritional and health benefits of up to an additional 6 lb of fresh fish per capita. Policies to achieve these benefits are highlighted. Augmenting state ownership of the resource with market transfers of individual effort or harvest quotas is preferred to open access, but common property or individual private property regimes are more likely to benefit society.

Edwards, S., Al Bejda, and A. Richards (1991). "Sole Ownership of Living Marine Resources: A Possible Solution to Overfishing." Draft report prepared by the Northeast Fisheries Center Research Council, September 5.

This report explores the meaning and application of sole ownership of living marine resources with the purpose of promoting an informed and timely discussion of its utility and feasibility. The major findings and conclusions are: (1) fish resources are the only publicly owned natural resources in the United States that are both widely subject to open access and available to harvesters at no cost; (2) both overfishing and the resultant dissipation of billions of dollars of resource value result from the absence of well defined (i.e. permanent, enforceable, and transferable) property rights to the living marine resources; (3) fishery quotas and effort restrictions address only the symptoms of open access, not the fundamental problem of a lack of property rights to the resource and its productivity; (4) the incentives that influence decisions of fishermen and public officials are fundamental to the presence of both "market failure" and "government failure;" (5) sole ownership--not limited entry or ITQs--could provide resource owners with the necessary incentives to husband the fish resources.

Edwards, S., Allen J. Bejda, and A. Richards (1993). "Sole Ownership of Living Marine Resources." NOAA Technical Memorandum NMFS-F/NEC-99, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Region, Northeast Fisheries Science Center, May, 21 pp.

This report explores the meaning and application of sole ownership of living marine resources. Its purpose was to promote an informed and timely

discussion of the utility and feasibility of instituting common property or individual private property in marine waters. Accordingly, why open access results in the depletion of fish resources was explained; both public and private forms of sole ownership were characterized; sole ownership was contrasted with other forms of controlled access, particularly limited entry and ITQs under a state ownership regime; the political economy of natural resource management was surveyed/ and a sole ownership strawman of the Northwest Atlantic groundfish resource in U.S. waters was begun.

Ehui, Simeon K., Thomas W. Hertel, and Paul V. Preckel (1990). "Forest Resource Depletion, Soil Dynamics, and Agricultural Productivity in the Tropics." Journal of Environmental Economics and Management, 18:136-154.

A two-sector dynamic model for agriculture and forestry is proposed. Agricultural yields are a function of the rate of deforestation, the forest stock, and purchased inputs. We examine the impact of changes in the social discount rate, net returns to agriculture, and direct marginal benefits of the forest stock benefits on the optimal deforestation path under the assumption of a quadratic agricultural yield function. Finally, steady-state comparative static analysis is conducted.

Eichenberg, Tim and Debby Crouse (1995). TEDs AA: Comments Due Nov 13. E-mail, Center for Marine Conservation, Washington, D.C., November, 3 pp.

A call for written comments to the National Marine Fisheries Service protesting the petition by the Texas Shrimp Association to repeal TED regulations in offshore waters of the Gulf of Mexico.

Eichhorn, W., R. Henn, K. Neumann, and R.W. Shephard (ed.) (1982). Economic Theory of Natural Resources. Physica-Verlag, Wurzburg-Wien, Germany.

This book contains 42 articles on natural resource economics that represent the state of the art covering six subject areas including production, extraction, exploration, markets, energy modeling, environment, and welfare.

Eldridge, Peter J. (19??). "The Relationship of (M), the Instantaneous Natural Mortality Rate, to Population Stability of Highly Fecund Species." Draft report, National Marine Fisheries Service, 15 pp.

This article explores the relationship between the natural mortality rate (M) and recruitment under the hypothesis that the recruitment process determines the natural mortality rate. Under this hypothesis if one understands the relationship between the natural mortality rate and recruitment, one will be able to determine the impact of fishing upon recruitment because fishing can be considered as a controllable component of the natural mortality rate. Stated somewhat differently, the natural mortality rate, set by the recruitment process, determines how much fishing a resource can sustain.

Eldridge, Peter J. (1995). "Preliminary 1995 Gulf Red Snapper Landings." Memorandum, Southeast Regional Office, 9721 Executive Center Drive North, National Marine Fisheries Service. April 20, 3 pp.

Quota monitoring report with comparison to 1994 and 1993 landings.

Ellerbrock, Michael J. and J. Walter Milon (1984). "A Methodology for Estimating the Economic Impact of Sportfishing Tournaments." Sea Grant Project No. IR-81-9, Grant No. NA80AA-D-00038, Report Number 59, Florida Sea Grant College, Department of Food and Resource Economics, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL, March, 27 pp.

This report presents one methodology for estimating the economic impact of sportfishing tournaments. It discusses objectives, personnel and computational needs, survey design, sample selection, survey distribution and collection, data analysis, multiplier effects, report of findings, and methodological limitations. References are made to economic impact studies previously conducted of three offshore sportfishing tournaments in Florida. This report can be used as a guide for local groups to conduct their own studies of the economic impact of sportfishing tournaments and other short term entertainment events.

Ellis, James E. (1972). "The Use of Electricity in Conjunction with a 12.5 Meter (Headrope) Gulf-of-Mexico Shrimp Trawl in Lake Michigan." NOAA Technical Report, NMFS, SSRF-653, March, iv + 10 pp., 11 Figs., 4 Tables.

The catching efficiency of a 12.5 meter standard shrimp trawl and the same trawl fitted with three different electrode array systems with power on and power off was investigated. The standard trawl caught 1.54 times or 54.2% more kilograms of fish than the electrode equipped trawl with power off. The electrode array hanging across the mouth area of the trawl acted as a visual stimulant and thus reduced the trawl's catch rate. Overall, the electrical trawl with power on caught 1.19 times or 19.0% more kilograms of fish than the electrical trawl with power off. Array 2 with power on had the best catch rate; 1.86 times or 86.9% more kilograms of fish than the power off catch rate. The avoidance of fish to an electrode array was more than offset with the catch rate of array 2 with power on. The dominance patterns of the catches with each system tested did not change significantly with the exception of chub catches with array 2 with power on. Length selectivity was highly significant for chubs caught with arrays 2 and 3 with power on. No significant length selectivity occurred with the other species landed.

Elnagheeb, Abdelmoneim H. and Jeffrey L. Jordan (1995). Comparing Three Approaches That Generate Bids for the Referendum Contingent Valuation Method. Journal of Environmental Economics and Management, 29:92-104.

Two Monte Carlo willingness-to-pay (WTP) models were constructed to compare three approaches that generate bids for the referendum contingent valuation method (CVM). In the first model, WTP was normally distributed, and in the second, was log normally distributed. The bid approaches were those of K.L. Boyle, M.P. Welsh, and R.C. Bishop (1988), J.C. Cooper (1993), and an ad hoc third approach. Some properties of these approaches were discussed. WTP estimates from the three approaches were compared to the true value. Results indicated that Boyle et al. s approach was preferred, especially when variation in WTP was low. Estimates from the three approaches became more comparable as WTP Variability and sample size increased.

Emami, Ali, Lewis E. Queirolo, and Richard S. Johnston (1994). Trade Restrictions and Trade Reversal: Lessons from the U.S.-Canada Herring Dispute. Marine Resource Economics, 9(1):31-45.

This paper analyzes international trade in value added products when free trade and perfect competition in the market for an intermediate product,

such as raw fish, are the exception rather than the rule. The study presents models showing that restrictions on the exportation of raw fish from an exporting country can make possible monopsony behavior by fish processors in a rival exporting country and they outline the market behavior of the players under such circumstances. The analysis illustrates how, under such conditions, economic forces contribute to the creation of trade disputes. It further demonstrates how expansion of the demand for final product may, through trade reversal pressures, dilute the market power of the processor monopsony and make trade restriction policies irrelevant.

Emerson, William (1996). The Economic Aspects of the Management of Living Marine Resources. Presentation for PECC Task Force on Fisheries Development and Cooperation, Symposium on The Interrelationship Between Fisheries Management Practices and International Trade, Wellington, New Zealand, November, 8 pp.

The aims of the study are to review the management practices and experiences in member countries with a view to identifying common problems and considering how economic instruments can be applied to improve the efficiency of the management of living marine resources; to consider the economic aspects of managing living marine resources, including aspects of structural adjustment, the management of fisheries with multiple species, highly migratory species, and straddling stocks; and to identify areas where international coordination and collaboration may prove useful.

Emiliani, Dennis A. (1977). " Equipment for Holding and Releasing Penaeid Shrimp During Marking Experiments." Fisheries Bulletin, 69(1):247-251.

Personnel of the National Marine Fisheries Service, Biological Laboratory at Galveston, Texas, have conducted numerous mark recapture experiments to obtain information on the movement, growth, and mortality of penaeid shrimp. These experiments were carried out under a variety of conditions at sea and in coastal bays. Several types of specialized equipment were developed to overcome problems of holding, handling, and releasing shrimp during the marking phase of these experiments. Some of this equipment has been described previously by Costello (1964). Holding tanks, a cooling unit, and two devices used to transport shrimp to the sea floor are described here.

Engle, Carole R. and Pierre-Justin Kouka (1995). Potential Consumer Acceptance of Canned Bighead Carp: A Structural Model Analysis. Marine Resource Economics, 10(2):101-116.

The effects of socio-demographic factors on consumer ratings of product attributes of an experimental canned bighead product were analyzed. OLS techniques were used to evaluate the effects of experience consuming other canned fish products, race, gender, age, and income on the taste, texture, appearance, and aroma of canned bighead. A logit analysis was then used to measure the effects of these variables on binary choice variables related to preference comparisons and willingness to pay as much for canned bighead as for canned salmon and canned tuna. Responses between the comparisons of canned bighead and canned salmon or canned tuna varied. Income, region, and gender significantly affected ratings on product attributes while taste variables significantly affected consumers willingness to pay as much for canned bighead as for canned tuna. Conditional probabilities showed more clearly the effects of age, income, and gender on taste ratings, the subsequent effects of taste on preferences, and ultimately on willingness to pay. Probabilities estimated showed that canned bighead competes more favorably with canned tuna than with canned salmon.

Engle, Carole R., Upton Hatch, and Scott M. Swinton (1988). "Factors Affecting Retail Grocery Demand for Seafood Products in East-Central Alabama and West-Central Georgia." Journal of the Alabama Academy of Science, 59(1):1-16.

This paper presents a detailed description of the grocery market for channel catfish as compared to other fish and seafood products. Data on monthly sales, volumes, product form, prices, and observed customer characteristics are presented for all seafood products in grocery stores and supermarkets within the sample area.

Englin, Jeffrey E. and Mark S. Klan (1990). "Optimal Taxation: Timber and Externalities." Journal of Environmental Economics and Management, 18:263-275.

The paper presents a model of the relationship between timber taxation and externalities. Optimal pigouvian taxation formulas are derived within this framework for common taxes. A simulation model of Douglas fir is used to estimate the size and direction of these effects. The results show that taxation policy can have a marked impact on the production of externalities, depending on tree species and land productivity.

Englin, Jeffrey E. and J.S. Shonkwiler (1994). "A Latent Variables Approach to the Travel Cost Model." Draft Report, Department of Agricultural Economics, University of Nevada, Reno, Nevada, August, 24 pp.

One of the difficulties facing researchers who wish to apply travel cost models is the construction of a travel cost variable. This difficulty results from the need to include travel costs as an explanatory variable when applying conventional econometric procedures. This paper approaches the problem from the maintained hypothesis that travel costs are inherently unobservable. The research develops an econometric approach that views travel costs as an unobserved latent variable. The latent variable approach utilizes indicators to capture the role of individual travel costs in recreational demand models. The latent variables approach has at least two advantages over conventional approaches. One, the indicators can include both traditional components such as travel time and travel distance and nontraditional components such as the scenic beauty of a trip. Second, the estimation procedure results in each indicator being valued in dollar terms.

English, Donald B.K., Warren Kriesel, Vernon R. Leeworthy, and Peter C. Wiley (1996). Economic Contribution of Recreating Visitors to the Florida Keys/Key West. Linking the Economy and Environment of Florida Keys/Florida Bay. Outdoor Recreation and Wilderness Assessment Group, Southern Forest Research Station, USDA-Forest Service, Athens, GA, November, 22 pp.

An economic impact analysis is conducted to estimate the economic contribution (sales, employment, and income) of both resident and visitor recreational uses of the Florida Keys and Florida Bay to the Monroe County economy and the South Florida regional economy. Also provided is an overview of the baseline economy with definitions of various concepts used in the analysis, a summary of results, and an explanation of the methodology used in the analysis.

Environmental Health Center (199?). Covering the Coasts. A Reporters Guide to Coastal and Marine Resources, National Safety Council, Product Number 12994-0000, 1019 19th Street, N.W., Suite 401, Washington, D.C.

This guidebook broadly defines the marine and coastal environments, the resources themselves, and also the wide range of challenges that must be effectively addressed in managing them. It does not attempt to answer all questions. Rather, it is intended to provide reporters with information that can aid them in more effectively pursuing answers on their own.

Epperly, Sheryan P., Joanne Braun, Alexander J. Chester (1995). "Aerial Surveys for Sea Turtles in North Carolina Inshore Waters." Fishery Bulletin, 93:254-261.

Aerial surveys for sea turtles conducted in Core Sound and Pamlico Sound, North Carolina, 1989-91 indicated a spring immigration by the turtles into these sounds and a summer time dispersal followed by emigration in the late fall and early winter. Estimates of density in Core Sound were greater than estimates for Pamlico Sound. Core Sound density estimates were comparable to those reported for the lower Chesapeake Bay and those reported from offshore pelagic surveys in the region. The data were analyzed by strip- and line-transect methods, and the choice of analysis did not influence the overall conclusions. The abundance of sea turtles in the inshore waters of the Atlantic Coast at densities at least as great as in the ocean indicates the importance of these estuarine habitats for the foraging and development of immature turtles.

Epperly, Sheryan P., Joanne Braun, and Allison Veishlow (1995). "Sea Turtles in North Carolina Waters." Conservation Biology, 9(2):384-394.

Until the turn of the century the inshore waters of North Carolina harbored populations of sea turtles large enough to support a commercial fishery. Based on a 4 to 5 year record of sighting reports by the public, interviews of recreational fishermen, and records kept by commercial fishermen, the waters continue to provide important developmental habitats for loggerhead, green, and Kemp's ridley sea turtles. Leatherback and hawksbill sea turtles infrequently entered the inshore waters. Reports from the public and commercial fishermen indicated that sea turtles were present offshore North Carolina all year and were present in inshore waters April through December. Sea turtles were encountered most frequently in the Atlantic Ocean, but seasonal encounters in some inshore waters, such as Core and Pamlico Sounds, often were greater. In early May large numbers of leatherbacks were sighted in the ocean and moved northward along the beach. Reported sighting of leatherbacks declined markedly by late June. Based on incidental captures by commercial fishermen loggerhead turtles were the most numerous species in Pamlico and Core Sounds (80%), followed by green (15%) and Kemp's ridley sea turtles (5%). Most captured turtles were immature, and all were released alive. The abundance of immature sea turtles in North Carolina inshore waters serves to emphasize that southeast U.S. estuaries are important habitats for these threatened and endangered species. This recognition supported the decision of the U.S. National Marine Fisheries Service to extend the requirement for turtle excluder devices in shrimp trawls to inshore areas during the entire year; full implementation of these requirements was achieved by December 1994.

Epperly, Sheryan P., Joanne Braun, Alexander J. Chester, Ford A. Cross, John V. Merriner, and Patricia A. Tester (1995). "Winter Distribution of Sea Turtles in the Vicinity of Cape Hatteras and Their Interactions with the Summer Flounder Trawl Fishery." Bulletin of Marine Science, 56(2):547-568.

Aerial surveys of North Carolina offshore waters between Cape Lookout

and the North Carolina/Virginia state line were conducted November 1991-March 1992 to determine the abundance of sea turtles in the area where a trawl fishery for summer flounder was active and to relate the distribution of turtles to physical oceanographic processes.

Erhardt, Nelson M. (1990). "Review of the Age and Growth of Swordfish Xiphias gladius in the Northwestern Atlantic." ICCAT Working Document SCRS/90/, Division of Biology and Living Resources, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida.

The primary goal of the work reported here was to thoroughly review the original data pertaining to the age and growth of swordfish in the western north Atlantic ocean. A second objective was to derive age-at-length curves that would accurately represent growth of swordfish throughout its entire life span.

Etkins, Robert and Edward S. Epstein (1982). "The Rise of Global Mean Sea Level as an Indication of Climate Change." Science, 215:287-289.

Rising mean sea level is a significant indicator of global climate change. The principal factors that can have contributed to the observed increases of global mean sea level in recent decades are thermal expansion of the oceans and the discharge of polar ice sheets. Monitoring of global mean sea level, ocean surface temperatures, and the earth's speed of rotation should be complemented by monitoring of the polar ice sheets, as is now possible by satellite telemetry. All parts of the puzzle need to be examined in order that a consistent picture emerge.

Etzold, David J. and J.Y. Christmas (eds.) (1977). "A Comprehensive Summary of The Shrimp Fishery of the Gulf of Mexico United States: A Regional Management Plan." Technical Report Series, No. 2, Part 2, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, November, 20 pp.

This document lists the goals and objectives of the regional plan to manage the shrimp resources of the Gulf of Mexico and to provide for optimum sustained benefits for the nation. The fishery is described, shrimp producing zones of the region are identified for preservation and improvement, and statistics collection is facilitated. The plan promotes research in bio-social-economic model development, development of a regional management plan, and extension education of shrimp fishermen.

Etzold, David J., J.Y. Christmas, and Vito Blomo (1983). "Analysis of Environmental and Demand Factors on Shrimp Production in the Gulf and South Atlantic United States, Impact on Harvesters and Processors." Report I in Assessment of Shrimp Industry Potentials and Conflicts, Volume One, Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August, 191 pp.

The basic purposes of this study are to review the relevant literature and using the best available data provide estimates of the impact of these environmental and demand changes on the future potential size composition and volume of the harvest from wild shrimp in the South Atlantic and Gulf of Mexico. Also, to estimate the impact of future domestic supply from the harvest of U.S. wild stocks on the movement of harvesters in and out of the shrimp industry in the study area.



Everett, John (1984). "Fisheries Development." Chapter 5 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Fisheries development has been the subject of persistent debate in the federal government. Most of this debate centers on the appropriate federal role in fisheries development. The issue is complicated by the venerable tradition of government intervention in industries other than fisheries. The debate is of interest to the recreational fishing community because, within the National Oceanic and Atmospheric Administration (NOAA), the National Marine Fisheries Service (NMFS) has a policy that the fishing industry is composed of commercial and recreational segments and that our programs should benefit both segments.

Faber, Mark I. (1990). "Swordfish Logbook Newsletter 1990." NOAA Technical Memorandum, NMFS-SEFC-270, USDOC, NOAA, NMFS, SEFC, 75 Virginia Beach Drive, Miami, FL 33149.

This newsletter is designed to explain how the swordfish logbook data are being used and to provide some results and summaries of these data. Topics include (1) a description of the process involved in handling the logbook forms, (2) summaries for the 1987 and 1988 data of numbers of swordfish, tunas and billfish caught by area with associated effort in hooks fished, (3) preliminary summaries of the 1989 data, (4) maps of reported fishing locations for 1987-89, (5) discussion of the revisions to the 1991 logbook forms, and (6) names of people to contact for further information.

Fable, William A. and Eugene L. Nakamura (1986). "Observations on Purse-Seined King Mackerel (Scomberomorus cavalla) and Spanish Mackerel (Scomberomorus maculatus), March 1983-March 1986." NOAA Technical Memorandum NMFS-SEFC-183, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory, 3500 Delwood Beach Road, Panama City, Florida, April, 44 pp.

This report summarizes the observations made and data collected on fishing activities, species in the catches, and size and sex composition of mackerels while aboard purse seine vessels from March 1983 through March 1986.

Fable, William A., Jr., Lee Trent, Gilbert W. Bane, and Steven W. Ellsworth (1987). "Movements of King Mackerel, Scomberomorus cavalla, Tagged in Southeast Louisiana, 1983-85." Marine Fisheries Review, 49(2):98-101.

King mackerel (1,968) caught by hook and line off Grand Isle, Louisiana were tagged with internal anchor tags and released between 1983 and 1985. Fifty five tags were recovered, providing an overall return rate of 2.8 percent. King mackerel tagged in winter were returned in every month of the year, but always from the Grand Isle area or westward as far as Veracruz, Mexico. All but one summer tagged fish were returned in winter months from the Grand Isle area, Key West, Florida, or from Mexico. Winter tagged fish were mostly large and mostly remained in the northwest Gulf. Summer tagged fish tended to stay in the northwest Gulf if they were large, or migrated to south Florida or Mexico if they were small. The data indicate that the northwest Gulf maintains resident large king mackerel year round, and that these fish mix with smaller migrants from south Florida and Mexico to some

degree in warmer months.

Fagnan, Sheila (1990). "Halibut Individual Quotas: A Benefit Cost Analysis." Internal DFO Report, Fishing Resource Analysis Unit, Program Planning and Economics Branch, fisheries and Oceans - Pacific Region, August.

A cost benefit analysis of the proposed adoption of the IVQ management system including transferability after the two year pilot program is presented in this report. The move to a nontransferable IVQ based management system is predicted to provide net benefits totaling \$140 million (ranging from \$75 to \$210 million) while even greater benefits are expected when quota becomes transferable.

Fair, Ray C. (1971). "The Optimal Distribution of Income." The Quarterly Journal of Economics, 85(4):551-579.

This paper attempts to derive bounds on the optimal distribution of income under a particular set of value judgements.

Farmer, Charles H., III, Charles W. Boardman, and J. David Whitaker (1977). The South Carolina Shrimp Fishery. South Carolina Wildlife and Marine Resources Department, Division of Marine Resources, Office of Conservation and Management, Educational Report Number 8, July, 49 pp.

This report provides a broad perspective of the current shrimp management program of the Division of Marine Resources. The report describes the South Carolina fishery, the life cycle of shrimp, and the management program.

Fare, Rolf (1984). The Existence of Plant Capacity. International Economic Review, 25(1):209-213.

This paper characterizes two definitions of plant capacity. The weaker notion requires that when some factors are bounded and the others variable, the least upper bound of the output rate is finite. The stronger notion requires in addition that the supremum is attained.

Fare, Rolf and Daniel Primont (1995). The Opportunity Cost of Duality. Draft report, Department of Economics, SIU-C, Carbondale, IL, April, 12 pp.

A dual representation of a technology, e.g., a cost function, may not contain all of the technological information, but it will contain all of the information about input vectors that would be chosen by a cost minimizing firm. At least this much is clear for deterministic technologies. The main question addressed in this paper is whether the same can be said about stochastic technologies and their dual representations. Despite some pessimism expressed in the stochastic frontier literature on this question, we argue that there is no extra cost imposed in the stochastic case. Thus, the conclusion of this paper is: JUST DUAL IT!

Fare, Rolf, Shawna Grosskopf, and James E. Kirkley (1999). Capacity Measures and Their Relevance for Productivity. Presentation at the Fishery Productivity Workshop, Department of Agricultural and Resource Economics, University of Maryland, College Park, February 19-20.

An application of a Malmquist index to panel data that decomposes productivity into technical efficiency, capacity utilization over time, and

technical change.

Fare, Rolf, Shawna Grosskopf, and James E. Kirkley (1999). An Introduction to DEA. Presentation at the Fishery Productivity Workshop, Department of Agricultural and Resource Economics, University of Maryland, College Park, February 19-20.

An introduction to Data Envelopment Analysis; definitions, sources in literature, a brief tutorial, and an example.

Fare, Rolf, Shawna Grosskopf, and James E. Kirkley (1999). Multi-Output Capacity Measures and Their Relevance for Productivity. Presentation at the Fishery Productivity Workshop, Department of Agricultural and Resource Economics, University of Maryland, College Park, February 19-20.

In this paper measures of capacity following those suggested Leif Johansen (1968) are developed. By taking advantage of Shepard's duality, Shepard (1970) see also Fare and Primont (1995), both primal and dual multi-output measures of capacity can be derived. Having generalized the capacity utilization measures, we show how these may be entered into measures of productivity. In particular, following DeBorger and Kerstens (1999), we show how the Malmquist direct and indirect productivity measures are related to our various measures of capacity utilization efficiency.

Fare, Rolf, Shawna Grosskopf, and Mary Norris (1997). Productivity Growth, Technical Progress, and Efficiency Change in Industrialized Countries: Reply. American Economic Review, 87(5): 1040-1043.

A response to the Ray and Desli (1997) comment on the uniqueness of the Fare et al. (1994) decomposition of the Malmquist productivity index.

Fare, Rolf, Shawna Grosskopf, and Pontus Roos (1996). On Two Definitions of Productivity. Economic Letters, 53: 269-274.

Caves et al. in 1982 introduced a productivity measure that does not proceed from a continuous time presentation. They named these indexes after Sten Malmquist who in 1953 used ratios of distance functions to formulate quantity indexes in the consumer context. In a later paper, Diewert proposed an alternative definition of productivity also based on distance functions, which he attributed to Hicks and Moorsteen. In this letter we provide necessary and sufficient conditions for the Malmquist productivity index to equal the Hicks-Moorsteen index.

Fare, Rolf, Shawna Grosskopf, C.A. Knox Lovell, and Suthathip Yaisawarng (1993). Derivation of Shadow Prices for Undesirable Outputs: A Distance Function Approach. The Review of Economics and Statistics, Notes: 374-380.

Many production activities generate undesirable byproducts in conjunction with the desirable outputs they produce. Pittman (1983) showed how to adjust productivity calculations, and Fare et al. (1989) showed how to adjust efficiency measures, in the presence of undesirable outputs. Here, we show how to estimate output distance functions as frontiers to generate shadow values of the undesirable outputs that are required to make both types of adjustment. An empirical application is provided.

Fare, Rolf, Shawna Grosskopf, C.A. Knox Lovell, and Carl Pasurka (1989). Multilateral Productivity Comparison When Some Outputs are Undesirable:

A Nonparametric Approach. The Review of Economics and Statistics, 71(1): 90-98.

Multilateral productivity comparisons of firms producing multiple outputs, some of which are undesirable, are obtained by making two modifications to the standard Farrell approach to efficiency measurement. The restriction that production technology satisfy strong disposability of outputs is relaxed to allow for the fact the undesirable outputs may be freely disposable, and the efficiency measures are modified to allow for an asymmetric treatment of desirable and undesirable outputs. Performance measures that satisfy these requirements are calculated as solutions to programming problems. The methodology is applied to a sample of mills producing paper and pollutants.

Farr, Sam (1997). The Oceans Act of 1997. H.R. 2547, House of Representatives, Washington, D.C., August.

A bill to create a Stratton-like Commission to assess the past, present, and future of our ocean resources.

Fedler, Anthony J. (1984). "Elements of Motivation and Satisfaction in the Marine Recreational Fishing Experience." Chapter 10 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

The purpose of this chapter is threefold: examine motivations for going marine recreational fishing (MRF), determine how these motives are related to satisfaction with the MRF experience, and assess the usefulness of this knowledge about motivations and satisfactions in the construction of conservation, development, and management strategies.

Fedler, Anthony J. and David M. Nickum (1993). "The 1991 Economic Impact of Sport Fishing in Maine." U.S. Fish and Wildlife Service Cooperative Grant Agreement No. 14-48-0009-93-1248, American Sportfishing Association, 1033 Fairfax Street, Suite 200, Alexandria, VA.

This report summarizes the economic impacts of angler expenditures on the state's economy. U.S. anglers who went fishing in Maine during 1991 spent over \$190 million for goods and services in many businesses throughout the state. The economic effects of these expenditures totaled over \$336 million and rippled throughout the economy with impacts felt throughout the state. These impacts sustained old jobs and created new ones. They generated sales and income taxes that benefitted government agency programs at all levels. In many small communities, angler expenditures were central to economic health and growth.

Fedler, Anthony J. and David M. Nickum (1993). "The 1991 Economic Impact of Sport Fishing in Massachusetts." U.S. Fish and Wildlife Service Cooperative Grant Agreement No. 14-48-0009-1248, American Sportfishing Association, 1033 Fairfax Street, Suite 200, Alexandria, VA.

This report summarizes the economic impacts of angler expenditures on the state's economy. U.S. anglers who went fishing in Massachusetts during 1991 spent over \$401 million for goods and services in many businesses throughout the state. The economic effects of these expenditures totaled over

\$766 million and rippled throughout the economy with impacts felt throughout the state. These impacts sustained old jobs and created new ones. They generated sales and income taxes that benefitted government agency programs at all levels. In many small communities, angler expenditures were central to economic health and growth.

Fedler, Anthony J. and David M. Nickum (1994). "The 1991 Economic Impact of Sport Fishing in Florida." Paper presented at the Atlantic States Marine Fisheries Commission Workshop on Socio-Economic Data and Analysis for Recreational Fisheries Management in Annapolis, Maryland, July, 18 pp. by the Sport Fishing Institute, 1010 Massachusetts Avenue, N.W., Washington, D.C.

This report summarizes the economic impacts of angler expenditures on the state's economy. U.S. anglers who went fishing in Florida during 1991 spent over \$1.9 billion for goods and services in many businesses throughout the state. The economic effects of these expenditures totaled nearly \$3.5 billion and rippled throughout the economy with impacts felt throughout the state. These impacts sustained old jobs and created new ones. They generated sales and income taxes that benefitted government agency programs at all levels. In many small communities, angler expenditures were central to economic health and growth.

Fee, Russ (1992). "Shrimp-Bycatch Conference Explores the Options." National Fisherman, August: 23-25.

An article summarizing the international conference on bycatch in Buena Vista, Florida. The meeting consensus is that finfish bycatch is real and that it either will be eliminated or used in ways that will be biologically and economically sound. Yet three days of talk led to no definite solutions. Bycatch does not lend itself to simple answers.

Fee, Russ (1993). "Shrimpers can Expect a Decline as Louisiana Marshland Recedes." National Fisherman, 73(11):18-19.

Louisiana's coastal wetlands are slowly sinking into the sea and with them may be going the future of the \$400 million a year shrimping industry of the northern Gulf of Mexico.

Feenberg, Daniel and Edwin S. Mills (1980). Measuring the Benefits of Water Pollution Abatement, Academic Press, New York.

This book is about measuring the benefits of water pollution abatement, but the techniques also apply to air pollution abatement. It is about the benefit side of the benefit - cost calculus.

Feeny, David, Susan Hanna, and Arthur F. McEvoy (1996). "Questioning the Assumptions of the Tragedy of the Commons Model of Fisheries." Land Economics, 72(2):187-205.

The tragedy of the commons argument predicts the overexploitation of resources held in common. There is a great deal of evidence to the contrary. The descriptive accuracy and predictive validity of six categories of assumptions of the argument are examined. These include individual motivations, characteristics of individuals, nature of institutional arrangements, interactions among users, the ability of users to create new arrangements, and the behavior of regulatory authorities. The tragedy of the commons argument is seriously incomplete. It needs to be replaced by a richer and more accurate framework.

Ferguson, Maury O. and Albert W. Green (1987). "An Estimate of Unsurveyed Coastal Recreational Boat Fishing Activity in Texas." Marine Fisheries Review, 49(2):155-161.

The Texas Parks and Wildlife has conducted on site creel surveys to estimate saltwater sportfishing landings and pressure since 1974. Boat trips originating from launch sites such as marina wet slips and boathouses at private residences have not been surveyed and were not included in landings and pressure estimates. In 1982 a mail survey of boat owners registered in Texas was conducted to estimate the percent of saltwater sportfishing boat trips that were missed by the on site survey and the percent and number of registered Texas boat owners who use their boats for saltwater fishing. From 25 to 30 percent of all saltwater sportfishing boat trips originated from unsurveyed launch sites. Therefore, the TPWD on site boat survey underestimates saltwater sportfishing boat pressure by 355,000 to 426,000 trips annually. Of the estimated 79,200 saltwater fishing boat owners, 18 percent never launched from surveyed sites in 1982.

Fernandez, Antonio (1995). Entry Into Force of the Management Recommendations Adopted by ICCAT. Memorandum from the International Commission for the Conservation of Atlantic Tunas, Madrid, Spain, to the Secretary of State, Washington, D.C., October.

The text of the recommendations for bluefin tuna fishing in the eastern Atlantic Ocean and Mediterranean Sea, bluefin tuna fishing in the western Atlantic Ocean, limitation of catches of southern Albacore, and Atlantic swordfish are presented in this memorandum.

Fernandez, Antonio (1995). Report of the 1995 SCRS Meeting. International Commission for the Conservation of Atlantic Tunas, Madrid, Spain, October.

This report contains the proceedings of the Plenary Session, including the Executive Summaries on the species, and the appendices attached to the Report.

Ferrara, Ida and Paul C. Missios (1996). Transboundary Renewable Resource Management: A Dynamic Game With Differing Noncooperative Payoffs. Marine Resource Economics, 11(4):239-245.

Recent conflicts over fish stocks, such as salmon and turbot, have revived public interest in the optimal management of transboundary renewable natural resources. Given that enforcement of binding contracts is often a major obstacle, dynamically consistent or self-enforcing contracting, as proposed by Vislie (1987), must be relied upon. A more general model is developed which recognizes that, in the absence of a cooperative agreement, two countries may enjoy differing economic payoffs. The predictions of the model are consistent with, and provide insights into, the particulars of recent disputes.

Fischer, Stanley (1997). Capital Account Liberalization and the Role of the IMF. International Monetary Fund, September, 13 pp.

The author addresses disagrees with the contention that the recent market turbulence in East Asia does suggests that the IMF capital account is more often the source of economic difficulties and risk rather than benefit, and therefore that capital account liberalization should be delayed as long as possible.

Fisher, Anthony C., John Krutilla, and Charles J. Cicchetti (1972).

"The Economics of Environmental Preservation: A Theoretical and Empirical Analysis." The American Economic Review, 62:605-619.

Krutilla has argued that private market allocations are likely to preserve less than the socially optimal amount of natural environments. Moreover, he concludes that the optimal amount is likely to be increasing over time - a particularly serious problem in view of the irreversibility of many environmental transformations. This paper extends Krutilla's discussion in two ways. First, a model is developed for the allocation of natural environments between preservation and development. Then, the model is applied to the Hells Canyon issue of whether it should remain in its natural state or be developed as a hydroelectric facility.

Fisher, Mark R. and Robert B. Ditton (1991). "Characteristics of U.S. Tournament Billfish Anglers in the Atlantic Ocean." Draft report submitted to Marine Fisheries Review, pp. 20.

A mail survey of 1,984 U.S. billfish tournament anglers was completed to examine their fishing activity, attitudes, trip expenditures, consumer's surplus, catch levels, and management preferences. A sample of 1,984 anglers was drawn from billfish tournaments in the western Atlantic Ocean during 1989. A response rate of 61 percent was obtained. Anglers averaged 13 billfish trips per year, catching a billfish 40 percent of the time. Eighty-nine percent of billfish caught were released with less than one billfish per year per angler retained. Catch and retention rates varied by region. Expenditures averaged \$1,600 per trip, but varied by region. The annual consumer's surplus was \$262 per angler, but increased to \$448 per angler if billfish populations were to increase. An estimated 7,915 tournament anglers in the U.S. western Atlantic spent \$179 million in pursuit of billfish in 1989. Anglers opposed management options that would diminish their ability to catch a billfish, but supported options limiting the number of billfish landed.

Fisher, Mark R. and Robert B. Ditton (1992). "A Social and Economic Characterization of the U.S. Gulf of Mexico Recreational Shark Fishery." Draft report, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843, July.

A mail survey of tournament shark anglers and party boat shark anglers was completed to examine their fishing activity, attitudes, trip expenditures, and consumer surplus. A sample of 700 shark anglers was selected from tournaments in the Gulf of Mexico during 1990, and a sample of party boat shark anglers was drawn from Port Aransas, Texas party boat anglers during the summer of 1991. A response rate of 58% (excluding non-deliverables) was obtained from tournament anglers. The sample of party boat shark anglers was too small to provide useful results. Tournament shark anglers reported fishing an average of 58 days per year and targeted sharks and other large marine species. Tournaments occupy a small portion of their fishing effort. If this group of anglers were not able to fish for sharks, one-third indicated no other species would be an acceptable substitute, while others were willing to substitute other large marine species. Shark trip expenditures averaged \$197 per trip with a consumer surplus of \$111 per trip. Based on MRFSS estimates of the number of shark fishing trips, we estimate a total of \$43 million was spent by shark anglers in the Gulf of Mexico with a consumer surplus of \$24 million for a gross value of the shark fishery of \$66 million. MRFSS estimates of the number of sharks landed indicate an equivalent use value of \$183 per shark. Logit model results appear incorrect, no explanation of consumer surplus derivation is given, no underlying economic model is provided.

Fisher, Mark R. and Robert B. Ditton (1993). "A Social and Economic Characterization of the U.S. Gulf of Mexico Recreational Shark Fishery." Marine Fisheries Review, 55(3):21-27.

A mail survey of tournament shark anglers and party boat shark anglers was completed to examine their fishing activity, attitudes, trip expenditures, and consumer surplus. A sample of 700 shark anglers was selected from tournaments in the Gulf of Mexico during 1990, and a sample of party boat shark anglers was drawn from Port Aransas, Texas party boat anglers during the summer of 1991. A response rate of 58% (excluding non-deliverables) was obtained from tournament anglers. The sample of party boat shark anglers was too small to provide useful results. Tournament shark anglers reported fishing an average of 58 days per year and targeted sharks and other large marine species. Tournaments occupy a small portion of their fishing effort. If this group of anglers were not able to fish for sharks, one-third indicated no other species would be an acceptable substitute, while others were willing to substitute other large marine species. Shark trip expenditures averaged \$197 per trip with a consumer surplus of \$111 per trip. Based on MRFSS estimates of the number of shark fishing trips, we estimate a total of \$43 million was spent by shark anglers in the Gulf of Mexico with a consumer surplus of \$24 million for a gross value of the shark fishery of \$66 million. MRFSS estimates of the number of sharks landed indicate an equivalent use value of \$183 per shark.

Fisheries Committee (1998). The Implications of Responsible Post-Harvesting Practices and Trade on Responsible Fishing. Directorate for Food, Agriculture, and Fisheries, OECD, Spain, 11 pp.

This paper provides an outline of the study into the implications of responsible post harvesting practices and trade. The paper describes the suggested content of the national reports. Post harvest practices include market demand for fish or various size, trade patterns, policies by management agencies, etc., that impact fishermen s behavior to circumvent responsible fishing practices.

Fisheries and Oceans (1990). "Proposal for Monitoring and Enforcement of the Halibut Fishery Under Individual Vessel Quotas." Department of Fisheries and Oceans, Canada, August.

The monitoring and enforcement plan suggested in this paper is broken down into six parts: reporting process, observer program, Department of Fisheries and Oceans enforcement, penalties, self enforcement, and public participation that are discussed separately. Discussion on the personnel and funding requirements for the program are also outlined.

Fisheries and Oceans (1991). "1991 Halibut Management Plan." Department of Fisheries and Oceans, Canada, April.

A Canada halibut fishery individual vessel quota (IVQ) program is outlined in this report.

Fisheries Statistics Division (1997). Processed Products Survey. Version 3.0, National Marine Fisheries Service, Silver Spring, MD, December.

The National Marine Fisheries Service and its predecessor agencies have been collecting seafood processing data since 1918. This survey is the only comprehensive review of the U.S. seafood industry conducted annually.

Fitzpatrick, John (1995). Technology and Fisheries Legislation. TCPA/8P7,



Technical Consultation on the Precautionary Approach to Capture Fisheries (TCPA), FAO Scientific Meeting, Lysekil, Sweden, June, 22 pp.

This document reviews technology adopted by the fishing industry. It explains how technology required to comply with international conventions has been further developed and adopted, on a voluntary basis, by the industry. It is suggested that to assess risks and reduce uncertainty, a thorough analysis should be made of the world's fleets of fishing vessels and fishing gear; that there should be a standard method for the measurement and classification of fishing vessels and gear; and that fleet restructuring policies should be elaborated on the basis of a full understanding of technology required for the implementation of conservation and management measures (if they are to be effective) as well as to benefit industry. The document concludes that requirements for the adoption of technology, or developments thereof, should be incorporated in legislation.

Fitzpatrick, John and Chris Newton (1998). Assessment of the World's Fishing Fleet 1991-1997. Greenpeace International, January.

The expansion in the size and capacity of the world's fishing fleets, as noted by the FAO 1995 State of World Fisheries and Aquaculture, has continued to increase over the period 1991 - 1996. A slow down in new additions occurred in 1995 and 1996. In 1997, the orders for new vessels show a return to construction of vessels with large tonnage. Throughout the period, additions to the world's fleet continue to exceed deletions. In this connection, there is evidence that the fishing fleets are not being restructured, that capacity is not being effectively reduced, and that states with open registers are increasing their capacity.

Flaaten, Ola (1991). "Bioeconomics of Sustainable Harvest of Competing Species." Journal of Environmental Economics and Management, 20:163-180.

The concept of maximum sustainable yield frontier (MSF) is applied to a Gause model of competing species. Maximizing the present value of economic rent under costless harvesting with positive discount rate implies optimal stock levels below the locus of MSF stocks. Maximizing economic rent with positive harvesting costs and zero discount rate implies optimal stock levels above the locus of MSF stocks. It is shown how the optimal steady state stock levels are altered by changes in the exogenous discount rate, harvest prices, and harvest costs. Optimal harvesting might imply harvesting of one of the two species at a loss.

Flaaten, Ola, Knut Heel, and Kjell G. Salvanes (1995). "The Invisible Resource Rent in Limited Entry and Quota Managed Fisheries: The Case of Norwegian Purse Seine Fisheries." Marine Resource Economics, 10(4):341-356.

This paper tests empirically to what extent the rent in a limited entry and quota managed fishery is capitalized in the value of a vessel license. This is done by comparing the profitability of Norwegian purse seine vessels that received their licenses for free, to the profitability of vessels whose licenses were purchased along with the vessel. In a sample of forty three vessels, thirty one had obtained their licenses for free when the licensing system was introduced in 1973, whereas twelve owners had bought licensed vessels later. Costs and earnings data for 1983 and 1984 show that those vessels that received free licenses have a significantly higher profitability than the other vessel group. The main reason for this is that the owners who bought licensed vessels had the highest capital costs. Policy implications of

these findings are indicated.

Flagg, V.G. (1977). "Optimal Output and Economic Rent of the Eastern Tropical Pacific Tuna Fishery: An Empirical Analysis." American Journal of Economics and Sociology, 36(1):19-32.

An empirical analysis of the yellowfin tuna catch of the eastern tropical Pacific tuna fishery indicates that the difference between maximum sustainable yield and maximum economic yield varies directly with the cost per unit of effort and inversely with the price per unit of output. If costs do not rise, the difference approaches zero in a fishery characterized by expanding demand and price. If overcapitalization were avoided, resource rent could be maximized.

Fletcher, Jerald J., Richard E. Howitt, and Warren E. Johnston (1988). "Management of Multipurpose Heterogeneous Fishing Fleets Under Uncertainty." Marine Resource Economics, 4:249-270.

This paper describes an approach to modeling fisheries in policy analysis when the population dynamics are not well known and the fleet is composed of a variety of multipurpose vessels. An empirical application of the methodology to the northern California Dungeness crab fishery is discussed. A multivariate time series intertemporal (year to year) relationships for a simulation model describing both within season and year to year fleet behavior. Appropriate modifications for the simulation model parameters reflect alternative policy scenarios. The analysis of the simulation outcomes provide insight into fleet response to several management alternatives that have been considered for the crab fishery.

Flood, R.C. (1991). The Cost and Earnings of Capture Fisheries, Aquaculture, and Livestock Industry - A Selective Annotated Bibliography. FAO Fisheries Circular No. 843, Fishery Development Planning Service, Fishery Policy and Planning Division, Fisheries Department, Food and Agriculture Organization of the United Nations, Rome, November, 32 pp.

This bibliography aims to facilitate access to recorded experience and data regarding the costs and earnings in fisheries and livestock industry, to stimulate the sharing of information and to broaden knowledge in the field.

Folsom, William B. (1995). World Swordfish Fishing, An Analysis of Swordfishing Operations Past - Present - Future. Draft Volume II. Africa and the Middle East, Office of International Affairs, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, Maryland.

Twelve African nations fishing for swordfish caught 2,166 tons in 1994. The majority of the catch was made by Morocco who caught 1,068 tons in the North Atlantic and Mediterranean Sea. Algerian fishermen caught 600 tons and Tunisian fishermen caught 234 tons in the Mediterranean while Ghanaian canoe fishermen landed 235 tons in the South Atlantic. The importance of the fishing grounds off West and Southwest Africa is not the harvest of African fishermen -- mostly artisanal canoe fishermen -- but rather the potential for significant catches by European flag or Asian flag fishermen. The Spanish swordfish fleet moved into the South Atlantic in 1986 and by 1994 reported a harvest of 7,937 tons -- as compared with 264 tons harvested by Angola, Benin, Ghana, Ivory Coast, Nigeria, South Africa, and Togo in these same waters in 1994. In the Mediterranean Sea the North African nations face problems associated with over exploitation during the past few decades that makes catching swordfish increasingly difficult. Kenyan fishermen reported modest

harvests of swordfish in 1990, but no recent harvest have been reported. Omani and Yemeni fishermen are landing small quantities of swordfish, but landings may increase in 1995 if various joint venture projects sought by Omani fishing companies can be finalized. The French Overseas Department of La Reunion has a swordfish fishery that lands about 400 tons annually; this fishery is growing.

Fontaine, Clark T. (1971). "Conversion Tables for Commercially Important Penaeid Shrimp of the Gulf of Mexico." U.S. Department of Commerce, NOAA, NMFS, Data Report 70, December, 9 pp.

Tables are divided by classifications commonly used by the industry to designate landings of whole or headless brown (Penaeus aztecus), white (P. setiferus), and pink (P. duorarum) shrimp. Data presented by sex and sexes combined for each species include shrimp that range from 70 to 235 mm total length.

Fontenot, Donna D., Richard E. Condrey, and Theodore B. Ford (1980). "A Menhaden Bibliography." Prepared for the Gulf States Marine Fisheries Commission, Ocean Springs, Mississippi by the Center for Wetland Resources, Louisiana State University, Baton Rouge, Louisiana, January, 105 pp.

A listing of a computerized bibliography of articles related to the menhaden fishery and its biology.

Fonyo, Carolyn M., Joan A. Browder, and Susan L. Brunenmeister (1983). "Dynamics of the Gulf of Mexico Shrimp Fleet, 1981." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida.

This study was designed to describe shrimp vessel mobility in the Gulf of Mexico in 1981 and to gain a better understanding of the dynamics of the shrimp fleet on a gulf wide scale toward the purpose of more effective management of the fishery.

Fonyo, Carolyn M., Joan A. Browder, and Susan L. Brunenmeister (1983). "Mobility Patterns and Characteristics of Shrimp Vessels Fishing Off Texas, 1981." NOAA Technical Memorandum NMFS-SEFC-120, U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149-1099.

This study identifies vessels fishing off Texas in 1981. Their mobility patterns in the Gulf of Mexico are determined. Seasonal fishing and port use patterns are determined. Physical vessel characteristics according to mobility pattern are identified. Vessel activity according to mobility pattern is determined. Relationships between vessel characteristics and activity are discovered. Lastly, the suitability of available data bases for further studies of fleet structure and behavior is assessed.

Food and Agriculture Organization Fisheries Department (1998). FAO Technical Working Group on the Management of Fishing Capacity. Preliminary Version, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, Food and Agricultural Organization of the United Nations, Rome, Italy, 41 pp.

The Technical Working Group on the Management of Fishing Capacity reviewed the various issues related to measurement and monitoring; management and reduction methods; broader policy and institutional considerations; as well as specific high seas aspects. The Technical Working Group (TWG) emphasized the timeliness of this meeting and stressed the crucial need for countries and the international community at large to urgently take steps to address and prevent overcapacity (overcapitalisation) as recommended by the Code of Conduct for Responsible Fisheries which the FAO Conference adopted in 1995. The TWG produced a wide consensus on the need: to develop more appropriate measurement methods and monitoring mechanisms, including fishing vessel registry; to give far greater emphasis to fleet monitoring and the assessment of fleet dynamics; to adopt policies which clearly specify access conditions; to give a greater priority to management methods aiming at adjusting rather than blocking the pervasive tendency for overfishing and overinvestment resulting from open access conditions; to reassess and strengthened management methods used and implementation procedure, in recognition that the applicability of available management methods would nevertheless remain situation specific; and to approach the reduction of fishing capacity with care, avoiding spillover effects and carefully controlling the induced effects of scrapping programmes. The TWG provided guidance and made a number of recommendations to better address and tackle these issues within national jurisdictions. The TWG also recognized that the high seas may be confronted with an even greater overcapitalization problem than EEZ fisheries due to the prevalence of rather open access conditions and the fact that there are at present no internationally agreed measure to cause states to control fishing capacity. It recommended that the 1995 UN Agreement and the FAO Compliance Agreement be urgently ratified. The TWG further suggested that complementary measures would be required, aiming in particular at: improving monitoring mechanisms for high seas fleets; strengthening and empowering regional fishery organizations; creating new organizations to ensure full coverage of the resource concerned; controlling the disposal ( dumping ) of excess national capacity in general, and of older vessels to developing countries in particular; and at addressing the growing importance of flags of convenience. Finally, the TWG felt that much more research work and institutional building efforts were still required at both national and international levels to improve present capacities to properly address the many issues pertaining to the effective control and reduction of fishing capacity.

Food and Agriculture Organization of the United Nations (1998).

Measurement and Monitoring of Fishing Capacity. Draft Report of Working Group #1, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 13 pp.

Definitions, methods of measurement, monitoring indicators for addressing excess capacity in global fisheries. Existing, target, and limit capacity are defined. Data requirements and recommendations are made to develop preliminary estimates of current capacity and to develop precise estimates of capacity. Estimation techniques are also discussed as an appendix. A basic system for monitoring and assessment is recommended with a recommendation for establishing an international registry of fishing vessel and boat characteristics.

Food and Agriculture Organization Fisheries Department (1998). Report of the Technical Working Group on the Management of Fishing Capacity. FAO Fisheries Report No. 586, FAO, La Jolla CA, April 15-18, Food and Agricultural Organization of the United Nations, Rome, Italy, 57 pp.

The Technical Working Group on the Management of Fishing Capacity reviewed the various issues related to measurement and monitoring; management and reduction methods; broader policy and institutional considerations; as well as specific high seas aspects. The Technical Working Group (TWG) emphasized the timeliness of this meeting and stressed the crucial need for countries and the international community at large to urgently take steps to address and prevent overcapacity (overcapitalisation) as recommended by the Code of Conduct for Responsible Fisheries which the FAO Conference adopted in 1995. The TWG produced a wide consensus on the need: to develop more appropriate measurement methods and monitoring mechanisms, including fishing vessel registry; to give far greater emphasis to fleet monitoring and the assessment of fleet dynamics; to adopt policies which clearly specify access conditions; to give a greater priority to management methods aiming at adjusting rather than blocking the pervasive tendency for overfishing and overinvestment resulting from open access conditions; to reassess and strengthened management methods used and implementation procedure, in recognition that the applicability of available management methods would nevertheless remain situation specific; and to approach the reduction of fishing capacity with care, avoiding spillover effects and carefully controlling the induced effects of scrapping programmes. The TWG provided guidance and made a number of recommendations to better address and tackle these issues within national jurisdictions. The TWG also recognized that the high seas may be confronted with an even greater overcapitalization problem than EEZ fisheries due to the prevalence of rather open access conditions and the fact that there are at present no internationally agreed measure to cause states to control fishing capacity. It recommended that the 1995 UN Agreement and the FAO Compliance Agreement be urgently ratified. The TWG further suggested that complementary measures would be required, aiming in particular at: improving monitoring mechanisms for high seas fleets; strengthening and empowering regional fishery organizations; creating new organizations to ensure full coverage of the resource concerned; controlling the disposal ( dumping ) of excess national capacity in general, and of older vessels to developing countries in particular; and at addressing the growing importance of flags of convenience. Finally, the TWG felt that much more research work and institutional building efforts were still required at both national and international levels to improve present capacities to properly address the many issues pertaining to the effective control and reduction of fishing capacity.

Food and Agriculture Organization of the United Nations and International Development Research Centre (1982). Fish ByCatch: Bonus from the Sea, Report of a Technical Consultation on Shrimp Bycatch Utilization held in Georgetown, Guyana, October 27-30, 1981. Ottawa Ont., IDRC, 163 pp.

The problem of postharvest loss derives from the carrying capacity of the shrimp trawlers, reflecting design, size, operational system, and cost. The term bycatch refers to all the fish and other organisms incidentally harvested by the trawling operations. In the past, all the bycatch was discarded into the sea and only the shrimp retained. This practice resulted in high losses from the discards. Now, it has become increasingly common to select and retain some marketable fish. Bycatch quantities are, therefore, no longer the same as the discards in every area where shrimp trawling occurs. Assessment is necessary for both the bycatch and the discards.

Foster, Kevin and Chris McCarron (1994). "Summary of Fishery Regulations for Atlantic Tuna Fisheries." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

This pamphlet was prepared to inform interested fishermen about the Atlantic Tuna fisheries regulations.

Fowle, Suzanne (1993). Fish for the Future: A Citizen's Guide to Federal Marine Fisheries Management. Center for Marine Conservation, Washington, D.C.

This guide explains how to become a fishery conservation activist. It describes the tools to advocate conservation through fishery management. In the guide is found background information on the terms and definitions used in fishery management, including gear types and management strategies; facts about the decline in fish populations and management failures; an explanation of the federal fishery management during this process; and suggestions on how to make your voice heard in Congress and at local public hearings and how to write effective letters.

Fowle, Suzanne and Rose Bierce (eds.) (1992). Proceedings of the Shrimp Trawl Bycatch Workshop, Center for Marine Conservation, November 22-23, 1991, St. Petersburg, Florida.

The proceedings of a workshop on shrimp bycatch including effects of shrimp trawl bycatch on finfish populations and ecosystems, socioeconomic effects of shrimp trawl bycatch, shrimp bycatch and fishery management, and ongoing research efforts.

Fowler, Sarah, Carl Safina, and Merry Camhi (1996). Shark News. Newsletter of the IUCN Shark Specialist Group, Volume 7, July, 16 pp.

A series of articles on shark tagging, population genetics, tag and release mortality, and telemetry and data storage tags.

Fox, William W., Jr. (1975). "Fitting the Generalized Stock Production Model by Least-Squares and Equilibrium Approximation." Fishery Bulletin, 73(1):23-37.

A least-squares method for fitting the generalized stock production to fishery catch and fishing effort data which utilizes the equilibrium approximation approach is described. A weighting procedure for providing improved estimates of equilibrium fishing effort and an estimator of the catchability coefficient are developed. A computer program PRODFIT for performing the calculations is presented. The utility and performance of PRODFIT is illustrated with data from a simulated pandalid shrimp population.

Fox, William W., Jr. (1990). "A Perspective on the Current State of Fisheries Statistics." Paper presented at the Woods Hole Oceanographic Institute Marine Policy Center, October 22-23, pp. 6.

This presentation describes the evolution of the fishery dependent statistics in the U.S. and describes current directions for change.

Fox, William W., Jr. (1990). "The Need for More Precise Fishery Predictions - A King Mackerel Case History." Paper presented to MAFAC, F/AKC, and U.S.D.O.C.

A speech that identifies the need for improved biological, economic, and sociological data to resolve fishery conflicts between commercial and recreational fishermen in the king mackerel fishery. The solution is to collect improved biological data from which improved confidence limits can be

estimated. A proposed budget is presented.

Fox, William W., Jr. (1991). "Focus on the Fisheries." Washington Post, August 24., Washington, D.C.

A rebuttal to an editorial (included) that suggests that fishery resources are being depleted under federal management. The principles of renewable marine resources, the failure of open access, and individual transferable quotas are advanced as the goals and objectives of the National Marine Fisheries Service.

Frank, Kenneth T., R. Ian Perry, and Kenneth F. Drinkwater (1990). "Predicted Response of Northwest Atlantic Invertebrate and Fish Stocks to CO<sub>2</sub>-Induced Climate Change." Transactions of the American Fisheries Society, 119:353-365.

We discuss the effect of changes in oceanographic conditions induced by a global increase in atmospheric CO<sub>2</sub> on the location, composition, and recruitment of invertebrate and finfish populations inhabiting the region from the Gulf of Maine to the Labrador Shelf. Published studies exist for the region that link historical climate fluctuations with fish distributions or that use physical data as proxy variables for nutrient flux, advection, and stratification to predict species recruitment patterns and stock size differences. We used these models in conjunction with a physical oceanographic scenario resulting from a doubling of atmospheric CO<sub>2</sub> to speculate on the most probable consequences to the fisheries of Atlantic Canada. For example, a general warming and freshening of the continental shelf waters is anticipated. We expect this to lead to shifts in the geographic distribution of several commercially important groundfish stocks, especially those that are presently at the extreme limits of their species ranges. Earlier arrival times and later departures are expected for pelagic species that undergo extensive seasonal migrations. Higher temperatures and increased water column stratification may result in less organic material reaching the bottom and tend to favor a pelagic fish community. Our analysis is highly speculative, in part because of uncertainties in the predicted physical changes, but also because of the limited knowledge of the processes linking physical oceanography with fisheries.

Fraser, G. Alex (1979). "Limited Entry: Experience of the British Columbia Salmon Fishery." J. Fish. Res. Board Can., 36:754-763.

In 1969 a program of limited entry was introduced in the B.C. salmon fishery; this indicates the near desperation of fisheries managers at the apparent bankruptcy of more traditional management measures. Also, this introduction represents a significant break in traditional management orientation. The goals of management were broadened to encompass not only resource conservation, but also socioeconomic rationalization. Unfortunately, the program was ill designed to achieve either objective. In spite of license limitation it appears that fishing costs and fishing capacity are still growing at a rapid rate. Although vessel numbers are declining, much of the potential benefits are being offset by increasing capacity and capital intensity in the individual vessels that now make up the limited fleet. While some benefits may remain from the program due to the rapid increase in the value of the salmon resource over recent years, the distribution of these benefits is somewhat anomalous. The public purse has gained little because license revenues represent a small proportion of the total management costs of the fishery. At the same time, it cannot be interpreted that fishermen will be the long run beneficiaries of the program. The only clear winners are the original group of license holders. Various adjustments in the structure of

the licensing program have been considered to address these problems. While the most practical and effective of these is a system of landings royalties or taxes on output, it remains the least politically attractive. If the British Columbia licensing programs is to become an effective vehicle for decreasing fishing costs and fishing capacity, some difficult decisions are required.

Frazer, Nat B. (1982). Demography of the Loggerhead Sea Turtle, Caretta Caretta. Draft report, Institute of Ecology, University of Georgia, Athens, Georgia, June.

This paper presents a methodology for computing demographic parameters for adult loggerhead sea turtles as well as suggestions toward a methodology for calculating age-specific survivorship of juvenile turtles in the wild.

Frazer, Nat B. (1984). A Model for Assessing Mean Age-Specific Fecundity in Sea Turtle Populations. Draft report, Marine Policy and Ocean Management Center, Woods Hole Oceanographic Institution, Woods Hole, MA.

A model is developed to estimate mean age-specific fecundity for sea turtle populations. Information on the numbers of eggs laid by female turtles of known relative ages is used to estimate the mean number of eggs that will be laid by females that are reproducing at a given age. Information about frequencies of interseasonal nesting intervals is then used to adjust the age-specific fecundities to reflect the substantial proportion of females for each age class that do not reproduce in a particular season (i.e., at a particular age). The model is developed with data collected on adult female loggerhead turtles, Caretta caretta, nesting on Little Cumberland Island, Georgia, USA, from 1969 through 1981. The model is applicable to species of marine and freshwater turtles in which individual females may not reproduce each year (i.e., at each consecutive age).

Frazer, Nat B. (1986). Survival from Egg to Adulthood in a Declining Population of Loggerhead Turtles, Caretta Caretta. Herpetologica, 42(1):47-55.

Previous estimates of survival rates of sea turtle eggs or hatchlings to adulthood depend upon the assumption that their populations are neither increasing nor decreasing in numbers. The assumption is made in spite of the fact that recent interest in sea turtle demography stems from the belief that populations are in decline. This paper presents estimates of the survival rate from egg to maturity necessary to maintain a populations of loggerhead turtles, Caretta caretta, at its present observed rate of decline. Conventional demographic equations were used along with values of adult survivorship, fecundity and alternative estimates of age at maturity from the literature. Results indicate that the proportion of eggs surviving to adulthood lies between 0.0009 and 0.0018 in this declining population, as opposed to an estimated value of 0.0025 in the unlikely event that the population is stationary. These results suggest that previous studies have overestimated survival of eggs or hatchlings to maturity in sea turtle populations. The methodology may be used to assess gross survivorship from egg to adulthood in increasing or decreasing populations of any species in which adults and eggs are more easily studied than are juveniles.

Frazer, Nat B. and Llewellyn M. Ehrhart(1984). Preliminary Growth Models for Green, Chelonia mydas, and Loggerhead, Caretta Caretta, Turtles in the Wild. Draft report, Marine Policy and Ocean Management Center, Woods Hole Oceanographic Institution, Woods Hole, MA and Department of Biological Sciences, Department of Biological Sciences, University of Central Florida, Orlando, Florida.



Capture-recapture measurements of 11 wild green turtles and of 28 wild loggerhead turtles in Florida indicate that growth in straight line carapace length fits von Bertalanffy growth models better than logistic models. The von Bertalanffy model for green turtle growth yields estimates for age at maturity of between 18 and 27 years, based on the carapace length of the smallest nesting female (88 cm) and the mean length of all nesting females (99 cm). The model for loggerheads yields estimates of between 12 and 30 years, also based on carapace measurements of the smallest nesting female (74 cm) and the mean carapace length of all nesting females (92 cm). It is suggested that the upper estimates provide more realistic indications of mean age at first maturity.

Frazer, Nat B. and Frank J. Schwartz (1984). Growth Curves for Captive Loggerhead Turtles, Caretta Caretta, in North Carolina, USA. Bulletin of Marine Science, 34(3):485-489.

Growth equations for two loggerhead turtles raised in captivity for 14 years are compared to an analysis conducted by Uchida (1967). The results obtained in the two studies differ substantially.

Freeman, A. Myrick III (1979). "Approaches to Measuring Public Goods Demands." American Journal of Agricultural Economics, 61(5):915-920.

This paper presents a brief review of the three major approaches to estimation of public good demands and benefits and a somewhat more detailed discussion of those techniques that are based on market interactions between public and private goods. The analysis is limited to those public goods that are arguments in individual utility functions. Public goods that are inputs in production processes for marketed goods, for example, air quality in agricultural production, affect cost, supply, and factor demand functions and through them affect one or more of the following: output prices, factor prices, and profits (quasi-rents). The benefits of increases in public goods supply can be measured in a conceptually straightforward manner from observable market data.

Freeman, A. Myrick III (1979). "Hedonic Prices, Property Values and Measuring Environmental Benefits: A Survey of the Issues." Scand. J. of Economics, 154-173.

This paper provides a review of the theoretical basis and the assumptions required to use hedonic price equations derived from property value data to obtain measures of the prices and the inverse demand functions for environmental amenities such as air quality. It also includes a review and assessment of existing empirical applications of the technique to problems of air and water quality and urban noise.

Freeman, A. Myrick III (1979). "The Benefits of Air and Water Pollution Control: A Review and Synthesis of Recent Estimates." A report prepared for the Council on Environmental Quality. Bowdoin College, Brunswick, Maine 04011, 174 pp.

This report reviews and synthesizes the large number of previous studies of the benefits from air and water pollution control and tries to make theoretical and applied sense of the various estimates to provide a standardized set of benefit estimates where ever possible.

Freeman, A. Myrick III (1993). "The Economics of Valuing Marine Recreation: A Review of the Empirical Evidence." A report

submitted to the Office of Policy Planning and Evaluation, U.S. Environmental Protection Agency, Washington, D.C. Department of Economics, Bowdoin College, Brunswick, Maine 04011, September, 35 pp.

The question addressed in this report is whether the available economics literature provides a basis for estimating the benefits to marine recreation attributable to the water pollution control programs of federal, state, and local agencies. While numerous techniques exist, estimates of net benefit from water quality improvements are not consistent. No direct evidence exists that supports the contention that the Federal Water Pollution Control Act (FWPCA) of 1972 has actually improved the recreational fishing experience. It appears that the upper bound estimates of fishing benefits from the FWPCA should not exceed \$1 billion per year.

Freeman, A. Myrick III (1995). "The Benefits of Water Quality Improvements for Marine Recreation: A Review of the Empirical Evidence." Marine Resource Economics, 10(4):385-406.

This paper reviews the empirical literature on the economic value of marine recreation fishing, beach visits, and boating. Questions addressed include: What values do people place on changes in the attributes of recreation sites and activities? What do we know about how water pollution control policy affects these attributes? And, is it feasible to use the value information obtained for specific sites and/or activities to estimate the benefits of improving marine water quality? The literature establishes that some measures of pollution reduce the values of trips to beaches and that improved fishing success is valued by recreational anglers. However, there is substantial variation in value measures across studies. Welfare estimates can be sensitive to model specification and estimation. In the case of marine recreational fishing, the links between pollution control policy and the attributes of the activity that people value (catch rate) have not been established.

Freund, R.J. and R.R. Wilson (1974). "An Example of a Gravity Model to Estimate Recreation Travel." Journal of Leisure Research, 6:241-256.

A gravity model to explain recreational travel and participation in Texas is estimated.

Fricke, Peter H. (1992). "Guidance for Social Impact Assessment for Marine Fishery Management and Planning." Draft report, USDOC, NOAA, NMFS, Silver Springs, MD.

This document provides fishery managers with an understanding of the objectives and techniques of Sociological Impact Assessment.

Fricke, Peter H. (1994). "Pacific Coast Groundfish Fishery Limited Entry Program: Interim Summary Information on Appeals Received." Position paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Northwest Regional Office, Seattle, Washington.

A review of the appeals process for the Pacific coast groundfish fishery limited entry program. Approximately 44 percent of denied applications or 16 percent of all applications were appealed. Of the appeals decided (76 percent of total), 23 percent were granted.

Fritz, Eugene S. and Francis M. Schuler (1984). "Why Develop Marine Recreational Fisheries." Chapter 6 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Development of marine recreational fisheries will help (1) to satisfy the demands of a constantly growing number of recreational fishermen without adversely affecting stressed fish populations; (2) to realize an economic gain from presently underutilized stocks; (3) to promote or improve economic development and employment opportunities in coastal communities; and (4) to compensate for interannual fluctuations of stocks of target species of species complexes. Both the benefits and constraints to recreational development must be considered when determining why marine recreational fishing should be further developed.

Fritz, Lowell W., Richard C. Ferrero, and Ronald J. Berg (1995). The Threatened Status of Steller Sea Lions, Eumetopias jubatus, under the Endangered Species Act: Effects on Alaska Groundfish Fisheries Management. Marine Fisheries Review, 57(2):14-27.

In April 1990, the Steller sea lion, Eumetopias jubatus, was listed as threatened under the U.S. Endangered Species Act by emergency action. Competitive interactions with the billion dollar Alaska commercial groundfish fisheries have been suggested as one of the possible contributing factors to the Steller sea lion population decline. Since the listing, fisheries managers have attempted to address the potential impacts of the groundfish fisheries on Steller sea lion recovery. In this paper, we review pertinent Federal legislation, biological information on the Steller sea lion decline, changes in the Alaska trawl fishery for walleye pollock, Theragra chalcogramma, since the late 1970's, and possible interactions between fisheries and sea lions. Using three cases, we illustrate how the listing of Steller sea lions has affected Alaska groundfish fisheries through: 1) actions taken at the time of listing designed to limit the potential for direct human-related sea lion mortality, 2) actions addressing spatial and temporal separation of fisheries from sea lions, and 3) introduction of risk-adverse stock assessment methodologies and Steller sea lion conservation considerations directly in the annual quota setting process. This discussion shows some of the ways that North Pacific groundfish resource managers have begun to explicitly consider the conservation of marine mammal and other nontarget species.

Frost, Hans (1984). "Fisheries Management and Uncertainty Within the EEC." Marine Resource Economics, 1(1):97-103.

Fisheries management within the EEC is subject to ambiguous goal formulations, ranging from the biological goal of maximum sustainable yield to intangible political goals. The management body within the EEC consists of various official and political committees that impose both bureaucratic and political uncertainty on the fishing industry. It is argued here that, as a result of this uncertainty, fishing effort in the short run will tend to rise, but in the long run will tend to decline. It is also argued that the reduction of uncertainty will depend on a more careful and less ambiguous goal formulation.

Frost, Hans and Niels Vestergaard (1995). An Operational Approach to Assess Management Regulation, Subject to Different Management Objectives. In, Bio-Economic Modelling in the EU, Concerted

Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 52-67.

A constrained optimization model is developed to determine the impact of fishing effort constraints on profits, the issuing process of effort licenses and allocation, management and control costs, bioeconomic efficiency, income distribution, and compliance in European Union fisheries. Given the limited yield from the fish stocks (implicit TAC), the transition from TAC to effort regulation problem is to determine the level of effort, preferably expressed in number of fishing days for fleet segments, that corresponds to the amount of fish a particular stock may yield, be it a quota or sustainable yield.

Fulton, Murray and Richard E. Just (1989). "Antitrust, Exploration, and Social Optimality in Nonrenewable Resource Markets." Journal of Environmental Economics and Management, 17:1-21.

Dependence of electrical utilities on uncertain supplies of uranium apparently has led to an unusual conditioning of uranium demand on the uncertainty of supply that, in turn, depends on the volume of reserves. This paper examines the implications of controlling resource production uncertainty through exploration. Exploration gives a monopolistic resource supplier another tool (in addition to restricting output) that can be used to exercise market power. Exploration, however, is not subject to antitrust regulation. Results show that traditional antitrust laws may move such an industry away rather than toward social optimality.

Funk, Fritz (1993). Preliminary Forecasts of Catch and Stock Abundance for 1993 Alaska Herring Fisheries. Regional Information Report No. 5J93-06, Alaska Department of Fish and Game, P.O. Box 25526, Juneau, Alaska, May, 92 pp.

The Pacific herring Clupea pallasii sac roe harvest in Alaska for 1993 is projected to be 76,063 tons. Herring food/bait harvests for 1993 are projected to be 9,938 tons. Herring spawn-on-pound-kelp fisheries are expected to produce 335 tons of product and spawn-on-wild-kelp harvests are expected to produce an additional 443 tons. The projected sac roe, food/bait, and spawn-on--kelp harvests are expected to increase from the 1992 levels. The 1992 herring harvest had an estimated value to fishermen of \$31,504,867. Of the total 1992 value, sac roe fisheries contributed \$25,160,330, spawn-on-pound-kelp fisheries \$3,722,000, food/bait fisheries \$2,135,156, and spawn-on-wild-kelp fisheries \$487,381. Excellent recruitment from the 1988 year class in most areas has caused stock levels to increase. In many areas the 1988 year class appears to be the largest on record. This strong year class will be age 5 for the 1993 harvest.

Funk, Robert D., Wade L. Griffin, James W. Mjelde, and John M. Ward (1999). "A General Bioeconomic Fisheries Simulation Model of License Limitation and Buyback in the Texas Bay Shrimp Fishery." Manuscript submitted to the American Journal of Agricultural Economics.

The effect of a license limitation and buyback program being implemented for the Texas bay shrimp fishery on effort, rents, license price, and consumer and producer surplus is simulated. Results indicate the current program will not reduce effort and increase rents until year 16 of the program. To decrease the time necessary to reduce effort, additional funds to buyback licenses are necessary. Simulated results indicate that an additional \$500,000 available per year at the beginning of the program to buy licenses

will reduce effort and positive rents will be incurred starting in year three of the program. Increased funds available to the program also result in the largest impact on consumer and producer surplus changes. Although the present value of changes is positive for both producer and consumer surplus, producers clearly gain more than consumers.

Funk, Robert D., Wade L. Griffin, James W. Mjelde, Teofilo Ozuna, Jr., and John M. Ward (1997). "A Method of Imputing and Simulating Costs and Returns in Fisheries." Manuscript submitted to the Journal of Environmental Economics and Management.

A methodology is developed capable of generating cost and revenue trends over time within a fishery. The method is developed for the Gulf of Mexico shrimp fishery where NMFS landings data, as well as a series of costs and returns survey data are available. The method is designed to use information available in NMFS landings files to forecast cash costs on a per trip basis. Annual industry level cost estimates are then obtained by aggregating per trip costs. This method is easily transferable to other fisheries which have previous cost surveys to develop similar models to simulate cash costs.

Funk, Robert D., Wade L. Griffin, James W. Mjelde, Teofilo Ozuna, Jr., and John M. Ward (1998). "A Method of Imputing and Simulating Costs and Returns in Fisheries." Manuscript submitted to the Journal of Marine Resource Economics.

A methodology is developed capable of generating cost and revenue trends over time within a fishery. The method is designed to use information available in NMFS landings files to forecast cash costs on a per trip basis. Annual industry level cost estimates are then obtained by aggregating per trip costs. The method is applied to the Gulf of Mexico Shrimp fishery where NMFS landings data, as well as a series of costs and returns survey data are available. The methodology is transferable to other fisheries which have previous cost surveys to develop similar models to simulate cash costs.

Funk, Robert D., Wade L. Griffin, James W. Mjelde, Teofilo Ozuna, Jr., and John M. Ward (1998). "A Method of Imputing and Simulating Costs and Returns in Fisheries." Journal of Marine Resource Economics, ?(??):???-???

A methodology is developed capable of generating cost and revenue trends over time within a fishery. The method is designed to use information available in NMFS landings files to forecast cash costs on a per trip basis. Annual industry level cost estimates are then obtained by aggregating per trip costs. The method is applied to the Gulf of Mexico Shrimp fishery where NMFS landings data, as well as a series of costs and returns survey data are available. The methodology is transferable to other fisheries which have previous cost surveys to develop similar models to simulate cash costs.

Funk, Robert D., Wade L. Griffin, James W. Mjelde, Teofilo Ozuna, Jr., and John M. Ward (1998). "A Method of Imputing and Simulating Costs and Returns in Fisheries." Journal of Marine Resource Economics, 13(3):171-183.

A methodology capable of generating cost and revenue trends over time within a fishery is developed. The method is designed to use information available in the National Marine Fisheries Service (NMFS) landings files to forecast cash costs on a per trip basis. Annual industry level cost estimates are then obtained by aggregating per trip costs. The method is applied to the Gulf of Mexico Shrimp fishery where NMFS landings data, as well as a series of

costs and returns survey data are available. The methodology is transferable to other fisheries that have previous cost surveys.

Furlong, William J. (1991). "The Deterrent Effect of Regulatory Enforcement in the Fishery." Land Economics, 67(1):116-129.

The common property problem derives from the incompatibility of individual incentives with collective interests. In the fishery this incompatibility results in a greater than optimum stock depletion. Authorities have responded to overfishing with a cornucopia of regulations. In practice, most of the widely employed regulations are not self-enforcing; enforcement costs must therefore be incurred. The purpose of the present study is to investigate the deterrent effect of regulatory enforcement in the fishery. In particular, estimates of the so called "supply of offenses" are obtained with observations of individual behavior drawn from a random survey of fishermen. The study focuses upon the response of violation rates to changes in different enforcement sanctions. Insight into the relative effectiveness of alternative enforcement tools may lead to a more efficient regulatory policy.

Galbraith, R.D. and P.A.M. Steward (1995). Bio-Economic Modelling Workshop. In, Bio-Economic Modelling in the EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 148-158.

In the light of current concerns with over-exploitation of traditional stocks, past and present definitions of fishing effort are discussed and the concepts of fishing time and fishing power in relation to vessel parameters and gear performance examined. Proposals are set out on how gear size might be monitored and current research projects are briefly discussed.

Gallastegui, Carmen (1983). "An Economic Analysis of Sardine Fishing in the Gulf of Valencia (Spain)." Journal of Environmental Economics and Management, 10:138-150.

The optimal management of a particular fishery is illustrated. Using data describing previous fishery exploitation, relevant biological and economic relationships are estimated, then the optimum levels of catches, effort, and stock are calculated. The prices that if implemented, would ensure the current efficient exploitation of the fishery are also calculated. Finally, the welfare gains that can be achieved by a movement from the free market equilibrium to the socially optimum solution are demonstrated.

Gallaway, B.J. and W.J. Gazey (1996). A Review of the Goodyear (1995) Red Snapper Stock Assessment. Report prepared for presentation to Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 W. Kennedy Blvd., Tampa, FL, August, 45 pp.

A review of Goodyear's (1995) red snapper stock assessment that suggests that environmental factors were not adequately addressed; specifically the hypoxic zone off of Louisiana and the impact of oil platforms on aggregation of red snappers. Also, mortality rates for age 0 and age 1 fish are set too low in Goodyear's analysis. His conclusions that variation of the natural mortality rates would not change the results based on a sensitivity analysis using conditional survival rates from fishing are misleading. A broader assessment is suggested that includes fishery, oceanographic, and habitat submodels. Goodyear (1996) refutes this review of the assessment.

Gallaway, B.J., J.D. Bryan, L.R. Martin, and J.G. Cole (1995). Sea Turtle

and Shrimp Fishery Interactions - Is a New Management Strategy Needed? Report prepared for the Texas Shrimp Association by LGL Ecological Research Associates, Inc., 1410 Cavitt Street, Bryan, Texas, April, 79 pp.

An analysis of existing data that supports a management alternative to the existing turtle excluder device (TED) regulations. The authors propose that TEDs be used by shrimp fishermen in inshore and near shore waters of the Gulf of Mexico to reduce marine turtle bycatch and associated mortalities and strandings levels. However offshore shrimp fishing vessels should be exempt from the TED use requirement since no turtle bycatch levels are associated with shrimp trawling in these waters based on National Marine Fisheries Service (NMFS) observer data.

Galtsoff, Paul S. (1962). The Story of the Bureau of Commercial Fisheries Biological Laboratory Woods Hole, Massachusetts. Circular 145, Bureau of Commercial Fisheries, Fish and Wildlife Service, United States Department of the Interior, May, 121 pp.

The history of the Woods Hole Laboratory from its inception in 1871 to 1962. The outlook for the future chapter is especially interesting in light of what actually occurred.

Galveston Laboratory (1992). "Shrimp Trawl Bycatch Characterization, Sampling Protocol Manual for Data Collection." National Marine Fisheries Service, Southeast Fisheries Science Center, September, 62 pp.

Onboard data collection for the purpose of bycatch characterization will consist of sampling trawl catches taken from commercial shrimp fishery vessels operating in the U.S. Gulf of Mexico and U.S. south Atlantic. Data relevant to species composition, abundance and life history will be gathered from each tow. Sample size and allocation of samples by stratum (i.e. fishing location, season, trawl type, and TED type) have been included in the sampling design and are discussed in the National Marine Fisheries Service's (NMFS) "Shrimp Trawl Bycatch Research Requirements Document", 1991. The procedures outlined here for sampling trawl catches have been prepared by personnel at NMFS, and are consistent with the Southeast Area Monitoring and Assessment Program's (SEAMAP) data management system. This protocol or similar data collection methods are recommended for use in all regional bycatch assessment programs to facilitate the accessibility and analysis of integrated data sets.

Galveston Laboratory (1992). "Evaluation of Bycatch Reduction Devices, Sampling Protocol Manual for Data Collection." National Marine Fisheries Service, Southeast Fisheries Science Center, September, 62 pp.

The Southeast Area Monitoring and Assessment Program (SEAMAP) has a standard data collection system used by state and federal research labs and universities in the southeast region. This method of data collection is recommended for the regional bycatch research program to standardize data collection procedures, analyses, and allow data to be pooled into a common data base using existing hardware and software. Procedures are outlined here for sampling catch from different bycatch reduction devices.

Galveston Laboratory (1993). "Biological Review of the 1993 Texas Closure." Report to the Gulf of Mexico Fishery Management Council, National Marine Fisheries Service, Southeast Fisheries Science Center, December, 23 pp.

This report contains an overview of recruitment, fishing trends, distribution of catch from Texas waters, shrimp landings by port, and white shrimp catch off Texas as impacted by the Texas closure regulation.

Galveston Laboratory (1994). "Biological Review of the 1994 Texas Closure." Report to the Gulf of Mexico Fishery Management Council, National Marine Fisheries Service, Southeast Fisheries Science Center, December, 26 pp.

This report contains an overview of recruitment, fishing trends, distribution of catch from Texas waters, shrimp landings by port, and white shrimp catch off Texas as impacted by the Texas closure regulation.

Garcia, S. (1983). "The Stock-Recruitment Relationship in Shrimps: Reality or Artifacts and Misinterpretations?" Oceanogr. Trop., 18(1):25-48.

After a detailed review of the information available on stock-recruitment relationships and environmentally driven variations of abundance in shrimp, the impact of this variability on the apparent shape of the SRR is examined. The existence of a strong autocorrelation in yearly data is stressed and it is concluded that the presently available relationships do not demonstrate that the recruitment of shrimps is a function of stock size. Examination of the particular case when seasonal relationships have been established with monthly data shows that despite a certain similarity in shape they should not be interpreted as SRR *sensu stricto* and a three dimensional interpretation is proposed instead. The other possible sources of error and bias are finally examined and the consequences of the above findings on management strategies are briefly discussed.

Garcia, S. (1984). "A Note on Environmental Aspects of Penaeid Shrimp Biology and Dynamics." In Penaeid Shrimps - Their biology and management, J.A. Gulland and B.J. Rothschild (eds.), Fishing News Books Limited, Farnham, England.

Shrimps are short-lived animals living in highly variable inshore areas during the juvenile phase and are therefore subject to particularly strong environmentally driven variability in recruitment and stock size. This paper examines the likely consequences of this fact on the surplus yield production and stock-recruitment modeling underlining the high risk of generating artifactual models when the data series are short.

Garcia, S. (1988). "Tropical Penaeid Prawns." Chapter 9 in Fish Population Dynamics, 2nd Edition, J.A. Gulland (ed.), John Wiley & Sons Ltd., New York.

The main characteristics of penaeids as tropical short-lived animals are pointed out here to show differences and similarities with the better known resources of temperate waters.

Garcia, S.M. and C. Newton (1995). Current Situation, Trends and Prospects in World Capture Fisheries. Presented at the Conference on Fisheries Management, Global Trends, Seattle (Washington, U.S.A.), June 14-16, 1994, FAO Fisheries Department, Rome Italy, 10 pp.

Following an earlier analysis provided by FAO (1993), the paper gives an update of the trends and future perspectives of world fisheries. It describes and comments on worldwide trends in landings, trade, prices, and fleet size. It illustrates the decrease in landings in the last 3 years, the relationship



between landings and prices and the large overcapacity in world fishing fleets. It provides a review of the state of world fishery resources, globally, by region and species groups, as well as a brief account of environmental impacts on fisheries. It presents an economic perspective for world fisheries which underlines further the overcapacity and subsidy issues that characterize modern fisheries. In conclusion, it discusses management issues including the need for fleet reduction policies, the potential combined effect of international trade on resources depletion in developing exporting countries, throwing into question the overall sustainability of the world fishery system.

Gardner, Bruce L. (1975). "The Farm-Retail Price Spread in a Competitive Food Industry." American Journal of Agricultural Economics, 57(3):399-409.

Consistency with market equilibrium places constraints on the pricing policies of food marketing firms in a competitive industry. This paper examines the implications of simultaneous equilibrium in three related markets: retail food, farm output, and marketing services. From equations representing the demand and supply sides of each market, elasticities are generated that show how the farm-retail price spread changes when food demand, farm product supply, or the supply function of marketing services shifts. Implications for the viability of simple markup pricing rules and the determinants of the farmer's share of the food dollar are discussed.

Gardner, M. (1988). "Enterprise Allocation System in the Offshore Groundfish Sector in Atlantic Canada." Marine Resource Economics, 5(4):389-432.

Following the extension of fisheries jurisdiction to 200 miles in 1977, Canada managed its Atlantic groundfish fisheries using total allowable catches and a variety of traditional controls on fishing effort. These controls were largely ineffective in resolving two of the inherent problems arising from the common property characteristics of the fishery: competitive fishing in the short run and the tendency toward overcapitalization in the long run. In 1982 a system of output controls in the form of enterprise allocations was implemented in the offshore sector of the fishery. This article describes the elements of the system and examines the changes in operating and investment behavior of the companies holding the enterprise allocations. The bundle of rights incorporated in the enterprise allocation is assessed and suggestions are made on how these rights might be modified to improve gains in efficiency already achieved. A case study of the impact of the system on one vertically integrated company is presented. The merits of the system are contrasted with behavior in the inshore sector still subject to traditional input controls.

Gardner, Michael (1994). "Input Controls vs. Rights-Based Management: The Political Economy of Fisheries Management in Atlantic Canada." C.M. 1994/T:53, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Seas, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September.

This paper examines the Canadian experience with quota managed fisheries, reviewing institutional structures and approaches. It begins with a review of management objectives following the extension of jurisdiction and traces the nature and rationale of changes. The specific measures used to achieve objectives are examined from a theoretical and practical perspective. The measures fall into two broad categories: conventional input controls:

vessel and gear restrictions; and, output controls: tradable and non-tradable enterprise/individual quotas. The experience indicates that input controls are largely ineffective in constraining effort. These measures fail to address the common property characteristics of the resource and consequently failed to blunt the incentives for share maximization and increased capitalization. These in turn lead to overfishing and misreporting, thereby undermining management objectives. Output controls fare better in constraining effort. They lead to fleet rationalization and improved quality and flow of raw material to processing facilities. But they may also lead to highgrading and discarding, as quantity incentives give way to unit value incentives under the rights based regime. Some of the early failures and more recent successes of policy are outlined, lessons are drawn and suggestions made about future directions.

Garnaut, Ross and Anthony Clunies Ross (1975). "Uncertainty, Risk Aversion and the Taxing of Natural Resource Projects." The Economic Journal, (June):272-287.

Whatever national benefit is to be derived from natural resources must come mainly through taxation. This paper analyses the problem and suggests an approach which appears to do less to reduce efficiency in the use of resources than any alternative taxation system.

Gaski, Andrea I. and Sonja Fordham (1996). Trade in Elasmobranchs. The TRAFFIC Network and the Center for Marine Conservation, Washington, D.C., June, 2 pp.

The international trade in elasmobranchs (sharks) is under study by the World Wildlife Fund and the Center for Marine Conservation which will produce an overview trade report in November.

Gately, Dermot (1984). "A Ten-Year Retrospective: OPEC and the World Oil Market." Journal of Economic Literature, 21:1100-1114.

This paper reviews the main events in the world oil market since 1973 and some major explanations as to what happened and why. Then there is a discussion of some projections for the next two decades and of some implications of various theories about OPEC's decision making process. What we learned about modeling OPEC and the world oil market is then summarized. This includes: the dominant theoretical approach based on the wealth maximization model of Harold Hotelling (1931); the simulation approach most common in the applied literature, that envisages target capacity utilization pricing by OPEC; and the difficult problem of modeling price behavior during disruptions. Finally, some important unresolved theoretical and empirical issues are discussed.

Gates, John M. (1974). "Demand Price, Fish Size and the Price of Fish." Canadian Journal of Agricultural Economics, 22(3):1-12.

Despite considerable work in fisheries economics on the supply side, little attention has been devoted to theoretical aspects of the relationship between ex-vessel price and landings. One of the widely recognized determinants of fish prices is fish size, yet virtually all empirical analyses of the demand for fish ignore fish size. In this paper a demand function is postulated that includes fish size as a continuous demand shift parameter and the implications of fish size to the relationship between price and quantity are examined. It is concluded that bioeconomic models of the fishery that ignore fish size may yield policy conclusions that are quantitatively and, in some cases, qualitatively inaccurate.

Gates, John M. (1984). "Principal Types of Uncertainty in Fishing Operations." Marine Resources Economics, 1(1):31-49.

Uncertainty in harvest has received relatively little study in fisheries economics. Given a paucity of literature in the area, this paper describes uncertainty in very general terms and uses sample data from several sources to illustrate the discussion. Major sources of uncertainty in harvest are identified as catch rates, equipment performance, prices, weather, quality of inputs, and institutions.

Gates, John M. and Stephen R. Crutchfield (1985). "Measuring the Performance of the Fishing Industry Using Financial Simulators." Draft report, Department of Resource Economics, University of Rhode Island, Kingston, RI.

The New England industry has been the focus of much research related to fisheries management and the economic status of fishermen. It has proven difficult to monitor economic status because of technical, bureaucratic and cost considerations associated with survey procedures. The authors have developed an alternative approach that combines information various data bases, including periodic surveys, and integrates them in a budgeting or economic engineering approach. The development of these programs originated on mainframe computers but has since been adapted to personal computers. The result of these adaptations is a tool useful for extension education as well as for research policy evaluation. This paper outlines the basic components of the vessel simulator for otter trawlers and presents selective results illustrating its use for policy analysis. Other applications are suggested for financial advisors and investors.

Gates, John M. and Virgil J. Norton (1974). The Benefits of Fisheries Regulation: A Case Study of the New England Yellowtail Flounder Fishery, Department of Resource Economics, University of Rhode Island, Marine Technical Report No. 21, Kingston, RI, Sea Grant.

To provide insight into the potential economic gains from an effective management program, the authors evaluated the impact of controlling the levels of domestic and foreign effort and mesh size in the yellowtail flounder fishery. This fishery was selected because of its long time importance to New England and because there are indications that the existing and generally increasing effort on this species has caused biological as well as economic overfishing.

Gates, John M., Elizabeth Gibbs, and Carole Jaworski (1992). "A Report on Social Science Research in U.S. Marine Fisheries." Summary of a Workshop at the University of Rhode Island, W. Alton Jones Campus, Rhode Island Sea Grant, University of Rhode Island, Bay Campus, Narragansett, RI, January, 17 pp.

This report summarizes priorities for social science research in fisheries developed at a workshop held at the University of Rhode Island. Priority 1 is provision of basic information for industry (commercial and recreational) and for managers. Priority 2 is assessment of social, economic, and cultural aspects of fisheries under alternative public policies. Priority 3 is investigation of communication, participation, and education in the management process. Priority 4 is investigation of alternative institutions for fisheries governance. Each priority is discussed in detail.

Gates, John, Dan Holland, and Eyjolfur Gudmundsson (1996). Theory and Practice of Fishing Vessel Buyback Programs. A Report Prepared for the

World Wildlife Fund, Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, RI, November, 40 pp.

This report describes programs called buyback programs which buy back fishing vessels and permits in limited access fisheries. The first objective of the report is to survey buyback programs in various parts of the world to glean lessons from the history of such attempts. The second part was to be a case study of the current attempt at vessel buybacks in New England and would relate other program experiences back to the New England experiment to determine possible outcomes. Given the greater resistance in the U.S. to governmental intervention and control, it is unlikely that the U.S. will have better luck than other countries in conserving fishery resources via vessel buybacks.

Gates, John, Dan Holland, and Eyjolfur Gudmundsson (1997). Theory and Practice of Fishing Vessel Buyback Programs. In World Wildlife Fund's Subsidies and Depletion of World Fisheries, WWF's Endangered Seas Campaign, 1250 Twenty-Fourth St., NW, Washington, D.C., 136 pp.

This report describes programs called buyback programs which buy back fishing vessels and permits in limited access fisheries. The first objective of the report is to survey buyback programs in various parts of the world to glean lessons from the history of such attempts. The second part was to be a case study of the current attempt at vessel buybacks in New England and would relate other program experiences back to the New England experiment to determine possible outcomes. Given the greater resistance in the U.S. to governmental intervention and control, it is unlikely that the U.S. will have better luck than other countries in conserving fishery resources via vessel buybacks.

Gates, J.M., Joel Dirlam, Philippe Lallemand, and Jung Hee Cho (1998). The Costs of Small Trawlers. Draft report, Department of Environmental & Natural Resource Economics, University of Rhode Island, Kingston, RI, February, 32 pp.

The results of an economic survey of small northeast fishing vessels using otter trawl gear is described. The population consisted of 572 persons who were holders of groundfish permits, had fishing vessels of 65 feet or less, and who reported catches in New England using trawl gear in 1996. A 10 percent response rate was achieved from a mail survey of a questionnaire that generated 35 usable responses from a probable population of 420 fishermen. The results of our mail survey of small trawlers are presented in three sets of tables and 2 figures. Each table summarizes quantitative data responses by providing two or more measures of central tendency (the mean or average and the median), and two measures of variability (the standard deviation and the range).

Gates, John, Timothy Hennessey, Lawrence Juda, and Jon G. Sutinen (1997). Sustaining Marine Ecosystems: The Human Dimension. Rhode Island Sea Grant Proposal, Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, RI, 7 pp.

A proposal to develop two workshops and compile research for a book containing the state of the art information on the impact of large marine ecosystems on the people dependent upon this resource.

Gaudet, Gerard and Pierre Lasserre (1988). "On Comparing Monopoly and Competition in Exhaustible Resource Exploitation." Journal of

Environmental Economics and Management, 15:412-418.

It is widely believed that exhaustible resource monopolies do not enjoy as much market power as standard non-resource monopolies, and may even produce in a socially optimal way. We argue that this paradoxical result arises from an inappropriate comparison methodology. When similar assumptions are applied to the resource and the conventional case, we show that the resource monopoly behaves as expected; i.e. restricts supply.

Gautam, Amy Buss (1996). Primer. Chapter 1 in draft OLEO report, National Marine Fisheries Service, Silver Spring, Maryland, 8 pp.

An introduction to economic concepts used in fisheries management.

Gautam, Amy Buss (1996). The Southeast Region Report. Chapter 6 in draft OLEO report, National Marine Fisheries Service, Silver Spring, Maryland.

The commercial, recreational, and processor sectors of the southeast region fishing industry with management problems, implications, and expectations for the future.

Gautam, Amy Buss (1996). Individual Fishing Quota Report. Proposal, National Research Council, National Marine Fisheries Service, Silver Spring, Maryland.

A proposal to analyze individual fishing quotas (IFQs) by the National Research Council as required by Congress.

Gautam, Amy B. and Andrew W. Kitts (1996). Data Description and Statistical Summary of the 1983-92 Cost-Earnings Data Base for Northeast U.S. Commercial Fishing Vessels. NOAA Technical Memorandum NMFS-NE-112, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Region, Northeast Fisheries Science Center, Woods Hole, Massachusetts, December, 21 pp.

Data from the National Marine Fisheries Service's Capital Construction Fund are summarized to provide a financial profile of Northeast U.S. commercial fishing vessels. Averages for various cost categories are presented by tonnage class, fishery, and effort level. Costs are also presented as percentages of total revenue. Data are then evaluated for how well they represent the Northeast fishing fleet. Potential uses and pitfalls of using these data for economic analyses are also discussed.

Gautam, Amy and Scott Steinback (1996). Valuation of Recreational Fisheries in the Northeast U.S. Striped Bass: A Case Study. Presented at EIFAC Symposium on Social, Economic, and Management Aspects of Recreational Fisheries, Dublin, Ireland, June, 23 pp.

As fishery resources in the northeastern U.S. decline, allocation of resources between commercial and recreational fishermen is becoming increasingly contentious. To estimate the value of recreational fishing in the northeast, approximately 8,000 anglers from Maine to Virginia were administered a two-part survey (at the fishing site, and in a follow-up phone interview) in 1994 in conjunction with the U.S.'s Marine Recreational Fisheries Statistical Survey. Using striped bass as a case study, contingent valuation, travel cost and random utility models are estimated, and the impacts of changes in bag limits and catch rates are analyzed for management purposes. The study illustrates the simplicity and utility of adding a

limited number of socio-economic questions to an existing national recreational survey.

Gautam, Amy Buss and Ivar Strand (1995). Leisure/Labor Tradeoffs: The Backward-Bending Labor Supply in Fisheries. *Journal of Environmental Economics and Management*, draft, 23 pp.

Economists have understood that the open access nature of fishing grounds can cause the long run fishery supply to bend backward. There is also increasing speculation that fishermen respond to falling output price either by increasing or decreasing effort, depending on the circumstances. This suggests a short run backward bending supply of fishing labor. A dynamic model of fishermen's behavior is developed to account for the behavior. The model highlights both contemporaneous and intertemporal trade offs between labor and leisure. The model is tested and the results indicate that the short run labor supply in fisheries may exhibit backward bending properties. A discussion explains by these results challenge many traditional regulatory strategies (e.g. output taxes) that address problems of open access.

Gautam, Amy Buss, Ivar Strand, and James Kirkley (1996). Leisure/Labor Tradeoffs: The Backward-Bending Labor Supply in Fisheries. *Journal of Environmental Economics and Management*, 31(3):352-367.

Economists have understood that the open access nature of fishing grounds can cause the long run fishery supply to bend backward. There is also increasing speculation that fishermen respond to falling output price either by increasing or decreasing effort, depending on the circumstances. This suggests a short run backward bending supply of fishing labor. A dynamic, utility-theoretic model of fishermen's behavior is developed to address this possibility. The model highlights both contemporaneous and intertemporal trade offs between labor and leisure. The model is tested and the results indicate that the short run labor supply in fisheries may exhibit backward bending properties. The results challenge many traditional regulatory strategies (e.g. output taxes) that address problems of open access.

Gauvin, John (1990). "Estimation of Supply and Demand Functions for Broadbill Swordfish in the United States." Draft report, South Atlantic Fishery Management Council, Charleston, South Carolina, January, 14 pp.

Using a two stage least squares simultaneous equation model, an analysis of swordfish supply and demand in the United States is presented. The estimated model is used to determine the impacts of proposed management regulations for consumer and producer surplus measures is discussed.

Gauvin, John (1993). "Discussion and Clarification of the Economic Issues Involved with King Mackerel Trip Limits or TACs by Gear." Draft and Final report, South Atlantic Fisheries Management Council, Charleston, South Carolina.

Good descriptive discussion of net benefits applied to the proposed king mackerel management plan.

Gauvin, John R. (1994). The South Atlantic Wreckfish Fishery: A Preliminary Evaluation of the Conservation Effects of a Working ITQ System. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

This paper outlines some of the conservation benefits that individual transferable quota (ITQ) management of the wreckfish fishery has created. Herein it is argued that ITQs are primarily designed to address the economic shortcomings of open access but that conservation benefits can result from the vesting aspects and economic rationalization of an ITQ. Preliminary evidence from the wreckfish case suggests that fishermen have embraced the long-term conservation of the wreckfish stock and habitat where wreckfish are found because it is clearly in their best economic interest to do so. Optimism must remain guarded at this point because results are preliminary, wreckfish is a rather different fishery, and the wreckfish ITQ has apparently shifted fishing effort to other fisheries still managed by open access, hereby potentially aggravating problems in those fisheries. These caveats acknowledged, early success with the wreckfish ITQ argues for expansion of the effort to put other fisheries under ITQs and underlines the importance of developing a comprehensive policy to evaluate and implement ITQ management for other fisheries in the United States.

Gauvin, John R., John M. Ward, and Edward E. Burgess (1993). "A Description and Preliminary Evaluation of the Wreckfish (Polyprion Americanus) Fishery Under Individual Transferable Quotas." Draft report, National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL.

The individual transferable quota (ITQ) system for wreckfish in the south Atlantic will be an important test of the practical merits of individual quota management for finfish fisheries in the United States. This paper describes the wreckfish ITQ program in detail and discusses difficulties encountered in its development. Beyond providing information on the practical constraints of setting up ITQs to managers contemplating ITQs for other fisheries, another goal is to evaluate the degree to which the wreckfish ITQ program is accomplishing its resource conservation, economic, and conflict reduction objectives. Analysis of data and experiences over the one and one-half year period during which the wreckfish ITQ has been in place are provided. Linked to the discussion of accomplishing objectives is an evaluation of the degree that consolidation has taken place and the tradeoff between efficiency goals and concerns over monopoly power.

Gauvin, John R., John M. Ward, and Edward E. Burgess (1994). "Description and Evaluation of the Wreckfish (Polyprion Americanus) Fishery Under Individual Transferable Quotas." Marine Resource Economics, 9(2):99-118.

The individual transferable quota (ITQ) system for wreckfish in the south Atlantic will be an important test of the practical merits of individual quota management for finfish fisheries in the United States. This paper describes the wreckfish ITQ program in detail and discusses difficulties encountered in its development. Beyond providing information on the practical constraints of setting up ITQs to managers contemplating ITQs for other fisheries, another goal is to evaluate the degree to which the wreckfish ITQ program is accomplishing its resource conservation, economic, and conflict reduction objectives. Analysis of data and experiences over the one and one-half year period during which the wreckfish ITQ has been in place are provided. Linked to the discussion of accomplishing objectives is an evaluation of the degree that consolidation has taken place and the tradeoff between efficiency goals and concerns over monopoly power.

Gay, Joel (1995). Naming Names, NMFS Lists Bycatch Rate, boat by Boat. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

At the request of industry, NMFS lists the vessel name and its bycatch rate for the Chinook salmon fishery. Information is available upon request or on the NMFS bulletin board.

Gay, Joel (1995). Rock Sole Fishery, One of the Dirtiest, But Slowly Cleaning Up. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

A discussion of the rock sole fishermen s efforts to voluntarily reduce bycatch without government regulations. Solutions discussed include individual fishermen s quotas, individual bycatch quotas, gear modifications, and closed areas.

Geen, Gerry and Mark Nayar (1988). "Individual Transferable Quotas in the Southern Bluefin Tuna Fishery: An Economic Appraisal." Marine Resource Economics, 5(4):356-387.

A system of individual transferable quotas (ITQs) was introduced into the southern bluefin tuna (SBT) fishery in 1984. This was the first such management system to be introduced in Australia and among the first worldwide. Its introduction marketed a radical departure from traditional management regimes based on limiting the number of boats allowed to operate and other input controls. Because ITQs are a potential management option for many other fisheries, their success or otherwise in improving the economic performance and prospects of the SBT fishery is likely to have ramifications for the future direction of fisheries management in Australia. The impact of the ITQ scheme on fishery profitability is assessed in relation to the expected outcomes of alternative management programs if they had been introduced instead of ITQs. A model that draws together the major biological, physical, and economic relationships in the fishery provides a framework for this analysis.

Georgianna, Daniel L. (1998). Hook Gear Fishery of the North Atlantic. Draft report, University of Massachusetts, Dartmouth.

Cost and earnings survey of the North Atlantic hook and line fishery.

Georgianna, Daniel L. and Alan Cass (1998). The Cost of Hook Fishing for Groundfish in Northeastern United States. Cooperative Marine Education and Research Program, National Marine Fisheries Service, Contract Number NA67FE0420, University of Massachusetts Dartmouth, North Dartmouth, MA, September, 40 pp.

This document reports the results of surveying hook fishing vessel owners about fishing effort, vessel characteristics, operating costs and overhead costs in the groundfish hook fishery. This document also reports information from port agents and others on vessel and fleet characteristics, and information from suppliers on prices of inputs used in the groundfish hook fishery.

Georgianna, Daniel L., Alan Cass, and Keith Brough (1998). The Cost of Hook Fishing for Groundfish in Northeastern United States. Cooperative Marine Education and Research Program, National Marine Fisheries Service, Contract Number NA67FE0420, University of Massachusetts Dartmouth, North Dartmouth, MA, September, 99 pp.

This document reports the results of surveying hook fishing vessel owners about fishing effort, vessel characteristics, operating costs and overhead costs in the groundfish hook fishery. This document also reports



information from port agents and others on vessel and fleet characteristics, and information from suppliers on prices of inputs used in the groundfish hook fishery.

Georgianna, Daniel L. and William V. Hogan (1986). Production Costs in Atlantic Fresh Fish Processing. Marine Resource Economics, 2(3):275-292.

Production costs for fresh Atlantic groundfish and scallop processing are examined using direct observation, linear regression analysis, and cost accounting. Assuming that management chooses a production technique where marginal costs are constant over a wide range of production due to management's expectation of predictable and unpredictable variation in product demand and exvessel supply, estimates of marginal cost for nonfish inputs from linear regression results and from cost accounting are compared. Also, regression results for physical yield from fish inputs are compared to estimates from the U.S. Department of Commerce. The similarity in results between these independent forms of estimation supports the maintained hypothesis of constant marginal cost over a wide range of production.

Geraci, V.J. and W. Prewo (1982). "An Empirical Demand and Supply Model of International Trade." Review of Economics and Statistics, 64:433-449.

This study develops an empirical model for the joint determination of the demand and supply for bilateral trade, in which both bilateral quantities and bilateral prices are endogenous.

Gianessi, Leonard P., Raymond J. Kopp, Peter Kuch, Cynthia Puffer, and Robert Torla (1988). "Welfare Implications of Restricted Triazine Herbicide Use in the Chesapeake Bay Region." Marine Resource Economics, 5(3):243-258.

The United States Environmental Protection Agency has responsibility under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) to formulate pesticide policies on the basis of risk-benefit analyses. To measure the benefits of pesticide use, one must look at the losses in consumer and producer surpluses that would accompany the banning of a particular pesticide. A typical scenario is one in which the banned pesticide is replaced by another that is more costly and/or less effective. The resulting decrease in supply raises the price of the crop on which the banned pesticide is used, and may alter the prices of substitute and complementary crops as well. This article presents a simulation model of corn and soybean implications of a local ban on triazine herbicides. It reports estimates of lost producer and consumer surplus and the effect that the ban would have on the profitability of agricultural production in the region.

Gibson, David J.M. (1981). "A Handbook on Processing Southern Bluefin Tuna for the Fresh Chilled Sashimi Market in Japan." Ministry of Agriculture and Fisheries, New Zealand Fishing Industry Board, Wellington, New Zealand.

The manual comprises five sections. The introduction gives a brief background to the biology, the fishery, the market, and the quality and grading of southern bluefin tuna caught in the New Zealand zone. The main section explains the processing techniques, the reasons behind the methods used, and the problems that can arise. There are sections on handling and storage in ice and freezing chilled fish and finally a section on packing large fish for export by air in accordance with the International Air

Transport Association regulations and guidelines.

Gilbert, David John (1988). "Use of a Simple Age-Structured Bioeconomic Model to Estimate Optimal Long-Run Surpluses." Marine Resource Economics, 5:23-42.

When the New Zealand government introduced individual transferable quotas for major commercial fish stocks, allocation for some stocks exceeded their total allowable catches and made it necessary to buy back immediately some of the quota. Quota was offered back by tender. A simple age structured bioeconomic model was used to estimate long run optimal surpluses. From these, the maximum prices that should be paid by government for quota were derived. The use of an age structured model proved convenient for this purpose as the necessary parameter estimates tend to arise naturally from literature sources and the population dynamics are transparent. If stocks were managed optimally, the long run value of quota would be equivalent to the net present value of the surplus at the dynamic maximum economic yield. Long run surpluses proved to be dependent on the relative changes in catch rates and costs of fishing that resulted from changes in stock biomass. Optimal surpluses of up to 45% of the greenweight revenues were obtained for heavily exploited, long lived stocks. Only small long run surpluses were obtained for short lived or very lightly exploited stocks.

Gilbert, Richard J. (1979). "Optimal Depletion of an Uncertain Stock." Review of Economic Studies, 46:47-57.

This paper characterizes optimal extraction from a resource stock of uncertain size and examines the value of information about the size of the stock assuming costs and social preferences are known. Given fairly typical assumptions, uncertainty implies a more conservative extraction policy when exploration does not exist. With exploration possible, it is shown to be optimal to invest in exploration to maintain a stock of known reserves.

Gill, Duane A., Robert B. Ditton, and Stephen M. Holland (1993). "Charter and Party Boat Operators in the U.S. Gulf of Mexico: A Social Structure Perspective." Marine Fisheries Review, 55(3):16-20.

To better address the charter and party boat fishery needs in the U.S. Gulf of Mexico, fishery managers must understand the linkages between the industry and other groups and organizations that affect its success. Gulf state charter and party boat operators were interviewed to ascertain the extent of their social network linkages, membership in community organizations, business community relationships, and linkages to information sources. Approximately one-third to one-half of the charter and party boat operators did not belong to local community organizations that could assist their business through tourism promotion or natural resource protection. Despite their limited integration in the community, the vast majority of operators gave and received referrals from other businesses. Of four major information sources, the National Weather Service and the County Marine Extension agents were rated highest and lowest, respectively, in mean importance to charter and party boat operators. Results suggest that business success can be enhanced by strengthening network ties between operators and local businesses, chambers of commerce, and tourism organizations. For this to occur, individual operators and charter/party boat organizations need to become more effective in representing industry interests. Informational linkages between industry and government agencies also need improvement.

Gillespie, William C., James C. Hite, and John S. Lytle (1969). "An

Econometric Analysis of the U.S. Shrimp Industry." Economics of Marine Resources No. 2, Department of Agricultural Economics and Rural Sociology, South Carolina Agricultural Experiment Station, Clemson University, Clemson, South Carolina in cooperation with Coastal Plains Regional Commission.

This study assesses the economic feasibility of imposing a quota on shrimp imports. Thai study was based on the primary hypothesis that a quota on shrimp imports, if used by itself and not coordinated with a program designed to limit the entry of more craft into the industry, would not improve the economic position of the average shrimp fisherman in the industry. More specifically, it was hypothesized that a quota would increase wholesale and ex-vessel prices more than they would have increased without the quota; the increase in prices would encourage the entry of more craft into the industry; and the increase in the number of craft in the industry and rising cost would prevent the real revenue per craft from increasing. A secondary objective of this study was to assess the economic feasibility of imposing a limit on the number of craft in the industry. It was hypothesized that a limit on the number of craft in the industry, if used by itself, would not increase the deflated revenue per craft. Another secondary objective was to assess the effect on the shrimp population of increases in fishing effort. It was hypothesized that increases in fishing effort would overfish the shrimp population and actually reduce the quantity of shrimp supplied.

Gillig, Tasana (1996). ITQ Model. Draft report, Department of Agricultural Economics, Texas A&M University, College Station, Texas.

Theoretical dynamic model used to derive the demand for individual transferable quotas in a stylized fishery.

Gillig, Tasana, Teofilo Ozuna, Jr., and Wade L. Griffin (1998). On the Use of Count Models for Recreation Demand Analysis. Draft report, Department of Agricultural Economics, Texas A&M University, College Station, Texas, January, 18 pp.

This article shows how to mathematically decompose changes in the conditional mean of the Poisson and negative binomial models. The importance of the decomposition is demonstrated by decomposing elasticities and changes in expected consumer surplus. The usefulness of the various decompositions is demonstrated by applying them to the Gulf of Mexico recreational red snapper fishery. The application suggests that more information can be extracted from the estimated coefficients of the Poisson and negative binomial models than is commonly realized.

Gilmartin, William G. and George A. Antonelis (1998). Recommended Recovery Actions for the Hawaiian Monk Seal Population at Midway Island. NOAA-TM-NMFS-SWFSC-253, southwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, May, 14 pp.

The recommendations of a workshop to facilitate recovery of the monk seal population at Midway were the basis for developing recovery actions presented in this document. Workshop participants were presented background data on the Midway monk seal population, results of the 1992 monk seal rehabilitation and translocation to Midway, population trend data for certain Midway reef fishes, and results of the Kure Atoll monk seal recovery efforts during 1985-91 and 1993-95.

Gimbel, Karyn L. (ed.) (1994). Limiting Access to Marine

Fisheries: Keeping the Focus on Conservation. Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

The results of a workshop entitled "Managing Marine Fisheries by Limiting Access" held in Annapolis, Maryland in 1992. Contributed papers and the results of the ensuing discussions are contained in the report.

Ginsburgh, Victor A. (1973). "A Further Note on the Derivation of Quarterly Figures Consistent with Annual Data." Applied Statistics, 22:368-374.

Several methods have been devised to deal with the problem of constructing quarterly data when either (a) related series are available or (b) when only annual totals exist. Methods (a) lead to quarterly figures inconsistent with annual totals. Methods (b) adds nothing to the economic interpretation of the quarterly phenomenon.

Ginter, Jay J.C. (1994). "Summary of First Limited Access Workshop." Memorandum, Chief, Limited Access Planning Branch, Alaska Regional Office, Juneau, Alaska.

The key accomplishments of the workshop are presented in the memorandum.

Ginter, Jay J.C. (1996). "Community Development Quota Report." Proposal, National Resource Council, Chief, Limited Access Planning Branch, Alaska Regional Office, Juneau, Alaska.

A proposal to analyze the performance and effectiveness of community development quota programs.

Gitschlag, Gregg R. and Jon K. Hale (1993). "Susceptibility of Sea Turtles to Underwater Explosives at Offshore Energy Structure Removals." Draft report, National Marine Fisheries Service, Southeast Fisheries Center, Galveston Laboratory, Galveston, Texas.

Observers were stationed at offshore sites to monitor and protect sea turtles during the explosive removal of oil and gas structures in waters of the Gulf of Mexico. Comparisons of sighting rates and effective survey distances for day and night surveys suggested sea turtles moved closer to structure removal locations at night.

Glantz, Michael H. and Lucy E. Feingold (eds.) (1990). Summary Report of the Climate Variability, Climate Change and Fisheries Project, Environmental Societal Impacts Group National Center for Atmospheric Research, P.O. Box 3000, Boulder, Colorado 80307-3000.

During the past decade there has been considerable speculation about the possible impacts of a global warming on terrestrial ecosystems. This study addresses the potential implications for fisheries and societies of the regional impacts of a global warming of the atmosphere based on an assessment of 15 case studies from around the globe.

Glen, John J. (1995). An Optimization Model of the Western Mackerel Fishery. In, Bio-Economic Modelling in the EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 129-147.

In the multi-cohort bioeconomic models that have been developed for

fishery policy evaluation, the length of the planning period and the state of the stock at the end of this period must be specified, although both these factors influence the results. It is suggested that this limitation can be overcome by evaluating policy over an infinite horizon. An optimization model for evaluating policy in a multi-cohort single species fishery over an infinite planning horizon is developed by incorporating results from a steady state fishery model in a multi-period model. The use of this approach is illustrated using data for the western mackerel fishery.

Godcharles, Mark F. (1993). "Synoptic History of Federal Management of King and Spanish Mackerel and Other Coastal Migratory Pelagic Species in the Gulf of Mexico and the South Atlantic." A contribution to the 1993 SAFE Report, National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL, May.

A review of the management history of the migratory coastal pelagics fishery from the implementation of the fishery management plan to amendment 6.

Godcharles, Mark F. (1997). "Catch Limits Approved for King and Spanish Mackerel." News release, National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL, April.

A news release issued to announce catch limits approved for king and Spanish mackerel fisheries in the Gulf of Mexico and south Atlantic groups. Attached is a history of management regulations indicating initial allocations and subsequent landings of the two species since regulations were initially imposed.

Godcharles, Mark F. and Michael D. Murphy (1986). "Species Profiles: Life History and Environmental Requirements of Coastal Fishes and Invertebrates (South Florida), King Mackerel and Spanish Mackerel." U.S. Fish and Wildlife Service Biological Report 82(11.58), U.S. Army Corps of Engineers, TR EL-82-4, June, 18 pp.

This species profile is one of a series on coastal aquatic organisms, principally fish, of sport, commercial, or ecological importance. The profiles are designed to provide coastal managers, engineers, and biologists with a brief comprehensive sketch of the biological characteristics and environmental requirements of the species and to describe how populations of the species may be expected to react to environmental changes caused by coastal development. Each profile has sections on taxonomy, life history, ecological role, environmental requirements, and economic importance, if applicable.

Goh, Bean-San (1980). Management and Analysis of Biological Populations. Developments in Agricultural and Managed- Forest Ecology, Elsevier Scientific Publishing Company, New York.

The two objectives of this book are to demonstrate that Liapunov and Liapunov-like functions can be successfully used to establish, in a nonlinear population model, stability relative to realistic perturbations and to demonstrate the usefulness of optimal control theory in the management of biological populations. Management policies should always be implemented in a feedback manner. This would reduce some of the adverse effects of uncertainties in an ecosystem in the real world.

Gold, Susan M. (1996). Fisheries Logbook System, Preliminary Design Draft. Southeast Fisheries Science Center, National Marine Fisheries Service, Miami, FL, February, 36 pp.

The aim of this paper is to provide a road map for the creation of a consolidated logbook system that will be flexible enough to meet the challenges of ever growing and changing regulations.

Goldberger, Arthur S. (1968). "The Interpretation and Estimation of Cobb-Douglas Functions." Econometrica, 35(3-4):464-472.

For empirical implementation of the Cobb-Douglas function, it is customary to append a multiplicative lognormal disturbance and fit a linear regression in the logarithmic variables. When this is done, attention is shifted (apparently unwittingly) to the conditional median from the conditional mean that is ordinarily the prime target of study. The customary procedure may be modified to provide minimum variance unbiased estimation of the conditional median or conditional mean.

Goldman, Marshall I. and Shigeto Tsuru (1985). "Economics of Environment and Renewable Resources in Socialist Systems." Chapter 16 in Kneese, Allen V. and James L. Sweeney (ed.). Handbook of Natural Resource and Energy Economics, Vol. II, Elsevier Science Publishers B.V.

The economics of pollution in socialist states. Pollution is no better and may be worse in the Soviet Union and China due to their concern about developing an industrial base to compete with the West.

Gomersall, C. Nicholas (1992). "Open-Access Fishery Models: Relaxing a Constraint and Removing an Econometric Obstacle," Marine Resource Economics, 7:59-73.

Over the past 30 years, a widely accepted model of open-access fisheries has been developed, yet empirical tests of the standard model have been relatively few. One difficulty is that fish stocks, the levels of which affect the rate of catch, are not directly observable. Simplifying assumptions are generally required, such as the assumption that catchability does not change over time. Estimation on the basis of the standard model also raises difficulties in specification, if contemporaneous correlation of the error term with one of the regressors is to be avoided. This paper describes an algorithm that imposes a less restrictive pattern than constancy on catchability, yet does so in an econometrically acceptable fashion. It also reports on an application of this algorithm to the Flemish Cap groundfish fishery over the period from 1971 to 1985.

Gonzalez, Exequiel (1996). "Territorial Use Rights in Chilean Fisheries." Marine Resource Economics, 11(3):211-218.

A description of the application of territorial use rights (TURFs) among traditional artisanal fishing communities called Areas for Management and Exploitation of Benthonic Resources (AMEBR) in Chile.

Goodreau, Louis J. (1987). "Enforcement of the MFCMA: An Economist's Perspective. Discussion." Marine Fisheries Review, 49(4):44.

A Discussion of John G. Sutinen (1987). "Enforcement of the MFCMA: An Economist's Perspective." Marine Fisheries Review, 49(4):36-43.

Goodyear, C. Phillip (1989). "LSIM - A Length-Based fish Population Simulation Model." NOAA Technical Memorandum NMFS-SEFC 219, U.S.D.O.C., NOAA, NMFS, SEFC, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149, February, pp. 55.

LSIM is a length-based simulation model for fish populations in which females spawn with an annual periodicity throughout their adult lives. It is designed to facilitate analyses of dynamics of such populations, forecast consequences of management alternatives, and explore the implications of alternative hypotheses concerning such things as growth, mortality, migration, or reproduction.

Goodyear, C. Phillip (1990). "Addendum, Status of Red Snapper Stocks of the Gulf of Mexico, Report for 1990." CRD 89/90-05A, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division.

This summarizes the results of additional analyses performed subsequent to the completion of the 1990 Gulf of Mexico red snapper assessment (Goodyear and Phares, 1990). These analyses include an evaluation of the implications of sharing the cumulative bag limit among headboat patrons and various analyses performed at the request of the Reef Fish Assessment Panel that met to review the assessment and other information to formulate advice for the Gulf council concerning the level of acceptable biological catch and other matters related to the Gulf of Mexico red snapper fishery.

Goodyear, C. Phillip (1990). "Spawning Stock Biomass per Recruit in Fisheries Management: Foundation and Current Use." In Press, Canadian Journal of Fisheries and Aquatic Sciences.

Spawning stock biomass per recruit (SSBR) estimates the expected lifetime reproductive potential of an average recruit (P) that is an important correlate of population growth potential. The ratio of the fished to unfished magnitude of P is the spawning potential ratio (SPR) and is a measure of the impact of fishing on the potential productivity of a stock. Current use of SPR merges concepts developed to quantify the compensation require for population persistence given anthropogenic increases in mortality with observations of stock productivity and SSBR for fisheries in the western North Atlantic. It has a firm theoretical basis and is evaluated against yield per recruit and contrasted with other traditional biological reference points. SPR is widely used in U.S. fisheries managed under the Magnuson Fishery Conservation and Management Act, usually in the context of a percentage of the unfished SSBR. Its implementation is intended to be risk averse through selection of minimum acceptable levels above which stocks maintain acceptable productivity. The behavior of the underlying principles suggests SPR values below about 0.2 should be avoided unless there is evidence for exceptionally strong density dependence in the stock. Critical levels have typically been set in the range of 0.2 to 0.3 primarily based upon the experience in the northwest Atlantic.

Goodyear, C. Phillip (1992). "Red Snapper in U.S. Waters of the Gulf of Mexico." Contribution: MIA 91/92-70, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL.

The biological stock assessment of the red snapper fishery for the Gulf of Mexico is presented in this paper. The conservation measures currently in place are enhancing the condition of the stock. However, without the planned permanent reduction of 50% in the bycatch mortality rate in 1994 or an even higher reduction in 1995, it will not be possible to attain the spawning stock goals of the Plan by the target date of 2007 and to also allow the directed fishery to operate under the current catch limit of 4 million pounds.

Goodyear, C. Phillip (1993). "Red Snapper in U.S. Waters of the Gulf of Mexico, 1992 Assessment Update." Contribution: MIA 92/93-76,

Southeast Fisheries Center, Miami Laboratory, Coastal Resources  
Division, 75 Virginia Beach Drive, Miami, FL.

This document updates tables and analyses that were presented in the 1992 assessment (Goodyear, 1992). New data are available for the 1993 commercial harvest, the 1992 recreational harvest, and recruitment indices for the 1991 and 1992 year classes. These data permit characterization of the size and age composition of the 1992 commercial and recreational catches that were not available for the previous assessment. The time series available to estimate catch per unit effort for all sectors of the recreation fishery are also extended through 1992. These data were used to re-estimate historical fishing mortalities for the directed fishery and shrimp bycatch mortality using the methods described in the earlier assessment. The possible implications for several management alternatives were also forecasted based on the current best estimates of fishing mortality and recruitment. The results of the present analyses are presented in figures and tables numbered to correspond to those in the previous work. A new executive summary, tables, and figures are provided.

Goodyear, C. Phillip (1993). Spawning Stock Biomass per Recruit in Fisheries Management: Foundation and Current Use. Pages 67-81 in S.J. Smith, J.J. Hunt, and D. Rivard (ed.) Risk Evaluation and Biological Reference Points for Fisheries Management, Can. Spec. Publ. Fish. Aquat. Sci. 120.

Spawning stock biomass per recruit (SSBR) estimates the expected lifetime reproductive potential of an average recruit (P), which is an important correlate of population growth potential. The ratio of the fished to unfished magnitude of P is the spawning potential ratio (SPR) and is a measure of the impact of fishing on the potential productivity of the stock. Current use of SPR merges concepts developed to quantify the compensation required for population persistence given anthropogenic increases in mortality with observations of stock productivity and SSBR for fisheries in the western North Atlantic. It has a firm theoretical basis and is evaluated against yield per recruit and contrasted with other traditional biological reference points. SPR is widely used in U.S. fisheries managed under the Magnuson Fishery Conservation and Management Act, usually in the context of a percentage of the unfished SSBR. Its implementation is intended to be risk averse through selection of minimum acceptable levels above which stocks maintain acceptable productivity. The behavior of the underlying principles suggests SPR values below about 0.2 should be avoided unless there is evidence for exceptionally strong density dependence in the stock. Critical levels have typically been set in the range of 0.2 to 0.3 primarily based upon the experience in the northwest Atlantic.

Goodyear, C. Phillip (1994). "Red Snapper in U.S. Waters of the Gulf of Mexico." Contribution: MIA 93/94-63, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL.

The 1994 red snapper stock assessment report concludes that the stock conservation measures currently in place are enhancing the condition of the stock. However, if the 50% reduction in bycatch mortality rate is not achieved in the near future, it will not be possible to attain the spawning stock goals of the plan by the target date of 2009 and to also allow the directed fishery to operate under the current catch limit of 6 million pounds. These estimates are considerably more pessimistic than those presented in 1993, primarily because the 1993 and 1994 catches exceeded TAC.

Goodyear, C. Phillip (1994). "Biological Reference Points for Red



Grouper: Effects of Uncertainty about Growth." MIA-93/94-60,  
Miami Laboratory, Southeast Fisheries Science Center, Miami, FL,  
June, 26 pp.

The effects of uncertainty about growth of U.S. Gulf of Mexico red grouper (Epinephelus morio) on estimates of their population statistics was evaluated by computing the statistics for each of several competing von Bertalanffy growth equations fitted to length at age data from different sources and time periods. Estimates of asymptotic lengths varied from 27.7 inches to 68 inches total length. These equations were used to estimate the age composition of the 1986-1992 combined harvest and to estimate total mortality through means of catch curves constructed for 1986-1989, before the 20 inch minimum size and for 1990-1992 when the minimum size was in place. All of the mortality rate estimates and yield per recruit (YPR) and spawning potential ratio (SPR) evaluations assume equilibrium conditions. The catch curve estimates of mortality that were derived from ages estimated from lengths were biased low. Simulated data were analyzed to develop bias correction equations which were subsequently used in an attempt to remove the bias. Estimated total mortality for fully recruited ages ranged from  $Z=0.286$  to  $Z=0.548$  for 1986-1989 and from  $Z=0.453$  to  $Z=1.545$  for 1990-1992 depending on the growth model selected. This equilibrium assumption is known to be violated for the later period, because of the introduction of the 20 inch minimum size, hence the latter estimates are suspect. The consequence of this defect was not evaluated. The results of this study support additional detailed examination of red grouper growth rates. Furthermore, if age structured assessment methods are to be employed with this stock we must begin routine collection of data to develop annual age-length keys to estimate the age composition of the catch of this fishery.

Goodyear, C. Phillip (1995). "Red Snapper in U.S. Waters of the Gulf of Mexico." Contribution: MIA 95/96-05, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL.

SPR in 1984 varied with the assumed post bycatch natural mortality level. At  $M=0.1$ , the SPR was estimated to be below 1%. Corresponding values for  $M=0.15$  and  $M=0.2$  were about 3% and 4%, respectively. The estimate for each level of post bycatch natural mortality is far below the minimally acceptable level of 20% adopted by the Gulf Council for this fishery. There has been very little improvement in the estimates since 1984, partly because year classes partly protected by recent conservation actions have not yet become important contributors to the spawning stock. Several scenarios of total allowable catch (TAC) and shrimp bycatch mortality reductions were evaluated. In each the bycatch mortality was reduced 5.8% in 1993 and 10.1% in 1994 from the 1984-1989 mean based on reduced shrimp effort. The projections indicate that, if shrimp bycatch mortality is reduced to 24% in 1996, 37% in 1997, and 50% in 1998 of the 1984-1989 average, the TAC for 1995 could be 4536 tons (10 million pounds) or less and still meet the SPR goal by the target date.

Goodyear, C. Phillip (1996). "Comments on the Gallaway and Gazey Review of the Goodyear (1995) Red Snapper Stock Assessment." Contribution: MIA 95/96-?, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL, 12 pp.

A rebuttal to the Gallaway and Gazey (1996) review of the Goodyear (1995) red snapper stock assessment specifically addressing the dead zone, natural mortality effects, and platform effects cited as problems by the

reviewers. Additional, specific comments on the review are provided by the author.

Goodyear, C. Phillip (1996). "Red Snapper Bycatch Mortality: Implications of Possible Estimate Bias on Parameters of the Recovery Plan." Contract report prepared for the Gulf of Mexico Fishery Management Council, 415 Ridgewood Road, Key Biscayne, FL, 15 pp.

To examine the consequences of possible bias in the estimates of red snapper bycatch in the Gulf of Mexico shrimp fishery, the number of juveniles taken as part of the bycatch were adjusted downward by 14 and 33 percent. Adjusting for these biases only slightly improves the estimates of current stock status. A 50 percent reduction in shrimp bycatch is still required in 1997. The magnitude of the postulated error in the bycatch estimates is insufficient to meaningfully affect the need to reduce bycatch of red snapper by the shrimp fishery.

Goodyear, C. Phillip and Sigurd W. Christensen (1984). "On the Ability of Detect the Influence of Spawning Stock on Recruitment." North American Journal of Fisheries Management, 4:186-193.

Simulated observations of spawning stock size, recruitment, and two random environmental variables were obtained from a density-independent Leslie matrix model. Recruitment to age 1 was directly proportional to population fecundity but strongly influenced by the effects of the random environmental variables. The simulated observations were subjected to multiple regression analysis that detected the influence of the random environmental variables but did not reliably detect the influence of spawning stock. These results indicate that multiple regression is unreliable in detecting the influence of stock on recruitment when annual variations in recruitment are primarily due to environmental factors.

Goodyear, C. Phillip and Patricia Phares (1990). "Status of Red Snapper Stocks of the Gulf of Mexico Report for 1990." Contribution: CRD 89/90-05, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL 33149-1099.

The conservation measures currently in place are unlikely to enhance the condition of the stock without the assistance of an unforeseen, environmentally controlled increase in recruitment. Stringent conservation measures will be required of the directed fishery to attain the spawning stock goals of the Plan and will likely be required to persist indefinitely if the shrimp trawl discard mortality cannot be controlled.

Goodyear, C. Phillip and Michael J. Schirripa (1993). "The Red Grouper Fishery of the Gulf of Mexico." Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL, August, 122 pp.

The biological stock assessment for red grouper in the Gulf of Mexico is presented in the paper.

Goodwin, Susan Ann (1977). "Measuring the Value of Housing Quality - A Note." Journal of regional Science, 17(1):107-115.

Kain and Quigley's paper was the catalyst for a study of rental housing quality in the metropolitan Boston area (Goodwin) undertaken in 1970-1971. In it, a range of apartment, town socioeconomic variables, and an extensive

selection of location characteristics were included in the regressions on monthly rents. This article concentrates on that portion of the Boston study that probed the influence of locational factors, and, in particular, explored the impact of a new employment accessibility index on rents.

Gordon, Daniel V. and Rognvaldur Hannesson (1996). "On Prices of Fresh and Frozen Cod Fish in European and U.S. Markets." Marine Resource Economics, 11(4):223-238.

The purpose of this paper is to test for price linkages among European France, Germany, and U.K.) and U.S. prices of whole fresh cod and frozen cod fillets. In testing for a cointegrated system, we use both the two-stage Engle-Granger and Johansen procedures. Short run price dynamics are measured using an error-correction model. Based on monthly import price observations from 1980 to 1992, the empirical results show no long run price relationships for fresh cod between European and U.S. markets, but we do measure long run price linkages for frozen cod fillets. Within Europe the markets for both fresh and frozen cod product are well integrated. The U.S. fresh cod market is distinct and separate from European markets, while the U.S. frozen cod market shows no short run links to European markets. There is weak evidence for a long run international market in frozen cod fillets.

Gordon, Daniel V., Kjell G. Salvanes, and Frank Atkins (1993). "A Fish is a Fish is a Fish? Testing for Market Linkages on the Paris Fish Market." Marine Resource Economics, 8(4):331-343.

This paper applies both the Engle-Granger and Johansen cointegration test procedures to determine the existence of market linkage among high valued (salmon and turbot) and low valued (cod) fish species using monthly average wholesale price data recorded on the Paris fish market. We find that the price of salmon is determined exogenously to the system of prices examined and that the market for salmon is not linked to the markets for turbot or cod.

Gordon, H. Scott (1953). "An Economic Approach to the Optimum Utilization of Fisheries Resources." J. Fish. Res. Board Can., 10(7):442-457.

The purpose of the paper is to approach the problems of optimum human utilization of fishery resources from the side of one of the social sciences-economics. I believe that an application of some of the standard devices of economic theory can help to clarify the objectives of conservation and contribute to a better evaluation of control measures.

Gordon, H. Scott (1954). "The Economic Theory of a Common-Property Resource: The Fishery." Journal of Political Economy, 62:124-42.

This paper examines the economic theory of natural resource utilization as it pertains to the fishing industry. It will appear that most of the problems associated with the words "conservation" or "depletion" or "overexploitation" in fisheries are manifestations of the fact that the natural resources of the sea yield no economic rent. Fishery resources are unusual in the fact of their common property nature; but they are not unique, and similar problems are encountered in other cases of common property resource industries, such as petroleum production, hunting and trapping, etc. Although the theory presented in the following pages is worked out in terms of the fishing industry, it is applicable generally to all cases where natural resources are owned in common and exploited under conditions of individualistic competition.

Gordon, H. Scott (1958). "Economics and the Conservation Question."  
Journal of Law and Economics, 14:110-121.

The chief purpose of this paper is to present, in as nontechnical terms as possible, the basic economic theory of the conservation problem. It is written with the hope of contributing something towards the rationalization of conservation policy by making the economist's point of view more widely understood.

Gorte, Ross W., Eugene H. Buck, David M. Sale, and Adrienne C. Grenfell (1985). "Limiting Access for Commercial Fish Harvesting."  
Prepared at the Request of the House Committee on Merchant Marine and Fisheries by Congressional Research Service, The Library of Congress, Washington, D.C. 20540, October 7, 71 pp.

Commercial fish harvesters are often able to exploit fisheries resources beyond sustainable levels, heightening competition and reducing their incomes. Limited access (restricting who is allowed to harvest fisheries resources) is one approach to addressing such problems. This paper describes the three basic limited access mechanisms (input restrictions: licenses and permits; economic disincentives: taxes and fees; and harvest allocations: harvester quotas and shares) and briefly catalogs existing limited access programs. There are also sections on case law involving limited access in the United States and on access to other natural resources as well as an extensive bibliography on limited access.

Gosselink, James G., Eugene P. Odum, and R.M. Pope (1974). "The Value of the Tidal Marsh." LSU-SG-74-03, Center For Wetland Resources, Louisiana State University, Baton Rouge, LA.

Natural tidal marshes are evaluated in monetary terms. Byproduct production (fisheries, etc.) on a per acre basis yields a value of only about \$100 per year, even when the whole value of the fishery is imputed to the marsh. More intensive uses, such as oyster aquaculture, that preserve many of the natural functions of the marsh-estuarine ecosystem, have a potential up to \$1000 per acre per year. The potential for waste assimilation is much higher, about \$2500 per acre per year for tertiary treatment. Summation of the noncompeting uses approaches an ecological life support value of about \$4000 per acre per year, based on the gross primary productivity (in energy terms) of the natural marsh, using a conversion ratio from energy to dollars based on the ratio of Gross National Product to National Energy Consumption. When these annual social values of \$2500 - \$4000 are income capitalized at a 5% interest rate the estimated total social values are \$50,000 to \$80,000 per acre. Some estuaries, such as the Potomac or the Hudson, are now performing waste assimilation work of even greater value, but such estuaries are overloaded to the point of degradation.

Analysis based on the total value of the life support role of a natural tidal marsh-estuary suggests that a strategy of optimization in land use planning should replace, or supplement, reliance on the pricing system which is inadequate for preservation of natural systems that increase in value with the intensity of adjacent development.

Gottinger, Hans Werner (ed.) (1974). Systems Approaches and Environmental Problems. Vandenhoeck & Ruprecht, Gottingen, Germany.

An international conference on new methods and techniques relating to the problems involved in solving environmental problems using systems theory.

Gould, J.R. (1972). "Extinction of a Fishery by Commercial Exploitation: A Note." J. Polit. Econ., 80:1031-1038.

This paper reexamines the inference by Smith (1969) that the received doctrine is unable to handle the situation in which a species may be exploited to the point of extinction. The theory implies that short of zero unit costs the equilibrium yield to competitive exploitation is never zero with an extinct population.

Gracia, Adolfo (1991). "Spawning Stock-Recruitment Relationships of White Shrimp in the Southwestern Gulf of Mexico." Transactions of the American Fisheries Society, 120:519-527.

The annual spawner-recruit relationship for white shrimp *Penaeus setiferus* in the southwestern Gulf of Mexico did not show a significant correlation ( $0.10 > P > 0.05$ ) from 1973 to 1984. I attribute this to the effect of environmental factors as well as to the interannual variability of recruitment strength in the main cohorts throughout each year. A Ricker stock-recruitment relationship was established for dominant cohorts in the 1973-1984 study period. The variance explained by the model increased from 70 to 82% (multiple correlation  $r=0.903$ ,  $P < 0.001$ ) when river discharges during the spawning month and before recruitment were included. I propose that the magnitude of recruitment largely depends on the carrying capacity of critical nursery habitats. Fishing effort is related to recruit abundance and has a direct effect in determining spawner stock size (multiple correlation  $r=0.91$ ,  $P < 0.001$ ). Through multiple-regression techniques, a surface was defined where the recruitment level varied according to spawning stock size as well as to river discharge.

Grafton, R. Quentin (1993). "Rent Capture in a Rights Based Fishery." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

The paper presents a comparison of different methods of rent capture and the first empirical analysis of the effects of rent capture upon a fishery managed with individual transferable quotas. Using simulations from a unit profit function, individual vessel profits that include intra-marginal rents and a resource rent are predicted for 1990. A quota rental charge, profit charge, lump sum charge, and an ad valorem royalty are then compared on a theoretical basis and with simulations using the predicted profits of fishers. The criteria for comparison include their effect on the distribution of profits after rent capture, distortions imposed on the fishery, the relative tax burden imposed on different fishers, flexibility to adjust to changes in the fishery, and the potential for fishers to avoid paying a rental charge.

Grafton, R. Quentin (1994). "A Note on Uncertainty and Rent Capture in an ITQ Fishery." Journal of Environmental Economics and Management, 27:286-294.

This note addresses the effect of uncertainty on the expected resource rent, the short run quota equilibrium, and the methods of rent capture in an individual transferable quota fishery with heterogeneous fishers. It presents some new results on the effects of output price uncertainty on the quota demands, the short run equilibrium, and the possible choice of a method of rent capture.

Grafton, R. Quentin (1995). "Rent Capture in a Rights-Based Fishery." Journal of Environmental Economics and Management, 28:48-67.

The paper compares four methods of rent capture in a fishery managed with individual transferable quotas using simulations from a unit profit function. Some theoretical properties of a quota rental charge, profit charge, lump sum charge, and an ad valorem royalty are examined and then compared in simulations in terms of the distribution of profits, distortions to the fishery, the relative burden on fishers, and flexibility to adjust to changes in the fishery.

Grafton, R. Quentin (1996). Implications of Taxing Quota Value in an Individual Transferable Quota Fishery: Comment. Marine Resource Economics, 11(2):125-127.

A response to an article by Johnson (1995) that examines the effects of imposing resource rentals on fishermen in an individual transferable quota (ITQ) fishery. In a second best world, a tax on ITQ value may not be ideal, but could be preferable to no tax under certain conditions.

Grafton, R. Quentin and J. Silva-Echenique (1997). How to Manage Nature? Strategies, Predator-Prey Models, and Chaos. Marine Resource Economics, 12(2):127-143.

The Lotka-Volterra predator-prey model exemplifies the implicit and explicit assumptions managers often have regarding species interaction - populations are stable or fluctuate periodically. The reality is often much more complicated and there is overwhelming evidence that many populations fluctuate in a nonperiodic way. Using a discrete predator-prey model that generates chaos, it is possible to qualitatively mimic the interaction of some predator-prey populations. The implications of the paper are that managers should place greater emphasis on theoretical modeling and simulations, try to understand ecosystems and broad relationships between species rather than obtain minute details and data on individual populations, make management as flexible as possible to help people adjust to rapid changes in populations, employ mixed strategies so as to give options whatever the underlying dynamics, and, where appropriate, experiment with different strategies for different subpopulations to learn more about the effectiveness of alternative management approaches.

Granger, C.W.J. (1989). Forecasting in Business and Economics. Academic Press, Inc., New York.

This text provides a clear cut strategy for tackling a forecasting problem. The importance of the selection of a relevant information set is emphasized together with the question of how to evaluate one's forecasts once they have been prepared. With this strategy in mind, a variety of forecasting techniques and problems, of increasing scope and complexity, are discussed.

Grant, George (1990). "The U.S. Swordfish Industry: A Socio-Economic Overview." Final Report, New Jersey fisheries Development Commission, April, 29 pp.

This monograph presents a compilation of descriptive, survey and analytical data relating to the possible socioeconomic impacts of Amendment 1 to the Swordfish Management Plan focusing on the state of New Jersey fishery.

Grant, William E. (1986). Systems Analysis and Simulation in Wildlife and Fisheries Sciences. John Wiley & Sons, New York.

The book's objectives are to describe the systems approach to problem solving, demonstrate its applicability to wildlife and fisheries problems, and

develop a general understanding and basic vocabulary in selected areas of mathematics, statistics, and computer science as they relate to ecological modeling while providing a hands-on approach to learning modeling skills.

Grant, W.E. and W.L. Griffin (1979). "A Bioeconomic Model of the Gulf of Mexico Shrimp Fishery." Transactions of the American Fisheries Society, 108(1):1-13.

A bioeconomic model of the brown shrimp fishery in Galveston Bay, Texas and adjacent offshore waters accurately predicts the general trends in the seasonality of shrimp harvest and the distribution of the harvest in relation to size of shrimp and water depth.

Grant, W.E., W.L. Griffin, and J.P. Warren (1981). "A Management Model of the Northwest African Cephalopod Fishery." Marine Fisheries Review, 43(11):1-10.

Two versions of a bioeconomic model (GBFSM) of the northwest African cephalopod fishery, one assuming an instantaneous natural mortality rate of  $M=1.25$  on an annual basis and the other a rate of  $M=2.0$ , predict the harvest of octopus, *Octopus vulgaris*; cuttlefish, *Sepia* spp.; and squid, *Loligo* spp. These predictions are compared with actual harvest data, the sensitivity of model behavior to changes in important biological parameters is examined, and two management schemes for the fishery are evaluated.

Grant, William E., Wade L. Griffin, and Mervin J. Yetley (198?). "Bio-Socio- Economic Model of Gulf of Mexico Shrimp Fishery." Outline of a proposal, Texas A&M University, College Station, Texas.

A draft proposal to develop a multi-disciplinary model of the shrimp fishery system.

Grant, W.E., K.G. Isakson, and W.L. Griffin (1981). "A General Bioeconomic Simulation Model for Annual Crop Marine Fisheries." Ecological Modeling, 13:195-219.

A generalized bioeconomic simulation model (GBFSM) of annual crop marine fisheries is described and its use in marine fisheries management is demonstrated. The biological submodel represents the recruitment of new organisms into the fishery, the movement of organisms from one fishing area to another and from one depth to another, the growth of organisms and the mortality of organisms resulting from both natural causes and from fishing. The economic submodel represents the fishing effort exerted on each resource species, the monetary costs of fishing, the value of the harvest and the rent (or excess profits) to the fishery.

Basic dynamics of the model result from changes in the number of organisms in the fishery over time, which can be summarized as a set of difference equations of the general form

$$CN/Ct = R + I - E - M - F$$

where  $CN/Ct$  is the net change in number of organisms in the fishery over time ( $t$ ),  $R$  is recruitment,  $I$  is immigration,  $E$  is emigration,  $M$  is natural mortality, and  $F$  is fishing mortality. The driving variable is  $R$  whereas  $I$ ,  $E$ ,  $M$ , and  $F$  are functions of the state of the system at any given point in time. The model can be run in a deterministic or stochastic mode. Values for parameters affecting rates of recruitment, movement, growth, natural mortality and fishing mortality can be selected from uniform, triangular or normal distributions.

Use of the model within a fisheries management framework is demonstrated by evaluating several management alternatives for the pink shrimp fishery on

the Tortugas grounds in the Gulf of Mexico. Steps involved in use of the model, including parameterization, validation, sensitivity analysis and stochastic simulations of management policies are explained.

Grady, Patrick, Gordon Munro, Paul MacNeil, Alex Fekete, and Gong Xue (1998). Free Trade and Investment in the Fisheries Sector of the Asia-Pacific Region: An Economic Analysis of Tariffs. Draft report, Ref: F98/CP/00267, Global Economics Ltd., Suite 307, 63 Sparks St., Ottawa, Ontario, October, 82 pp.

The authors find that trade liberalization in fishery products could potentially improve net economic benefits among APEC member countries. This recommendation is based on a simple model of international trade and assumes that APEC member countries will take the necessary corrective management actions in their own countries.

Grady, Patrick, Gordon Munro, Paul MacNeil, Alex Fekete, and Gong Xue (1999). Free Trade and Investment in the Fisheries Sector of the Asia-Pacific Region: An Economic Analysis of Tariffs. Draft report, Ref: F98/CP/00267, Global Economics Ltd., Suite 307, 63 Sparks St., Ottawa, Ontario, October, 82 pp.

The authors find that trade liberalization in fishery products could potentially improve net economic benefits among APEC member countries. This recommendation is based on a simple model of international trade and assumes that APEC member countries will take the necessary corrective management actions in their own countries to correct for market failures. It also assumes that aquaculture will increase to fill any wild harvest short fall created by trade liberalization.

Gray, Lewis Cecil (1914). "Rent Under the Assumption of Exhaustibility." The Quarterly Journal of Economics, 28:466-489.

The real economic rent of exhaustible resources comprise the entire net return from the rent bearer, including the royalty.

Greboval, Dominique (1997). Expert Consultation on Management of Fishing Capacity. Draft proposal, Food and Agriculture Organization of the United Nations, Rome, Italy.

A proposal to develop a expert panel to develop guidelines on the measurement and control of fishing capacity in global fisheries. The scope is limited to major industrial marine fisheries with consideration given to mixed species harvest operations and less developed countries.

Greboval, Dominique (1997). Fishing Capacity in National Jurisdictions and High Sea. Draft report, Food and Agriculture Organization of the United Nations, Rome, Italy.

A discussion of the implications for controlling overcapitalization and excess capacity in national and high seas fisheries. While over capacity and overcapitalization are assumed to be similar while their legal environments are different. To control high seas fishing capacity, existing international agreements would have to be strengthened.

Greboval, Dominique (1999). Managing Fishing Capacity. FAO Fisheries Technical Paper 386, Food and Agriculture Organization of the United Nations, Rome, Italy.



Excessive fishing capacity is largely responsible for the degradation of marine fisheries resources, for the dissipation of food production potential and for significant economic waste, especially manifest in the form of redundant fishing inputs. The globalization of this phenomenon and the impact of excessive fishing capacity on the biological and economic condition of many fisheries throughout the world have been a matter of increasing concern in recent years. Selected papers prepared as reference material for a Technical Working Group on the Management of Fishing Capacity in La Jolla, are presented in this FAO Fisheries Technical Paper. Underlying economics and methods of control are reviewed. Specific aspects of high seas fisheries are addressed. Issues raised in measuring fishing capacity and capacity utilization are extensively explored. Difficulties associated with the assessment of fishing capacity at the global level are also briefly discussed.

Greboval, Dominique and Gordon Munro (1997). Overcapitalization and Excess Capacity in World Fisheries: Underlying Economics and Methods of Control. Draft report, Food and Agriculture Organization of the United Nations, Rome, Italy.

A discussion of the possible means of control and reduction of fisheries overcapitalization.

Greboval, Dominique and Gordon Munro (1998). Overcapitalization and Excess Capacity in World Fisheries: Underlying Economics and Methods of Control. Revised draft report, Technical Working Group on the Management of Fishing Capacity, Food and Agriculture Organization of the United Nations, Rome, Italy.

A discussion of the economics of overcapitalization and possible means of control to reduce fisheries overcapitalization.

Green, John M. (1984). "Recommendations for Action: Panel 4 Potentials for Expanded Resource Use." Chapter 23 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Recommendations for the conservation and preservation of marine habitat as a base for recreational and commercial fisheries.

Green, Paul E. (1984). "Hybrid Models for Conjoint Analysis: an Expository Review." Journal of Marketing Research, May:155-271.

Over the past few years hybrid models for conjoint analysis have been developed to reduce data collection effort and time. Hybrid models combine features of self-explicated utility measurement with more traditional conjoint analysis. A classification of hybrid models is presented, followed by a review of their comparative performance in cross validation tests. Though hybrid models represent an attempt to cope with an important practical problem in industry applications of conjoint techniques, these models entail a number of untested assumptions requiring further theoretical analysis and empirical research. Suggestions are offered on future studies that are essential before the role of hybrid models in conjoint methods can be evaluated properly.

Green, Paul E. and V. Srinivasan (1978). "Conjoint Analysis in Consumer Research: Issues and Outlook." Journal of Consumer Research, 5:103-123.

Since 1971 conjoint analysis has been applied to a wide variety of problems in consumer research. This paper discusses various issues involved in implementing conjoint analysis and describes some new technical developments and application areas for the methodology.

Green, Paul E. and Yoram Wind (1975). "New Way to Measure Consumers' Judgments." Chapter 3 in New Product Forecasting, pages 89-108 reprinted from Harvard Business Review, (July-August).

Conjoint measurement starts with the consumer's overall or global judgments about a set of complex alternatives and then decomposes his or her original evaluations into separate and compatible utility scales by which the original global judgments can be reconstituted providing a manager with the relative importance of different product attributes.

Green, Trellis G. (1984). "Compensating and Equivalent Variation of the Florida Saltwater Tourist Fishery." Ph.D. Dissertation, Department of Economics, Florida State University.

The study establishes the value in recreational use of Florida's saltwater tourist fishery, using exact Hicksian compensating and equivalent variation methods. The Hicksian approach removes the approximating error of Marshall's consumer surplus measures. The theoretical model underlying the angling experience emphasizes the multipurpose nature of the tourist trip. It is based upon a Gibbs type approach in which variable on-site cost proxies market price and travel cost enters the budget constraint. On-site cost and angling success rate are explicitly incorporated into a system of behavioral relations. Some restrictive assumptions found in similar studies are relaxed with composite goods utility. Empirical estimates for aggregated and subgroup angling categories are made with multiple equation models of identified linear and nonlinear specifications. There is some evidence that shore anglers might be more and less sensitive to changes in on-site cost and success rate, respectively. Single equation models are also used, but exhibit downward coefficient bias. Results corroborate the findings of previous studies that the market and nonmarket values of Florida's marine recreational fishery are very large relative to state product and/or commercial sector activity. Inelastic short run price and success rate elasticity is confirmed. Hicksian methods are not shown to be significantly more accurate than most Marshallian ones, except in the case of the direct aggregate user opinion method. Sensitivity analysis offers policy implications supporting a marine tourist fishing license and stock rebuilding schemes, such as bag limits for depleted species. The unrecoverable deadweight burden to society caused by a \$10 annual tourist fishing license is less than one percent of the \$31 million in direct, adjusted license revenues estimated to be forthcoming annually.

Green, Trellis G. (1989). The Economic Value and Policy Implications of Recreational Red Drum Success Rate in the Gulf of Mexico. National Marine Fisheries Service, MARFIN Grant No. NA87WC-H-06146.

The author undertakes an assessment of the MRFSS data base using red drum as a target species in a recreational fishing trip. A red drum angler profile is provided and success elasticity is estimated and used in the estimation of welfare benefits of red drum reallocation management measures. A suggested policy to move the fishery closer to optimal yield is a reallocation of red drum stocks to recreational anglers. One weakness of the study is the lack of a comparable commercial harvest sector to base model conclusions concerning reallocation.

Green, Trellis G. (1994). "Allocation Between Commercial and Recreational Sectors in Stressed Marine Fisheries." Society and Natural Resources, 7:39-56.

This paper provides an overview of the economic approach to open access, optimum fishery allocation between commercial and recreational users. The goal is to familiarize noneconomists with efficiency concepts, such as net benefit, that pertain to optimum allocation. A theoretical model of the policy trade off between economic efficiency and social equity is also developed. Net benefit is distinguished from economic impact that cannot guarantee optimum allocation. Finally, empirical methods are applied to the red drum fishery in the Gulf of Mexico. Results support policies that reallocate wild red drum from the commercial to the recreational fishery.

Greenberg, Joshua A., Mark Herrmann, and John McCracken (1995). An International Supply and Demand Model for Alaska Snow Crab. Marine Resource Economics, 10(3):231-246.

The Alaska snow crab fishery has increased in commercial importance as the king and Tanner crab stocks have declined. The commercial success of snow crab has led to a rejuvenation of the Alaska crab fleet. This success has led to important economic questions about snow crab markets. This paper is the first to econometrically model the world snow crab markets and addresses the specific question of whether a 400 million pound harvest in 1992 would have enhance gross receipts to the Alaska snow crab fleet. The results do not support industry s concern that a 1992 400 million pound harvest would have depressed gross fishery returns.

Greene, Gretchen, Charles B. Moss, and Thomas H. Spreen (1997). "The Demand for Recreational Fishing in Tampa Bay, Florida: A Random Utility Approach." Marine Resource Economics, forthcoming, May.

An estimation of demand for recreational fishing in Tampa Bay, Florida, can facilitate the environmental management of the bay. A nested random utility travel cost model is used to estimate access values. Results suggest average annual values for the bay alone are \$18.14 and \$0.048 for participants and nonparticipants, respectively.

Greene, Gretchen, Charles B. Moss, and Eric Thunberg (1994). "Estimation of Recreational Anglers' Value of Reef-Fish in the Gulf of Mexico." Submitted to Resource Economics, January.

Several public policy issues in the Gulf of Mexico region involve the value of the reef fish recreational fishery. This study estimates the economic impact of this fishery using a travel cost procedure. The results indicate that the fishery generates \$460 million within the state of Florida annually.

Greene, Gretchen, Charles B. Moss, and Eric Thunberg (1994). "Estimation of Recreational Anglers' Value of Reef-Fish in the Gulf of Mexico." Draft MARFIN report, Department of Food and Resource Economics, University of Florida, Gainesville, FL. September.

Several public policy issues in the Gulf of Mexico region involve the value of the reef fish recreational fishery. This study estimates the economic impact of this fishery using a travel cost procedure. Demand for recreational reef fishing is estimated as a function of travel costs and other costs paid, and of success of catch. The results indicate that the fishery

generates \$566.8 million within the state of Florida annually. Further a 20% reduction in the average catch reduced these total expenditures by \$32.1 million.

Greene, Gretchen, Charles B. Moss, and Eric M. Thunberg (1994).

"Estimation of Recreational Anglers' Value of Reef-Fish in the Gulf of Mexico." Final MARFIN report, Contract No. NA37FF0054, Department of Food and Resource Economics, University of Florida, Gainesville, FL. September.

Several public policy issues in the Gulf of Mexico region involve the value of the reef fish recreational fishery. This study estimates the economic impact of this fishery using a travel cost procedure. Demand for recreational reef fishing is estimated as a function of travel costs and other costs paid, and of success of catch. The results indicate that a 20% reduction in the average catch reduced expenditures by \$32.1 million. The fishery is estimated to generate \$385.6 million in total expenditures within the state of Florida annually.

Greer, Jed (1995). The Big Business Takeover of U.S. Fisheries: Privatizing the Oceans Through Individual Transferable Quotas (ITQs). Greenpeace, 1436 U Street, N.W., Washington, D.C., April.

A unique report biased against the adoption of ITQs in U.S. fisheries that selectively cites material from the literature and takes quotas from authors out of context. Evidence from the literature that does not support their position is ignored. Confusion also exists about the basic concepts underlying different proposed rights based management regulations such as individual quotas and individual transferable quotas.

Gregory, D.R., Jr. (1988). "An Annotated Bibliography of Literature Pertaining to Reef Fish Bycatch in Shrimp Trawls." Gulf of Mexico fishery Management Council, March, 13 pp.

An annotated bibliography of reef fish bycatch literature.

Gregory, Douglas R. (Chairman) (1994). "1994 Report of the Reef Fish Stock Assessment Panel." Reef Fish Assessment Panel, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida.

The report reviews the reef fish stock assessment and recommends a range of allowable biological catch and framework measures required to attain management goals. This report also documents data collection problems in conjunction with minimum size fishery management regulations in the red grouper fishery that severely bias stock assessment estimates.

Grice, Frank, Russell A. Cookingham, Deborah Cramer, Eleanor M. Dorsey, William G. Gordon, Henry Lyman, Frank Mirarchi, and David B. Rockland (1990). New England Groundfish In Crisis -- Again. Report of the Massachusetts Offshore Groundfish Task Force, December, 33 pp.

The task force has examined the recent precipitous decline in groundfish landings in New England and concluded that the primary cause is overfishing by American fishers due to mismanagement of the resource.

Griffith, David and Christopher L. Dyer (1996). An Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in New England and the Mid-Atlantic Regions. Contract Number 50-DGNF-5-00008,

Aguirre International, Bethesda, MD for the National Oceanic and Atmospheric Administration, 1315 East-West Highway, Silver Spring, MD.

Aguirre International was engaged to report on the social and cultural aspects of the multispecies groundfish fishery by ascertaining community-dependence on the MGF, providing information on the demographics of the fishing industry, identifying social science data bases that could be used in follow-up studies and developing a classification system that will aid in predicting the social impacts of the changing fishery regulations on fishery dependent communities.

Grigalunas, Thomas (1984). "Hydrocarbon Economics." Chapter 22 in Resource Use and Use Conflicts in the Exclusive Economics Zone. Proceedings of Workshop sponsored by the Center for Ocean Management Studies.

Economic issues in managing the exclusive economic zone (EEZ) are discussed based on experiences with the Outer Continental Shelf Lands Act Amendments of 1978. Specifically, regulations versus economic incentives to avoid oil spills, social tradeoffs of alternative leasing systems, and the rate of leasing are discussed. Basically, the EEZ proclamation does not raise any fundamentally new management issues for oil and gas exploitation in federal waters. Nonetheless, the economic importance of the hydrocarbon resources in federal waters, the variety of diverging interests concerned with their development, and the movement of exploitation toward deeper waters and harsher environments assure that the management of oil and gas in the EEZ will remain a topic of considerable significance and public debate.

Grigalunas, Thomas A., James J. Opaluch, Deborah French, and Mark Reed (1986). "Measuring Damages to Marine Natural Resources: Application of An Integrated Ocean Systems/Economic Model." Draft report, Economic Analysis Inc., Wakefield, R.I., July, 32 pp.

Several pieces of federal environmental regulation establish strict liability for damages from spills of oil and hazardous substances. This paper discusses the approach proposed by the U.S. Department of Interior for evaluating "Type A" spills of oil or hazardous substances in the marine environment. The approach employs an integrated ocean systems/economic model to simulate the physical fates, biological effects, and the resulting economic damages from spills in the marine environment. Some preliminary results are presented for hypothetical spills of a number of substances in a variety of environments. The results show that the size and shape of the damage function depend on a variety of properties of the substance spilled and the environment in which the spill occurs.

Grigalunas, Thomas A., Robert C. Anderson, Gardner M. Brown, Jr., Richard Congar, Norman F. Meade, and Philip E. Sorensen (1986). Estimating the Cost of Oil Spills: Lessons from the Amoco Cadiz Incidence. Marine Resource Economics, 2(3):239-262.

This paper addresses some of the conceptual and empirical issues involved with estimating the economic costs of oil spills, using a comprehensive economic analysis of the 1978 supertanker Amoco Cadiz incident as a case study. Estimates are made of the market and nonmarket-valued costs of the spill and their distribution among the residents of the affected region, the nation, and the rest of the world. The implications of the case study for the analysis of future oil spill incidents are examined.

Griffin, James M. and Henry B. Steele (1980). Energy Economics and Policy. Academic Press, Inc., New York.

This book provides a unified analysis of energy economics and energy policy using a microanalytic approach to complex policy problems that offers the prospect of markedly improving policy decisions. Using oil and gas within a cost benefit framework, decision makers are provided the tools to act so as to minimize the economic cost of achieving the goals that they are empowered to pursue.

Griffin, Kerry (19??). Factors Affecting the North Pacific Groundfish Fishery. Draft report, 18 pp.

The inshore/offshore allocation debate has dominated the discussion of management of groundfish fisheries of the north Pacific in recent years. This, along with several other factors, influences the groundfish market. These other factors include quality concerns, other fishing management decisions, world economic dynamics, and the status of the rest of the world's groundfish fisheries. These issues are discussed, although special emphasis will be given to the inshore/offshore allocation debate and the management strategy for north Pacific groundfish.

Griffin, Wade L. (1977). "Time Trends in the Harvesting Sector of the Gulf of Mexico Shrimp Industry." DIR 77-1, SP-2, The Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, March, 32 pp.

Time trends in pounds landed, days fished, fleet size, fishing effort index numbers, and value are presented and discussed.

Griffin, Wade L. (1994). "Shrimp Fishing Cost and Returns in Texas." Department of Agricultural Economics, Texas A&M University, College Station, Texas.

Trends in costs and returns for vessels greater than 60 feet operating off the Texas coast.

Griffin, Wade L. (1996). Quantitative Methods in Agricultural Economics and Agribusiness. Agricultural Economics 317, Class Notes, First Summer Session, Department of Agricultural Economics, Texas A&M University.

An introduction to mathematical economics and econometrics.

Griffin, Wade L. (1996). Quantitative Methods in Agricultural Economics and Agribusiness. Agricultural Economics 317, Answers to Exercises, First Summer Session, Department of Agricultural Economics, Texas A&M University.

Answers to exercises in an introduction to mathematical economics and econometrics.

Griffin, Wade L. (1996). "Shrimp Bycatch Reduction: Impacts on the Shrimp and Red Snapper Harvesting Sectors in the Gulf of Mexico." MARFIN Proposal, Department of Agricultural Economics, Texas A&M University, College Station, Texas.

A proposal to measure the impact of alternative management policies on shrimp and red snapper fisheries by measuring the changes in consumer and producer surplus. The specific objectives are to: 1) review literature and collect available data on the red snapper fishery, 2) Develop a parent-stock recruitment relationship in GBFSM for the red snapper fishery in the Gulf of Mexico, 3) Develop a submodel for the recreational harvesting sector in GBFSM

of the red snapper fishery, 4) Develop a submodel for the commercial harvesting sector in GBFSM of the red snapper fishery, 5) Incorporate the demand models into GBFSM, 6) Develop a submodel to generate producer and consumer surplus for the shrimp and red snapper fisheries, 7) Parameterize the biological and economic components of the red snapper submodels, and 8) Estimate the economic impacts on the shrimp harvesting sector and the red snapper recreational and commercial sectors due to seasonal/area closures and use of BRDs imposed on the Gulf shrimp fishery.

Griffin, Wade L. and Bruce R. Beattie (1978). "Economic Impact of Mexico's 200-Mile Offshore Fishing Zone on the United States Gulf of Mexico Shrimp Fishery." Land Economics, 54(1)27-38.

A simple static equilibrium model of the Gulf of Mexico shrimp fishery is developed using cost data collected for 1974 and 1975 to determine the impact of the 200-mile limit imposed by Mexico on shrimp fishermen operating out of Texas and Florida. Given the present shrimp price and cost of production situation, the adjustment to the Mexican 200 mile limit will not result in negative rents for the U.S. Gulf shrimp fleet.

Griffin, Wade L. and William E. Grant (1976). "A Profile of Bio-Economic Models of the Gulf of Mexico Shrimp Resource." Proposal, RF-77-11, submitted by the Texas A&M Research Foundation to the National Marine Fisheries Service, September, 7 pp.

The two objectives of the proposed study are (1) to develop a profile of various bioeconomic models of the Gulf of Mexico shrimp resource, determine the data requirements of each model, the cost of each model, and the time frame in which each can be developed and (2) to provide a framework for coordination and development of multidisciplinary studies of the shrimp fishery of the Gulf of Mexico and management strategies related to it.

Griffin, Wade L. and William E. Grant (1991). "General Bioeconomic Fisheries Simulation Model." Developed at Texas A&M University, College Station, Texas 77843-2124.

This manual describes in detail a General Bioeconomic Fisheries Simulation Model (GBFSM) Version 2.0 designed for use in management programs of marine fish species that do not exhibit a significant relationship between the size of the parental population and the number of young recruited into the fishery.

Griffin, Wade L. and Holly Hendrickson (1992). "Bycatch Related Data Set Descriptions and Formats." Department of Agricultural Economics, Texas A&M University, College Station, Tx.

A description of data sets related to finfish bycatch in the Gulf of Mexico shrimp fishery as part of a on-going S/K contract.

Griffin, Wade L. and Holly Hendrickson (1992). "Potential for Reduction of Shrimp Trawl Bycatch of Selected Finfish Species in the Gulf of Mexico." Final Report, Saltonstall-Kennedy Project No. NA17FL0099, U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

The General Bioeconomic Fisheries Simulation Model was used to estimate the changes in bycatch and economic rent that would result under different fishery management policies. Bycatch reduction devices were found to be more effective than closures at reducing bycatch and also less costly to fishermen.

The September version incorporates editorial comments based on a review of the August version.

Griffin, Wade L. and L.L. Jones (1975). "Economic Impact of Commercial Shrimp Landings on the Economy of Texas." Marine Fisheries Review, 37(7):12-14.

This report focuses on the economic contribution that shrimp producers make to Texas to evaluate the potential economic value of shrimp production.

Griffin, Wade L. and John P. Nichols (1976). "An Analysis of Increasing Costs to Gulf of Mexico Shrimp Vessel Owners: 1971-75." Marine Fisheries Review, 38(3):8-12.

This report is intended to provide current information on the economics of owning and operating a shrimp vessel in the Gulf of Mexico. Lower shrimp prices coupled with rapidly escalating prices for fuel and other input items have brought about a cost-price squeeze that has put the vessel owners in a struggle for economic survival. Cost and returns estimates are based on 1971 and 1973 data collected from shrimp vessel owners. More specifically, this report includes: 1) Estimated break-even annual shrimp catches with various ex-vessel shrimp prices for 1971, 1973, 1974, and 1975; and 2) Evaluation of expected cost and returns in 1975.

Griffin, W.L. and Chris Oliver (1991). "Evaluation of the Economic Impacts of Turtle Excluder Devices (TEDs) on the Shrimp Production Sector in the Gulf of Mexico." Draft report, MARFIN Project NO. NA-87-WC-H-06139. Agricultural Economics Dept., Texas A&M University, College Station, TX 77843-2124.

By accounting for the dynamics of the shrimp population, a more accurate representation of the gains and losses from the implementation of TED regulations was provided. Percent loss by region varied with the fishing pressure of each region; the higher the fishing pressure the less the overall loss to each region. Across all regions, an estimate by the NMFS of a 10% loss in shrimp retention due to the use of TEDs translated only to an overall 5.3% loss in landings in the entire Gulf region. In economic terms, this renders a 16.2 million dollar loss of rent to vessels and crew in the shrimp fishing industry in the Gulf of Mexico. Regional compliance ranged from 61 to 91% based on Coast Guard estimates, therefore, overall loss in rent was reduced to 12.8 million dollars. However, the loss in rent to vessel owners and crew who complied with the TED regulation was 15.7 million dollars, while the gain in rent to non-complying owners and crew was 2.9 million dollars. The overall loss to the Gulf of Mexico shrimp industry, based on the 1990 individual tow losses of 0.7%, was a decline in rent of 4.5 million dollars most of which was due to the purchase of the TEDs. These short run results indicate that nominal days fished in the long run must decrease for the industry to move to a new equilibrium. This is true across all vessel classes and regions, since they all incurred negative rents. Estimating the net present value for this adjustment process, over time, is reserved for future analysis.

Two problems with the analysis are the short run time scale employed and the use of a homogeneous fleet assumption. Limiting the analysis to the impacts next year does not allow the fleet size to adjust to increased costs and reduced revenues caused by adoption of the TEDs in their harvesting operations. A stock effect from reduced fleet size should cause the catch per unit effort to increase and total catch to remain the same. The analysis uses the assumption of a homogeneous fleet where total revenue equals total cost even though three separate vessel size classes are employed in the analysis.



The impacts of TEDs on the highliner is not accounted for using this assumption. Given the stock effect and the reduced fleet size, the inframarginal firm could actually generate a positive rent due to the adoption of TEDs by the marginal firm.

Griffin, W.L. and Chris Oliver (1991). "Evaluation of the Economic Impacts of Turtle Excluder Devices (TEDs) on the Shrimp Industry in the Gulf of Mexico." MARFIN Project NO. NA-87-WC-H-06139. Agricultural Economics Dept., Texas A&M University College Station, TX 77843-2124.

By accounting for the dynamics of the shrimp population, a more accurate representation of the gains and losses from the implementation of TED regulations was provided. Percent loss by region varied with the fishing pressure of each region; the higher the fishing pressure the less the overall loss to each region. Across all regions, an estimate by the NMFS of a 10% loss in shrimp retention due to the use of TEDs translated to an overall 5.3% loss in landings in the entire Gulf region. In economic terms, this renders a 16.2 million dollar loss of rent to vessels and crew in the shrimp fishing industry in the Gulf of Mexico. Regional compliance ranged from 61 to 91% based on Coast Guard estimates, therefore, overall loss in rent was reduced to 12.8 million dollars. However, the loss in rent to vessel owners and crew who complied with the TED regulation was 15.7 million dollars, while the gain in rent to non-complying owners and crew was 2.9 million dollars. The overall loss to the Gulf of Mexico shrimp industry, based on the 1990 individual tow losses of 0.7%, was a decline in rent of 4.5 million dollars most of which was due to the purchase of the TEDs. These short run results indicate that nominal days fished in the long run must decrease for the industry to move to a new equilibrium. This is true across all vessel classes and regions, since they all incurred negative rents. Estimating the net present value for this adjustment process, over time, is reserved for future analysis.

Two problems with the analysis are the short run time scale employed and the use of a homogeneous fleet assumption. Limiting the analysis to the impacts next year does not allow the fleet size to adjust to increased costs and reduced revenues caused by adoption of the TEDs in their harvesting operations. A stock effect from reduced fleet size should cause the catch per unit effort to increase and total catch to remain the same. The analysis uses the assumption of a homogeneous fleet where total revenue equals total cost even though three separate vessel size classes are employed in the analysis. The impacts of TEDs on the highliner is not accounted for using this assumption. Given the stock effect and the reduced fleet size, the inframarginal firm could actually generate a positive rent due to the adoption of TEDs by the marginal firm.

Griffin, Wade L. and Arvind K. Shah (1994). "Estimation of Standardized Effort in the Heterogeneous Gulf of Mexico Shrimp Fleet." MARFIN Project No. NA37FF0053-01, National Marine Fisheries Service, St. Petersburg, FL, April, 24 pp.

This project estimates standardized effort in the Gulf of Mexico shrimp fishery. Specifically, it develops a method to estimate standardized effort from the vessel operating units files and the interviewed shrimp landings file, develops a method to expand days fished from the interviewed shrimp landings files to the total landings files, and characterizes the historical trends of the shrimp fishery relative to vessel configuration, nominal effort (nominal days fished) and standardized effort.

Griffin, Wade L. and Arvind K. Shah (1995). "Estimation of Standardized Effort in the Heterogeneous Gulf of Mexico Shrimp Fleet." MARFIN

Project No. NA37FF0053-01, National Marine Fisheries Service, St. Petersburg, FL, February, 50 pp.

This project estimates standardized effort in the Gulf of Mexico shrimp fishery. Specifically, it develops a method to estimate standardized effort from the vessel operating units files and the interviewed shrimp landings file, develops a method to expand days fished from the interviewed shrimp landings files to the total landings files, and characterizes the historical trends of the shrimp fishery relative to vessel configuration, nominal effort (nominal days fished) and standardized effort.

Griffin, Wade L. and Sayra G. Thacker (1994). "Combined Indoor/Outdoor Red Drum Aquaculture: A Stochastic Sensitivity Analysis." Journal of Applied Aquaculture, 4(3):1-22.

Stochastic sensitivity analysis was used to examine a combined indoor fingerling and outdoor grow-out red drum aquaculture facility. Three important biological and three important economic factors were varied individually to determine the chance of survival (farm does not go bankrupt), and chance of economic success (net present value greater than zero). Because individuals have a different preference for risk, an investor must determine his own required rate of return (RRR) for his investment. For this reason, chances of economic success ranging from 5 to 20% are given in the results. If an investor's RRR is below 10%, he has a better chance of achieving economic success if the farm is 100% equity financed. If his RRR is greater than 10%, he has a better chance of achieving economic success if the farm is 50% equity financed. Finally, management capabilities have a tremendous impact on chances of economic success.

Griffin, Wade L. and N.J. Wardlaw (1974). "Economic Analysis of Costs and Returns of Gulf of Mexico Shrimp Vessels: 1973." Final report, Contract No. 03-4-042-18, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, September, 107 pp.

This study develops a vessel classification system, evaluates each vessel class with respect to costs and returns, determines break-even quantities of shrimp landed for each class, investigates the implications of price changes for each class, and determines the optimal vessel configuration with respect to profitability.

Griffin, Wade L. and N.J. Wardlaw (1975). "Economic Analysis of Costs and Returns of Gulf of Mexico Shrimp Vessels: 1973." Departmental Technical Report Number 74-3, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, 43 pp.

Throughout the Gulf shrimp fleet there is a wide range in vessel size, construction, power, and capability. There is also a wide range of variable costs, fixed costs, investment requirements, and profitability associated with the various vessel configurations. The overall objectives of this study, using 1973 data, are to (1) develop a vessel classification system, (2) evaluate each vessel class with respect to costs and returns, (3) determine break-even quantities of shrimp landed for each class, (4) investigate the implications of price changes for each class, and (5) determine the optimal vessel configuration with respect to returns to the owner.

Griffin, Wade L., Melvin L. Cross, and John P. Nichols (1977). "Effort Measurement in the Heterogeneous Gulf of Mexico Shrimp Fleet." Department Technical Report Number 77-5, Texas Agricultural Experiment Station, Texas A&M University.

To calculate the total effort of the fleet, the effort index of vessels operating in the shrimp fishery must be determined where effort is defined as the amount of fishing power that a vessel can exert in a day fished relative to that of a standard vessel.

Griffin, Wade L., Melvin L. Cross, and George W. Ryan (1974). "Seasonal and Movement Patterns in the Gulf of Mexico Shrimp Fishery." Department Technical Report Number 74-4, Texas Agricultural Experiment Station, Texas A&M University.

This study describes the migration trends and production patterns for brown, pink, and white shrimp in the Gulf of Mexico for 1963 to 1971.

Griffin, Wade L., Dhazn Gillig, and Teofilo Ozuna, Jr., (1999). An Economic Assessment of Gulf of Mexico Red Snapper Management Policies. NOAA Grant No. NA57FF0284, Department of Agricultural Economics, Texas A&M University, College Station, TX, June, 145 pp.

This study comprehensively assesses the biological and economic consequences of the commercial and recreational red snapper and shrimp fisheries for various red snapper fishery management policies which are aimed at improving red snapper stocks. The GBFSM has been expanded to include red snapper commercial and recreational demand and population dynamics. The policy analysis of various alternatives to recovered snapper stocks finds the most preferable policy to be the 1998 current policy of BRD adoption.

Griffin, Wade L., Linda A. Jensen, and Charles M. Adams (1983). "Installation Manual for Budget Simulation System." In "A Generalized Budget Simulation Model for Fishing Vessels." Draft Version 1, Sea Grant No. 04-8-M01-133, Texas A&M University, Department of Agricultural Economics, Texas Agricultural Experiment Station, College Station, Texas.

This manual is designed to enable the user to install and test either the Aquaculture Budget Simulation System or the Vessel Budget Simulation System.

Griffin, Wade L., Linda A. Jensen, and Charles M. Adams (1983). "User Manual for Data Management System." Volume 1 in "A Generalized Budget Simulation Model for Fishing Vessels." Draft Version 1, Sea Grant No. 04-8-M01-133, Texas A&M University, Department of Agricultural Economics, Texas Agricultural Experiment Station, College Station, Texas.

This manual discusses the mechanics of operating the data management program (DMP) and provides detailed descriptions of the variables to be entered into the direct access (D-A) files.

Griffin, Wade L., Linda A. Jensen, and Charles M. Adams (1983). "User Manual for Budget Simulation System." Volume 2 in "A Generalized Budget Simulation Model for Fishing Vessels." Draft Version 1, Sea Grant No. 04-8-M01-133, Texas A&M University, Department of Agricultural Economics, Texas Agricultural Experiment Station, College Station, Texas.

This manual contains three sections: the general descriptions of the operations of the budget simulator program, a description of each agenda, including operations performed in the called subroutines, and the Appendix tables containing codes for variables, data description and data format

information.

Griffin, Wade L., Linda A. Jensen, and Charles M. Adams (1983). "A Generalized Budget Simulation Model for Fishing Vessels." TAMU-SG-83-203, Marine Information Service, Sea Grant College Program, Texas A&M University, College Station, Texas, January, 113 pp.

The Vessel Budget Simulator System (VBSS) enables a user to select and equip a vessel to be operated in any fishing ground normally frequented by U.S. owned vessels. The physical flow of inputs into the production process aboard a vessel is simulated to produce the information required for financial reports. This system consists of two programs; a data management program (DMP) in COBOL that is used to create and update direct access (D-A) physical inventory files and a budget simulation program (BSP) in FORTRAN that performs all operational procedures. Part 1 of the manual describes the use of the DMP while Part 2 describes the use of the BSP.

Griffin, Wade L., Ronald D. Lacewell, and Wayne A. Hayenga (1974). "Estimated Costs, Returns, and Financial Analysis: Gulf of Mexico Shrimp Vessels." Marine Fisheries Review, 36(12):1-4.

This report results from an economic evaluation of shrimp landings in the Gulf of Mexico based on data available from the National Marine Fisheries Service and is intended for financial institutions, shrimp vessel owners, and prospective shrimp vessel owners. The first part of this report indicates costs and returns of shrimp vessels in 1971. The second part is an investment analysis including cash flow and rate of return on a shrimp vessel entering the Gulf shrimping fleet. The last section reflects cost changes in the base 1971 data to account for cost levels experienced in early 1974.

Griffin, Wade L., Ronald D. Lacewell, and John P. Nichols (1976). "Optimum Effort and Rent Distribution in the Gulf of Mexico Shrimp Fishery." American Journal of Agricultural Economics Nov:644-652.

Traditional methods used to estimate fishing effort that maximize rent to an open access resource have almost universally assumed all costs are directly proportional to effort. When crews receive a fixed share of gross returns, labor costs are proportional to catch. Hence, rent accrues to crews as well as vessel owners under limited entry. A model that allows costs to be proportional to effort and catch is applied to the Gulf of Mexico shrimp fishery. This study indicates that traditional analysis would result in management schemes that overtax vessels and ignore rent accruing to crews.

Griffin, Wade L., J. Nichols, and Ronald D. Lacewell (1973). "Trends in Catch/Effort Series: Gulf of Mexico Shrimp Fishery." Project Number 03-3-042-19, Department Technical Report Number 74, Texas Agricultural Experiment Station, Texas A&M University, December, 85 pp.

The objective of this study is to determine time series relationships for the Gulf of Mexico shrimp resource with respect to catch, effort, and catch per unit effort.

Griffin, Wade L., J. Nichols, and Joe Bob Smith (1975). "Economic Analysis of Returns to Gulf of Mexico Shrimp Vessel Owners for the Period 1971-1975." Dir 75-1, SP-4, The Texas Agricultural Experiment Station, Texas A&M University System, College Station, Texas, July.

This report provides current information on the economics of owning and operating a shrimp vessel in the Gulf of Mexico for the period 1971-1975. The break-even annual shrimp catches with various ex-vessel shrimp prices for 1971, 1973, 1974, and 1975 are estimated and the expected cost and returns in 1975 are evaluated.

Griffin, Wade L., Deborah Tolman, and Chris Oliver (1993). "Economic Impacts of TEDs on the Shrimp Production Sector." Society and Natural Resources, 6:291-308.

The economic impact of the effects of the Turtle Excluder Device (TEDs) used in the Gulf of Mexico to control the numbers of turtles caught in shrimp trawl nets is analyzed. This is a major concern to the shrimp fishing economy due to the potential loss of shrimp. A simulation modeling technique is used which estimates the changes in landings, revenues, costs, and the economic rents. A base scenario in which no TEDs are used is compared with five different scenarios where the TED is used by vessels in the Gulf of Mexico. The analysis was based on a single year impact. The implementation of the TED comes with costs to the vessel owners and crew in the Gulf of Mexico. Since the implementation of the TEDs does cause negative rent, it is a certainty, all other things remaining equal, that some vessel owners and crew will leave the industry. The number to leave the industry will depend on how effective they are at learning to use the TED effectively.

Griffin, Wade L., John Ward, and James Nance (1996). "A Bioeconomic Analysis of Existing and Proposed Management Alternatives to Control Sea Turtle Mortality In the Gulf of Mexico Shrimp Fishery." Presentation, Symposium on the Consequences and Management of Fisheries Bycatch, the American Fisheries Society Annual Meeting, Dearborn Michigan, August 26-29, 13 pp.

The General Bioeconomic Fishery Simulation Model was used to examine the effectiveness of four proposed management alternatives to reduce sea turtle bycatch in the Gulf of Mexico shrimp fishery.

Griffin, Wade L., John Ward, and James Nance (1996). "A Bioeconomic Analysis of Management Alternatives to Control Sea Turtle Mortality In the Gulf of Mexico Shrimp Fishery." Proceedings, Fisheries Bycatch: Consequences and Management, Alaska Sea Grant Report 97-02: 57-62, Dearborn Michigan, August 27-28, 13 pp.

The General Bioeconomic Fishery Simulation Model was used to examine the effectiveness of four proposed management alternatives to reduce sea turtle bycatch in the Gulf of Mexico shrimp fishery.

Griffin, Wade L., Newton J. Wardlaw, and John P. Nichols (1976). "Economic and Financial Analysis of Increasing Costs in the Gulf Shrimp Fleet." Fishery Bulletin, 74(2):301-309.

The 115 Gulf of Mexico shrimp vessels used in this study were grouped into classes I (larger vessels) through V (smaller vessels) based on their type of construction, length of keel, and index of effort. In 1973, class II vessels were the only vessels able to register a positive return to owner's labor and management, \$560; the other four classes registered negative returns. The payback period occurred during the eighth year due to the sale of the vessels in classes II, III, and V, whereas payback did not occur for classes I and IV. A positive rate of return on investment was experienced by the vessels in classes II, III, and V in the amount of 13.21, 2.65, and 2.63%, respectively. The internal rate of return on investment was negative for

vessels in classes I and IV.

Input prices increased some 20% from 1973 to 1974 whereas production remained approximately constant and ex-vessel shrimp prices were lower. Thus, none of the classes of vessels would have experienced a break-even cash flow for 1974. Increasing input cost another 10% above the 1974 level, and assuming normal production, the average vessel in class II seems to be operating at a better than a break-even level in 1975 assuming ex-vessel shrimp prices remain constant at 1973 levels. Classes I, III, IV, and V experienced less than break-even cash flows under the same conditions in 1975.

Griffin, Wade L., Newton J. Wardlaw, and John P. Nichols (1976). "Cost and Return Analysis By Selected Vessel Characteristics: Gulf of Mexico Shrimp Fishery, 1971-1975." MP-1253C, The Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas.

This report is intended to provide current information concerning the economics of owning and operating a shrimp vessel for use by owners, managers, financial institutions and public policy makers.

Griffin, Wade L., Jim Cato, John Gates, and Fred Prochaska (1981). "Socioeconomic Budget Simulator." Final report, Contract No. NA80-GA-C-00011, NMFS, SEFC, Miami, Florida, pp. 269.

This project develops an enterprise budget simulator for commercial fishing vessels using collected cost and earning information on the Gulf shrimp, Florida paying passenger and New England fishing fleets, and compares the predicted results to actual data.

Griffin, Wade L., Jerry Clark, Joy Clark, and James Richardson (1988). "Economic Impact of TED on the Shrimp Industry in the Gulf of Mexico." Final report, National Marine Fisheries Service, Grant No, NA-WC-H-06130.

This research project estimates the costs and returns to individual shrimpers for their adoption of the turtle excluder device (TED).

Griffin, Wade L., Melvin L. Cross, Ronald D. Lacewell, and John P. Nichols (1973). "Effort Index for Vessels in the Gulf of Mexico Shrimp Fleet." Texas Agricultural Experiment Station, Texas A&M University.

A total effort index based on vessel characteristics is calculated for the shrimp fishery in the Gulf of Mexico. The report includes an extensive review of the literature; a description of the model, associated data sets, and the statistical procedure employed; the empirical results; and lastly, a summary and conclusions.

Griffin, W.L., W.E. Grant, R.W. Brick, and J.S. Hanson (1984). "A Bioeconomic Model of Shrimp Maricultural Systems in the U.S.A." Ecological Modelling, 25:47-68.

A general conceptual model of a marine shrimp farming system representing important relationships between the engineering design of facilities, the environmental and managerial factors affecting shrimp growth and survival, and the factors affecting production costs and profit is presented. Based upon this conceptual model, a bioeconomic simulation model is developed to assess the economic feasibility of a projected penaeid shrimp maricultural operation along the Texas coast, and to evaluate the effects of

changes in an important managerial variable rate of water flow, on the biological and economic productivity of the system.

The conceptual model consists of five interconnected parts including environmental, production, engineering, marketing, and profit submodels. The bioeconomic simulation model is coded in FORTRAN to simulate system behavior with a daily time step on a digital computer.

Results of simulations of a projected penaeid shrimp maricultural operation along the Texas coast suggest that such an operation would be marginally economically feasible when based upon the particular assumptions of this study. Baseline simulations predict a mean annual profit of US \$275 per acre with a standard deviation of US \$122 per acre, which represents a 2% chance of economic loss. The predicted annual return on investment is 4.5%.

The role of modelling in development of shrimp maricultural systems in the United States is discussed.

Griffin, Wade L., Johannes A.D. Lambregts, M.W. Yates, and A. Garcia (1993). "The Impact of Aquaculture Pond Engineering Design on the Returns to Shrimp Farms." Journal of the World Aquaculture Society, 24(1):23-30.

The effects of a pond design on the internal rate of return of a 40 ha shrimp farm is evaluated. The influence of four pond construction parameters (pond size, pond shape, levee crown size, and canal bank slope) on the total amount of earth moved and construction cost is determined using an engineering design model. The bioeconomic model, MARSIM, calculates returns to farms with the design modifications. Of the four parameters, the pond shape is the most influential over the range considered (from 17% to 8%). Pond size is the second most important parameter (from 17% to 21%). Levee width and canal bank slope influence are of lesser importance (<1% change).

Griffin, Wade L., John P. Nichols, Robert G. Anderson, James E. Buckner, and Charles M. Adams (1978). "Costs and Returns Data: Texas Shrimp Trawlers Gulf of Mexico 1974-1975." TAMU-SG-79-601, Texas A&M University, Sea Grant College Program, September, 97.

This report summarizes estimates of costs and returns for vessels of different characteristics that anchor in Texas and shrimp trawl in the Gulf of Mexico. Data for 1974 and 1975 were obtained from vessel owners. Results are presented in self explanatory tables. No attempt is made to draw inferences or discuss implications of trends or relationships that may be apparent in the data.

Griffin, W., J. Warren, J. Nichols, W. Grant, and C. Pardy (1983). "The Texas Shrimp Fishery: Analysis of Six Management Alternatives Using the General Bioeconomic Fishery Simulation Model (GBFSM)." TAMU-SG-84-202, Sea Grant College Program, Texas A&M University, College Station Texas, Oct., 66 pages.

Six management alternatives were evaluated in terms of their impact on total landings, amount of discards, cost and returns, and fishing effort employed. Management alternatives consisted of closure of specified areas for particular periods of time, changes in count size regulations, or both. The analyses were conducted using the General Bioeconomic Fishery Simulation Model designed to represent the important biological and economic processes of the Texas shrimp fishery. Impacts were estimated both for the first year and for a long run situation, that gave the industry time to adjust by increasing or decreasing the number of bay boats and Gulf vessels.

Griffin, Wade L., Kenneth Roberts, Antonio B. Lamberte, John M. Ward,

and Holly M. Hendrickson (1992). "Considerations for the Potential Use of Individual Transferable Quotas in the Gulf of Mexico Shrimp Fishery." Volume 3 of a report prepared for the NOAA, NMFS, Silver Spring MD, January 17, pp. 125.

The report investigates the possibilities of developing an individual transferable quota system for the Gulf of Mexico shrimp fishery. If industry cooperation can be developed through a comanagement system, then the potential for generating substantial net benefits for the fishery and the nation exist through the increase in harvesting sector profits, declines in bycatch of endangered species, and the increase in production of finfish in commercial and recreational fisheries for bycatch finfish species. However, substantial changes will have to occur in the shrimp fishery institutions that presently exist. For example, a credit card system to record landings and price information through a central clearing house will have to be implemented and fishermen organizations will have to be developed by the industry.

Griffin, W.L., Holly Hendrickson, Chris Oliver, Gary Matlock, C.E. Bryan, Robin Riechers, and Jerry Clark (1992). "An Economic Analysis of Texas Shrimp Season Closures." A draft and revisions submitted to the Marine Fisheries Review.

Management of the Texas penaeid shrimp fishery is aimed at increasing revenue from brown shrimp (Penaeus aztecus) landings and decreasing the level of discards. Since 1960 Texas has closed its territorial sea for 45 to 60 days during peak migration of brown shrimp to the Gulf of Mexico. In 1981, the closure was extended to 200 miles to include the U.S. Exclusive Economic Zone. In this study, simulation modeling was used to estimate the changes in landings, revenue, costs, and economic rent attributable to the Texas closure. Four additional analyses were conducted to estimate the effects of closing the Gulf 1-4 fathom zone for 45 to 60 days, with and without effort redirected to inshore waters. Distributional impacts were analyzed in terms of costs, revenues, and rents, by vessel class, shrimp species, vessel owner, and crew.

Two problems with the theoretical discussion of the model appear to exist in the article. The movement along the preclosure yield curve should actually occur on the post closure yield curve. This leads to an incorrect interpretation of short run rent generated by the regulation. That is, effort increases prior to the management regulation. Secondly, the costs curves are incorrectly defined. The equilibriums and the resulting interpretations of rent appear to be different for each curve.

Griffin, W.L., Holly Hendrickson, Chris Oliver, Gary Matlock, C.E. Bryan, Robin Riechers, and Jerry Clark (1993). "An Economic Analysis of Texas Shrimp Season Closures." Marine Fisheries Review, 54(3):21-28.

Management of the Texas penaeid shrimp fishery is aimed at increasing revenue from brown shrimp, Penaeus aztecus, landings and decreasing the level of discards. Since 1960 Texas has closed its territorial sea for 45-60 days during peak migration of brown shrimp to the Gulf of Mexico. In 1981, the closure was extended to 200 miles to include the U.S. Exclusive Economic Zone. Simulation modeling is used in this paper to estimate the changes in landings, revenue, costs, and economic rent attributable to the Texas closure. Four additional analyses were conducted to estimate the effects of closing the Gulf 1 to 4 fathom zone for 45 and 60 days, with and without effort redirected to inshore waters. Distributional impacts are analyzed in terms of costs, revenues, and rents, by vessel class, shrimp species, vessel owner, and crew.

Griffin, Wade, Chris Oliver, Bruce McCarl, Gary Matlock, C.E. Bryan,



Robin Riechers, and Jerry Clark (1989). "Shrimp Fisheries Management to Increase Economic Returns." Final report, MARFIN Project No. NA88WC-H-MF199, USDOC, NOAA, NMFS, SERO, St. Petersburg, FL.

This report analyzes the effects of various management alternatives on the shrimp fishery for Texas. A simulation modeling technique is used that estimates the changes in landings, revenues, costs, and ultimately, economic rents (profits to the fishery taking into account all costs including opportunity costs of fishing) attributable to the fishery under the various management alternatives set forth. The simulation model is programmed to depict the average fishery conditions for the period 1963-1980. This is based on average patterns and levels of fishing effort for this period under average environmental conditions and the model generates average landings for the same period for comparison to actual data.

Grigalunas, Thomas A., James J. Opaluch, Deborah French, and Mark Reed (1987). "Measuring Damages to Marine Natural Resources from Pollution Incidents under CERCLA: Applications of an Integrated Ocean Systems/Economic Model." Staff Paper Series Department of Resources, University of Rhode Island, Kingston, Rhode Island.

Several pieces of federal environmental regulation establish strict liability for damages from spills of oil and hazardous substances. This paper discusses the Natural Resource Damage Assessment Model for Coastal and Marine Environments that is to be used for assessing damages from spills of oil or hazardous substances in coastal and marine environments under CERCLA and the Clear Water Act as amended. The approach employs an integrated ocean systems/economic model to simulate the physical fates and biological effects of a spill and to measure the resulting economic damages. To illustrate application of the model, selected results are presented for hypothetical spills of a number of substances in a variety of environments. The results show that the damage function depends on the physical and chemical properties of the substance spilled, the season, and the environment in which the spill occurs.

Grigalunas, Thomas A., James J. Opaluch, Deborah French, and Mark Reed (1988). "Measuring Damages to Marine Natural Resources from Pollution Incidents under CERCLA: Applications of an Integrated Ocean Systems/Economic Model." Marine Resource Economics, 5:1-21.

Several pieces of federal environmental regulation establish strict liability for damages from spills of oil and hazardous substances. This paper discusses the Natural Resource Damage Assessment Model for Coastal and Marine Environments that is to be used for assessing damages from spills of oil or hazardous substances in coastal and marine environments under CERCLA and the Clear Water Act as amended. The approach employs an integrated ocean systems/economic model to simulate the physical fates and biological effects of a spill and to measure the resulting economic damages. To illustrate application of the model, selected results are presented for hypothetical spills of a number of substances in a variety of environments. The results show that the damage function depends on the physical and chemical properties of the substance spilled, the season, and the environment in which the spill occurs.

Grissim, John (1995). Mass marking, Identification of Salmon can Help Separate Hatchery from Wild Stocks. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

By clipping the adipose fin on young hatchery salmon, the fish can be clearly identified and ensure the escapement of wild stocks that are declining and threatened at a cost of \$4 million for the Coho stock alone.

Gronau, Reuben (1974). "Wage Comparisons - A Selectivity Bias." The Journal of Political Economy, 82:1119-1143.

The wage rate a person receives depends not only on the wage offered (a function of his market characteristics), but also on his job-search strategy. The higher his wage demands, the higher the wage he can expect, though the probability of finding an adequate job is lower. When comparing wages of different population groups, one must take their different search policies into account. Ignoring these differences results in a selectivity bias. This bias is particularly relevant for the secondary labor groups; it may distort our conclusions about male-female and white-nonwhite wage differentials, the age-earning profiles, the rate of return and the rate of depreciation of human capital, and the determinants of labor-force participation.

Gross, George B. (1973). "Shrimp Industry of Central America, Caribbean Sea, and Northern South America." Marine Fisheries Review, 35(3-4):36-55.

This report reviews the shrimp fishery of South and Central America and the Caribbean on a country by country basis for 1961 to 1971. The ten year trend in pounds and value are discussed, the activities of major harvesters are summarized, and a description of each fishery is provided.

Groth, Philip (1980). "The Socio-Demographic Characteristics of the Shrimp Fishing Community in South Central Louisiana." A report of continued work on socio-demographic aspects of the "Shrimp Mark-Recapture Study," NMFS, NOAA, Contract Number 03-7-042-35132, May, pp. 87.

This report summarizes the demographic characteristics of residents of a three parish shrimp community of south central Louisiana.

Gu, Guang and James L. Anderson (1994). "Deseasonalized State-Space Time Series Forecasting with Application to the U.S. Salmon Market." RI-94-101, URI/OSU Research Paper Series, A USDA Cooperative State Research Service Joint Research Project between the University of Rhode Island and Oregon State University, University of Rhode Island, Kingston, Rhode Island, November, 22 pp.

An approach that combines seasonality removal with a multivariate, state-space, time series forecasting model is developed to provide short run forecasts for the U.S. salmon market. Time series included in the model are: U.S. fresh Atlantic salmon wholesale price index; fresh salmon (Atlantic, coho, and chinook) monthly U.S. import quantities and prices; and U.S. chum and sockeye salmon monthly export prices. Four versions of the state-space forecasting model are compared in terms of their statistical performance during out of sample forecasts. Out of sample 3, 6 and 12 month ahead directional predictions are generated to test the models' performance in terms of direction. Under identical modeling conditions, out of sample statistical and directional tests indicate that deseasonalization improves the overall performance of the state-space model. As a result, a linear, deseasonalized, state-space forecasting model is selected to provide twelve monthly out of sample forecasts for all series.

Gu, Guang and James L. Anderson (1995). "Deseasonalized State-Space Time Series Forecasting with Application to the U.S. Salmon Market." Marine Resource Economics, 10(2):171-185.

An approach that combines seasonality removal with a multivariate, state-space, time series forecasting model is developed to provide short run forecasts for the U.S. salmon market. Time series included in the model are: U.S. fresh Atlantic salmon wholesale price index; fresh salmon (Atlantic, coho, and chinook) monthly U.S. import quantities and prices; and U.S. chum and sockeye salmon monthly export prices. Four versions of the state-space forecasting model are compared in terms of their statistical performance during out of sample forecasts. Out of sample 3, 6, and 12 month ahead directional predictions are generated to test the models' performance in terms of direction. Under identical modeling conditions, out of sample statistical and directional tests indicate that deseasonalization improves the overall performance of the state-space model. As a result, a linear, deseasonalized, state-space forecasting model is selected to provide twelve monthly out of sample forecasts for all series.

Gugliotta, Guy (1997). Fight Over Quotas Roils the Top of Food Chain. Washington Post, Tuesday, June 3, page A17.

Newspaper article on the impact of a fifty percent reduction in total allowable catch on the shark fishing fleet.

Guilkey, David K., C.A. Knox Lovell, and Robin C. Sickles (1983). "A Comparison of the Performance of Three Flexible Functional Forms." International Economic Review, 24(3):591-616.

This study continues and broadens the line of attack initiated by Wales (1977) who used Monte Carlo techniques in a effort to determine the range of data points over which translog and generalized Leontief forms provided acceptable approximations to a two input linearly homogeneous CES technology. At issue is the ability of estimating models derived from three flexible functional forms to track a known technology over a range of observations. The three flexible forms we consider are the translog, the generalized Leontief, and the generalized Cobb-Douglas. The Monte Carlo experiments we conduct are based on a known technology whose complexity (i.e., scale and substitution structure) is permitted to vary across experiments, and on a data base whose characteristics (i.e., range and correlation) are held fixed across experiments.

Gulf and South Atlantic Fisheries Development Foundation, Inc. (1988). "Seafood from the Gulf and South Atlantic States." Gulf and South Atlantic Fisheries Development Foundation, Inc., Lincoln Center, Suite 669, 5401 West Kennedy Boulevard, Tampa, Florida, November, 27 pp.

This packet of material provides facts and figures about the 1987 seafood products of the Gulf and south Atlantic states of Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. This is an updated version of a packet originally based on 1984 data. To identify trends, the 1984 data is frequently referenced after providing the 1987 data. Data on landings and value of catch, their relation to the U.S. total, unique attributes of the region's species, the impact they contribute to the nation's economy, and a discussion of the people producing the products and the gear they use is included in the first section. Also included is an overview of present and projected seafood consumption. This is followed by a summary of the importance and characteristics of the seafood

industry in each of the nine states that form the Gulf and south Atlantic region.

Gulf and South Atlantic Fisheries Development Foundation, Inc. (1994).  
"Organization and Management of a Gulf of Mexico and South Atlantic Ocean Fishery By-Catch Management Program." Gulf and South Atlantic Fisheries Development Foundation, Inc., Lincoln Center, Suite 669, 5401 West Kennedy Boulevard, Tampa, Florida, April.

This one year project provided for the initiation of research designed to gather information which will eventually lead to the successful reduction of finfish bycatch in the shrimp fishery. Such a result is ecologically and economically beneficial to the industry, the region, and the Nation. Successful completion of a bycatch reduction program will economically benefit the shrimp industry and other fisheries affected by the incidental mortality that occurs in the shrimp fishery, and have a positive ecological impact on the marine faunal community that inhabits the shrimp grounds.

Gulf and South Atlantic Fisheries Development Foundation, Inc. (1995).  
"An Industry Workshop Addressing Bycatch Issues in Southeastern U.S. Fisheries." A Report to the National Marine Fisheries Service, NMFS Purchase Order No. 43AANF504465, Lincoln Center, Suite 669, 5401 West Kennedy Boulevard, Tampa, Florida, November.

A workshop report designed to provide input, perspective, and information from the southeast U.S. industry leadership on regional bycatch issues and how the issues may be addressed in various fisheries.

Gulf and South Atlantic Fisheries Development Foundation, Inc. (1996).  
"Commercial Shark Fishery Observer Program." Final Report MARFIN Award NA47FF0008, Gulf and South Atlantic Fisheries Development Foundation, Inc., Lincoln Center, Suite 669, 5401 West Kennedy Boulevard, Tampa, Florida, March.

To garner otherwise unobtainable information, and thus enhance the reliability of management strategies, observers aboard voluntarily participating commercial shark vessels documented a sample catch and effort of the southeast U.S. commercial shark longline fishery. With only two years of data, no conclusive trends can be determined concerning the health of the shark stock, but given that much of the catch inside 10-15 fathoms is immature fish or pregnant females, continued fishing pressure in nearshore (<10 fm) waters may have substantial negative impacts on the stock; to the long term detriment of the stock and fishery. Excluding these nearshore efforts, recruitment to the fishery is substantial by the time the fish are 135 cm FL (12 years of age). Based on this age structure, a minimum size limit of perhaps 140 cm FL for sandbar sharks might be an appropriate management measure. Very preliminary estimates indicate that with such measures, which would equal approximately a 10% reduction in quota, the sandbar shark stock could increase in numbers with continued fishing.

Gulf of Mexico Fishery Management Council (1980). "Draft Fishery Management Plan for Groundfish in the Gulf of Mexico." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, April.

Implementation of the Fishery Management Plan for Groundfish will provide for gear restrictions in the shrimp fishery to reduce bycatch of groundfish when such gear is proven to be effective and meets specified

criteria. Nursery sanctuaries in state waters and habitat protection are encouraged. Data reporting is required from harvesters and processors. The Secretary is provided with authority to set seasons, restrict gear, and close areas in the FCZ when harvest is expected to exceed MSY by ten percent.

Gulf of Mexico Fishery Management Council (1981). "Draft Fishery Management Plan, Environmental Impact Statement and Regulatory Analysis for Groundfish in the Gulf of Mexico." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, January, 39 pp.

Implementation of the Fishery Management Plan for Groundfish will provide for gear restrictions in the shrimp fishery to reduce bycatch of groundfish when such gear is proven to be effective and meets specified criteria. Nursery sanctuaries in state waters and habitat protection are encouraged. Data reporting is required from harvesters and processors. The Secretary is provided with authority to set seasons, restrict gear, and close areas in the FCZ when harvest is expected to exceed MSY by ten percent.

Gulf of Mexico Fishery Management Council (1980). "Draft Fishery Management Plan for the Shark and Other Elasmobranch Fishery of the Gulf of Mexico." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, July.

The proposed action will result in management of the shark and other elasmobranch in the U.S. Fishery Conservation Zone (FCZ) under the jurisdiction of the Gulf of Mexico Fishery Management Council. The basic objective will be to manage these stocks for their optimum yield. Specific objectives are to minimize foreign fishing bycatch and mortality of species other than sharks for which no surplus (TALFF) is available. Maximize the benefits derived by domestic fishermen from the shark and other elasmobranch resource. Minimize conflicts among the participants in the shark fishery and other fisheries in the FCZ. Establish a data collection system which will provide the information necessary for future management of the fishery. Recognizing that a surplus exists in the fishery and that it is an underutilized resource, a long term objective shall be support of a fishery development program.

Gulf of Mexico Fishery Management Council (1981). "Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, United States Waters." Draft Update, Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, November.

The fishery management plan for shrimp whose goal is to manage the shrimp fishery of the United States waters of the Gulf of Mexico to attain the greatest overall benefit to the nation with particular reference to food production and recreational opportunities on the basis of maximum sustainable yield as modified by relevant economic, social, or ecological factors.

Gulf of Mexico Fishery Management Council (1987). "Amendment Number 1 and Environmental Assessment and Supplemental Regulatory Impact Review and Initial Regulatory Flexibility Analysis to the Secretarial Fishery Management Plan for the Red Drum Fishery of the Gulf of Mexico." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, May, 25 pp.

This amendment by the Gulf of Mexico Fishery Management Council respecifies problems in the fishery and objectives of the FMP, modifies the management unit, provides a procedure for setting total allowable catch (TAC),

provides for allocation of the TAC, and deletes the FMP exemption to states' law.

Gulf of Mexico Fishery Management Council (1988). "Amendment 4 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico United States Waters, Includes Environmental Assessment and Regulatory Impact Review." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida 33609, August.

Amendment No. 4 identifies additional problems which have developed in the fishery and revises the objectives of the FMP accordingly. The annual review process for the Tortugas sanctuary is simplified, and the Council and Regional Director review for the Texas closure is extended to February 1st. White shrimp taken in the EEZ are to be landed in accord with a state's size possession regulations to provide consistency and facility of enforcement with the State of Louisiana. This latter action is to be implemented at such time when Louisiana provides for an incidental catch of undersized white shrimp in the fishery for seabobs.

Gulf of Mexico Fishery Management Council (1990). "Supplement to Amendment 4 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico United States Waters, Includes Environmental Assessment and Regulatory Impact Review." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida 33609, February.

White shrimp taken in the EEZ and transported into Louisiana are to be landed in accord with Louisiana's size possession regulations when possessed within the jurisdiction of that state.

Gulf of Mexico Fishery Management Council (1991). "Amendment Number 5 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico United States Waters, Includes Environmental Assessment and Regulatory Impact Review." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida 33609, January.

A definition of overfishing and measures to restore overfished stocks is proposed for brown and pink shrimp. Seabobs and rock shrimp are removed from the management unit.

Gulf of Mexico Fishery Management Council (1991). "Coastal Migratory Pelagics Limited Access options Paper." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida 33609, August.

A review of the coastal migratory pelagics fishery with a discussion of limited access alternatives that could be implemented to maximize net economic benefits to the nation. The species to be regulated, the area, and the participants under a license limitation or individual transferable quota system are discussed. Additional topics include windfall profits, rent sharing, and appeals boards.

Gulf of Mexico Fishery Management Council (1991). "An Options Paper for a Limited Access System for the Shrimp Fishery of the Gulf of Mexico." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida 33609, August.

A paper that discusses several limited access systems for the Gulf of Mexico shrimp fishery.

Gulf of Mexico Fishery Management Council (1991). "An Options Paper for

a Limited Access System for the Shrimp Fishery of the Gulf of Mexico." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida 33609, August.

A revision of the options paper cited above that discusses several limited access systems for the Gulf of Mexico shrimp fishery.

Gulf of Mexico Fishery Management Council (1992). "Regulatory Amendment to the Reef Fish Fishery Management Plan for Setting the 1993 Red Snapper Total Allowable Catch." Gulf of Mexico Fishery Management Council, Tampa, Florida, October, 29 pp.

Regulatory amendment, regulatory impact review (RIR), and environmental assessment (EA) specifying total allowable catch (TAC) for red snapper for 1993.

Gulf of Mexico Fishery Management Council (1992). "Amendment 3 to the Fishery Management Plan for the Red Drum Fishery of the Gulf of Mexico (Includes Environmental Assessment and Regulatory Impact Review)." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida 33609.

The Council recognized the present annual assessment schedule as an unnecessary burden and determined that a two year time frame, starting in 1993, would still allow comprehensive monitoring of recovery of the red drum stock, while allowing NMFS stock assessment personnel to devote scarce resources to other fisheries in need of evaluation.

Gulf of Mexico Fishery Management Council (1992). "Amendment Number 6 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico United States Waters Includes Environmental Assessment and Regulatory Impact Review." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida 33609.

A definition of overfishing and measures to restore overfished stocks is proposed for white shrimp. The size of the Tortugas Sanctuary is to be adjusted seasonally based on an annual assessment of stocks.

Gulf of Mexico Fishery Management Council (1993). "Public Hearing Draft Amendment 7 to the Reef Fish Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida 33609.

Draft reef fish amendment 7 includes the proposed individual transferable quota regulations for red snapper in the Gulf of Mexico.

Gulf of Mexico Fishery Management Council (1994). "Amendment Number 7 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, United States Waters, Includes Environmental Assessment with Regulatory Impact Review and Initial Regulatory Flexibility Analysis." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, January, 28 pp.

This amendment provides a definition of overfishing for white shrimp and provides for remedial action to restore the stock if overfishing should occur. It provides for revising the overfishing indices for brown, white, and pink shrimp when new data become available. A total allowable level of foreign fishing for royal red shrimp is to be terminated to allow a higher level of catch by the domestic fleet. A revised definition of overfishing and a

procedure for updating maximum sustainable yield (MSY) for royal red shrimp is provided. Environmental and economic impacts are evaluated.

Gulf of Mexico Fishery Management Council (1994). "The ITQ Red Snapper System Under Council Preferred Alternatives." Prepared for the Ad Hoc Red Snapper Advisory Panel meeting in New Orleans, August 8-9, 5 pp.

A set of questions and answers concerning the red snapper ITQ program for the commercial reef fish fishery.

Gulf of Mexico Fishery Management Council (1994). "Draft Amendment 8 and Environmental Assessment (Effort Management Amendment) to the Reef Fish Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, November, 141 pp.

The amendment includes a discussion of license limitation, individual transferable quotas, and the status quo in the reef fish fishery in the Gulf of Mexico. It also includes the Regulatory Impact Review and the Initial Regulatory Flexibility Analysis.

Gulf of Mexico Fishery Management Council (1995). "Draft Amendment 3 to the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico Including an Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, February, 27 pp.

This amendment extends the live rock regulations promulgated in amendment 2 to include an annual quota during phaseout, revision of trip limits, closed area off Florida's Panhandle, redefinition of allowable octocorals, and limited personal use harvest.

Gulf of Mexico Fishery Management Council (1995). "Draft Amendment 8 and Environmental Assessment (Effort Management Amendment) to the Reef Fish Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, May, 151 pp.

This amendment proposes rights based fishery management to increase the stability of the red snapper fishery in terms of fishing patterns and markets, to avoid to the extent practicable the derby type fishing season, to promote flexibility for the fishermen in their fishing operations, to provide for cost effective and enforceable management of the fishery, and to optimize net benefits from the fishery.

Gulf of Mexico Fishery Management Council (1995). Draft Amendment Number 9 to Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters With Supplemental Environmental Impact Statement, Regulatory Impact Review, Initial Regulatory Flexibility Analysis, and Social Impact Assessment. Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, August, 17 pp.

The Gulf of Mexico Fishery Management Council proposes an amendment to the fishery management plan for the shrimp fishery of the Gulf of Mexico, U.S. waters, to require a reduction of the unwanted bycatch of finfish, particularly the red snapper. The requirement of fish escapement devices in the shrimp trawl is proposed to allow rebuilding of the overfished stock of



red snapper.

Gulf of Mexico Fishery Management Council (1995). Fishing Regulations for Gulf of Mexico Federal Waters. Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, February.

A list of fishing regulations for all federal managed fisheries in the Gulf of Mexico.

Gulf of Mexico Fishery Management Council (1995). "Reef Fish Motions." Council Meeting Minutes, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, January, 4 pp.

Motions concerning reef fish fishery management plan.

Gulf of Mexico Fishery Management Council (1995). "Regulatory Amendment to the Reef Fish Fishery Management Plan to Set 1996 Red Snapper Total Allowable Catch." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, December, 49 pp.

This regulatory amendment proposes changes to the red snapper TAC for 1966.

Gulf of Mexico Fishery Management Council (1995). "Statement of Organization Practices and Procedures." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, September, 38 pp.

As required by the Magnuson Fishery Conservation and Management Act, the Gulf of Mexico Fishery Management Council has prepared and published this statement of organization, practices, and procedures.

Gulf of Mexico Fishery Management Council (1996). Draft Amendment Number 9 to Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters With Supplemental Environmental Impact Statement, Regulatory Impact Review, Initial Regulatory Flexibility Analysis, and Social Impact Assessment. Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, March, 53 pp.

The Gulf of Mexico Fishery Management Council proposes an amendment to the fishery management plan for the shrimp fishery of the Gulf of Mexico, U.S. waters, to require a reduction of the unwanted bycatch of finfish, particularly the red snapper. The requirement of fish escapement devices in the shrimp trawl is proposed to allow rebuilding of the overfished stock of red snapper.

Gulf of Mexico Fishery Management Council (1996). Draft Amendment Number 9 to Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters With Supplemental Environmental Impact Statement, Regulatory Impact Review, Initial Regulatory Flexibility Analysis, and Social Impact Assessment. Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, May, 125 pp.

This DSEIS addresses the issue that shrimp trawls have a significant bycatch of nontarget species of finfish, most of which are discarded dead. Consequently, fisheries directed at the discarded species and other fauna may be adversely affected and ecosystem diversity may be reduced. Red snapper is one species documented to be overfished and unable to recover because of the unacceptably high mortality of juveniles taken incidentally in shrimp trawls.

Alternatives are presented that will reduce bycatch. Because BRDs are not 100 percent effective, some reduced level of incidental take will continue to occur. A reduction or loss of shrimp through the BRD also may occur. The amount of shrimp loss is dependent on the type of BRD used and the operation of the trawl and vessel. In areas not directly affected by this action (i.e., state controlled waters), the fishery may continue to take incidental catch. Ecological modeling suggests that the use of the three most effective BRDs will result in a decline in shrimp biomass ranging from 5.9 to 8.2 percent (Martinez et al. 1966) as a result of increased predation and a reduction in available nutrients for recycling. The subsequent effect on shrimp landings is unknown because over the past five years natural variability in landings has averaged about 12 percent. However, the impact of BRDs on the shrimp fishery in the Gulf of Mexico is expected to be substantial ranging from 3.6 billion to -1.6 billion dollars. The expected preferred BRD that achieve the bycatch reduction target of 50 percent should reduce the value of the shrimp fishery by 280 million dollars.

Gulf of Mexico Fishery Management Council (1996). Draft Amendment Number 9 to Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters With Supplemental Environmental Impact Statement, Regulatory Impact Review, Initial Regulatory Flexibility Analysis, and Social Impact Assessment. Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, September, 145 pp.

This DSEIS addresses the issue that shrimp trawls have a significant bycatch of nontarget species of finfish; most of which are discarded dead. Consequently, fisheries directed at the discarded species and other fauna may be adversely affected and ecosystem diversity may be reduced. Red snapper is one species documented to be overfished and unable to recover because of the unacceptably high mortality of juveniles taken incidentally in shrimp trawls. Alternatives are presented that will reduce bycatch. The proposed measures address problem number 4 of the FMP concerning conflicts with the Gulf's reef fish fishery and Management Objective number 5 to minimize the incidental capture of finfish by shrimpers, when appropriate. Because BRDs are not 100 percent effective, some reduced level of incidental take will continue to occur. A reduction or loss of shrimp through the BRD also may occur. The amount of shrimp loss is dependent on the type of BRD used and the operation of the trawl and vessel. In areas not directly affected by this action (i.e., state controlled waters), the fishery may continue to take incidental catch. Ecological modeling suggests that the use of the three most effective BRDs will result in a decline in shrimp biomass ranging from 5.9 to 8.2 percent (Martinez et al. 1966) as a result of increased predation and a reduction in available nutrients for recycling. The subsequent effect on shrimp landings is unknown because over the past five years natural variability in landings has averaged about 12 percent. However, the impact of BRDs on the shrimp fishery in the Gulf of Mexico is expected to be substantial ranging from 1.1 billion to -.366 billion dollars. The expected preferred BRD that achieve the bycatch reduction target of 50 percent should reduce the value of the shrimp fishery by 117 million dollars.

Gulf of Mexico Fishery Management Council (1996). Minutes. Shrimp Advisory Panel, Biloxi, Mississippi, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, June 10, 16 pp.

Review of shrimp amendment 9 to reduce bycatch in the Gulf of Mexico shrimp fishery with recommendations to improve the amendment.

Gulf of Mexico Fishery Management Council (1996). Minutes. Shrimp Advisory Panel, Biloxi, Mississippi, Lincoln Center, Suite 331, 5401 West Kennedy

Boulevard, Tampa, Florida, November 4, 7 pp.

Review of shrimp amendment 9 regulatory impact review to reduce bycatch in the Gulf of Mexico shrimp fishery.

Gulf of Mexico Fishery Management Council (1996). Minutes. Standing and Special Shrimp Scientific and Statistical Committees, Biloxi, Mississippi, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, November 4, 7 pp.

Review of shrimp amendment 9 regulatory impact review to reduce bycatch in the Gulf of Mexico shrimp fishery.

Gulf of Mexico Fishery Management Council (1996). Minutes. Joint Standing Scientific and Statistical Committee and Special Shrimp Scientific and Statistical Committee, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, June 12, 8 pp.

Review of shrimp amendment 9 to reduce bycatch in the Gulf of Mexico shrimp fishery with recommendations to improve the amendment.

Gulf of Mexico Fishery Management Council (1996). NMFS Southeast Region Recreational Economic Survey and Demand Workshop. Clearwater Airport LaQuinta Inn, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, November 7-8.

A collection of reports and materials presented at the recreational demand workshop designed to modify the economic add on to the Marine Recreational Fisheries Statistics Surveys. A draft copy of the meeting minutes is also included.

Gulf of Mexico Fishery Management Council (1996). Summary of the Standing and Special Shrimp Scientific and Statistical Committee Meeting. Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, June 12, 2 pp.

Review of shrimp amendment 9 to reduce bycatch in the Gulf of Mexico shrimp fishery with recommendations to improve the amendment.

Gulf of Mexico Fishery Management Council (1997). Amendment Number 9 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters With Supplemental Environmental Impact Statement, Regulatory Impact Review, Initial Regulatory Flexibility Analysis, and Social Impact Assessment. The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, Florida, February, 153 pp.

The Gulf of Mexico Fishery Management Council proposes an amendment to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters, to reduce unwanted bycatch of juvenile red snapper with ancillary benefits to other finfish species. The requirement of bycatch reduction devices in shrimp trawls is proposed to allow rebuilding of the overfished stock of red snapper at a cost to society net of benefits of \$117 million and a 3.3% reduction in fleet size.

Gulf of Mexico Fishery Management Council (1997). Amendment Number 15 to the Fishery Management Plan for the Reef Fish Fishery of the Gulf of Mexico (Includes Regulatory Impact Review, Initial Regulatory Flexibility Analysis, and Environmental Assessment). The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, Florida, June, 99 pp.

This document principally includes alternatives for creating a license limitation system for the commercial red snapper fishery; alternatives for defining harvest allowances of reef fish from traps, other than permitted fish traps, stone crab traps and lobster traps; size limits for vermilion snapper, removal of grunts, porgies, and sea bass from the FMP; greater amberjack seasonal closure; and 20-fish aggregate bag limit modifications.

Gulf of Mexico Fishery Management Council (1997). Draft Minutes Gulf of Mexico Fishery Management Council One Hundred and Fifty-Third Meeting, Duck Key Florida. The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, Florida, July, 68 pp.

Draft minutes of the Gulf of Mexico Fishery Management Council meeting held in Duck Key, Florida.

Gulf of Mexico Fishery Management Council (1998). Checklist For FMP Amendments. The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, Florida, August, 9 pp.

This checklist addresses questions that should be considered in making amendments to FMPs to comply with National Standard 1 of the SFA, following NMFS National Standard Guidelines. Most items in the checklist make reference to specific sections in the document Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act, which should be consulted for further elaboration.

Gulf of Mexico Fishery Management Council (1998). Generic Amendment for Addressing Essential Fish Habitat Requirements in the Following Fishery Management Plans of the Gulf of Mexico: Shrimp, Red Drum, Reef Fish, Coastal Migratory Pelagic Resources, Stone Crab, Spiny Lobster, and Coral and Coral Reefs. The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, Florida, October, 238 pp.

Essential fish habitat (EFH) is identified and described based on areas where various life stages of 26 representative managed species and coral complex commonly occur. They were selected because sufficient information existed to document and map their habitat associations and use. Threats to EFH from fishing and non-fishing activities are identified. Options to conserve and enhance EFH are provided. Research needs also are identified.

Gulf of Mexico Fishery Management Council (1998). Draft Minutes Gulf of Mexico Fishery Management Council Joint Reef Fish/Shrimp Management Committees Meeting, Mobile, Alabama. The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, Florida, September.

Shrimp and finfish bycatch discard rates based on gear testing, and bycatch characterization studies are presented to the Council by NMFS. Bycatch reduction device evaluation analysis presents the results for new devices and the observer program that went into effect to determine if sufficient red snapper had been saved in the shrimp fishery to justify the release of additional quota to commercial and recreational fishermen.

Gulf of Mexico Fishery Management Council and the National Marine Fisheries Service (1990). "Regulatory Impact Review of Changes in TAC, Quotas, and Bag Limits for King and Spanish Mackerel, Gulf of Mexico and Atlantic Migratory Groups, Managed under the Fishery Management Plan for the Coastal Migratory Pelagic Resources of Gulf of Mexico and the South Atlantic." Southeast Regional

Office, 9450 Koger Blvd., St. Petersburg, Fl, May, 14 pp.

The RIR addresses the problems of (1) Atlantic and Gulf Spanish mackerel and Gulf king mackerel stocks are being overfished and (2) new recruits into the Atlantic and Gulf Spanish mackerel and Gulf king mackerel stocks need protection to allow for an increase in the spawning stock biomass.

Gulf of Mexico Fishery Management Council and the National Marine Fisheries Service (1991). "Regulatory Impact Review of 1991/1992 Fishing Year Changes in TAC, Quotas, and Bag Limits for King and Spanish Mackerel, Gulf of Mexico and Atlantic Migratory Groups, Managed under the Fishery Management Plan for the Coastal Migratory Pelagic Resources of Gulf of Mexico and the South Atlantic." Southeast Regional Office, 9450 Koger Blvd., St. Petersburg, Fl, August, 14 pp.

The RIR addresses the problems of (1) Atlantic and Gulf Spanish mackerel and Gulf king mackerel stocks are being overfished and (2) new recruits into the Atlantic and Gulf Spanish mackerel and Gulf king mackerel stocks need protection to allow for an increase in the spawning stock biomass.

Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council (1985). "Final Amendment 1, Fishery Management Plan, Environmental Impact Statement for the Coastal Migratory Pelagic Resources (Mackerels)." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, April.

The proposed action will amend an existing fishery management plan in response to new scientific findings particularly with respect to the king mackerel stock. This stock is to be divided into migratory groups for management purposes. The plan is to be provided with more flexibility to address changes in the fish populations. In the initial plan years restrictions are proposed for the Gulf migratory group of king mackerel to restore reduced populations resulting from overfishing.

Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council (1986). "Amendment Number 2 and Environmental Assessment and Supplemental Regulatory Impact Review and Initial Regulatory Flexibility Analysis to the Fishery Management Plan for the Coastal Migratory Pelagic Resources (Mackerels)." Draft, Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, September, 25 pp.

This amendment clarifies the intent of the Councils to set total allowable catch (TAC) for mackerels within framework guidelines, revises maximum sustainable yield, adjusts TAC, and establishes allocation procedures for Spanish mackerel, regulates mackerel fishing gear, and provides for fishing permits.

Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council (1987). "Revised Amendment Number 2 to the Fishery Management Plan for the Coastal Migratory Pelagic Resources (Mackerels), Includes Environmental Assessment, Supplemental Regulatory Impact Review, and Initial Regulatory Flexibility Analysis." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida, March, 32 pp.

This amendment clarifies the intent of the Councils to set total allowable catch (TAC) for mackerels within framework guidelines, revises

maximum sustainable yield, adjusts TAC, and establishes allocation procedures for Spanish mackerel, regulates mackerel fishing gear, and provides for fishing permits.

Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council (1987). "Supplemental Regulatory Impact Review of Pre-Season Changes in TAC, Quotas, and Bag Limits for King and Spanish Mackerel Gulf of Mexico and Atlantic Migratory Groups managed under the Fishery Management Plan for the Coastal Migratory Pelagic Resources of Gulf of Mexico and the South Atlantic." Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, Florida.

This amendment clarifies the intent of the Councils to set total allowable catch (TAC) for mackerels within framework guidelines, revises maximum sustainable yield, adjusts TAC, and establishes allocation procedures for Spanish mackerel.

Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council (1994). "Amendment 2 to the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic Including a Final Supplemental Environmental Impact Statement, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, July, 56 pp.

The Gulf of Mexico and South Atlantic Councils (Councils) propose an amendment to the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and the South Atlantic (FMP) that adds "live rock" to the fishery management unit. Live rock means certain living marine organisms or an assemblage thereof attached to a hard substrate (including dead coral or rock). In addition to corals, these organisms include anemones, sponges, tube worms, bryozoans, sea squirts, and algae. Management will include harvest limitations and prohibitions to prevent fishery habitat loss, permitting of harvesters, and a provision for aquaculture of live rock.

Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council (1995). "Amendment 8 to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and South Atlantic Includes Draft Supplemental Environmental Impact Statement, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, October, 84 pp.

The Gulf of Mexico and South Atlantic Fishery Management Councils (Councils) propose an amendment to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and South Atlantic (FMP) to adjust management procedures for king and Spanish mackerels, cobia, and dolphin. Proposed changes include requirements for gear, transfer of mackerel at sea, stock boundary adjustments, change in the definition of overfishing, permitting requirements, and extension of the range of management for cobia. Also proposed is a reallocation of Atlantic Spanish mackerel, possible changes in trip limits for cobia and dolphin, and additional flexibility for changes to be made as seasonal adjustment by regulatory amendment.

Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council (1995). "Draft Amendment 8 to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and South Atlantic Includes Draft Supplemental

Environmental Impact Statement, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis." Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, November, 97 pp.

The Gulf of Mexico and South Atlantic Fishery Management Councils (Councils) propose an amendment to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and South Atlantic (FMP) to adjust management procedures for king and Spanish mackerels, cobia, and dolphin. Proposed changes include requirements for gear, transfer of mackerel at sea, stock boundary adjustments, change in the definition of overfishing, permitting requirements, and extension of the range of management for cobia. Also proposed is a reallocation of Atlantic Spanish mackerel, possible changes in trip limits for cobia and dolphin, and additional flexibility for changes to be made as seasonal adjustment by regulatory amendment.

Gulf States Marine Fisheries Commission (1986). Striped Bass Fishery Management Plan. Larry Nicholson (ed.), P.O. Box 726, Ocean Springs, MS, November.

A management plan to restore and maintain the striped bass population throughout the Gulf of Mexico.

Gulf States Marine Fisheries Commission (1992). Striped Bass Fishery Management Plan, Amendment 1. P.O. Box 726, Ocean Springs, MS, May, 13 pp.

To restore and maintain the striped bass population throughout the Gulf of Mexico, it is recommended that the sale and/or purchase of striped bass harvested from public waters be prohibited, a bag limit of six fish per person per day with a minimum size limit of eighteen inches total length be established, and that the states bordering the Gulf of Mexico region participate in the stocking of striped bass fry and/or fingerlings in coastal areas on an annual basis, with the goal of ten million fish per year stocked with at least 500,000 being phase two fingerling.

Gulf States Marine Fisheries Commission (1995). A Profile of the Western Gulf Stone Crab, Menippe adina. Number 31, P.O. Box 726, Ocean Springs, MS, January.

The western Gulf stone crab (Menippe adina) ranges in coastal waters from northwest Florida around the Gulf of Mexico to the state of Tamaulipas, Mexico. Currently, M. adina supports small, directed commercial fisheries in Louisiana and Texas. In Mississippi and Alabama, the fishery exists as a limited, seasonal bycatch component of the blue crab (Callinectes sapidus) fishery. High dockside value of stone crab claws and an apparently unsatisfied market demand have created interest in further development of commercial fisheries for stone crabs. The goal of this document is to provide a data base for use in development of management measures. The objectives are to summarize available literature, data, and regulations pertaining to the western Gulf stone crab and to describe the fishery.

Gulland, John A. (1974). The Management of Marine Fisheries. University of Washington Press, Seattle.

The management of marine fisheries presents a complex mixture of biological, economic, social, and political problems. In recent years this subject has earned increasing attention owing both to the growing pressures on the world fish stocks, and to the general concern with the proper use of the environment, of which the rational harvesting of fish in the sea is an

important special case.

Gulland, John A. (ed.) (1978). Fish Population Dynamics. John Wiley & Sons, New York.

A review of the status of fish population dynamics. The historical development of the science is followed by a description of methods and practical applications using different species of fish. The intent of this volume is to make a fuller and more rational use of the resources of the sea.

Gulland, John A. (1982). "Long-Term Potential Effects from Management of the Fish Resources of the North Atlantic." J. Cons. Int. Explor. Mer., 40(1):8-16.

Long-term benefits from improved fishery management can be placed in four classes - greater gross value of the catch; reduced costs of capture; better allocation of benefits, e.g. between different regions, or different sections of the community; and reduced administrative and similar burdens. These benefits are discussed in general terms, and in relation to the value of the North Sea fisheries. Though the volume of the catch from the North Sea has more than doubled in the last 20 years, the value (at fixed prices) has probably not changed much. Different patterns of fishing might increase the value of the North Sea catch by 50% or more. The total net benefits from better management of the northeast Atlantic fisheries might be a billion dollars annually.

Gulland, John A. (1989). "Comments on Giulio Pontecorvo's "The State of Worldwide Fishery Statistics: A Modest Proposal"." Marine Resource Economics, 6(1):85-86.

Gulland takes exception to Pontecorvo's view of FAO's ability to supply world wide fishery statistics data.

Gulland, John A. and M.A. Robinson (1973). "Economics of Fishery Management." Journal of the Fisheries Research Board of Canada, 30(12-2):2042-2050.

In an unmanaged fishery the costs of catching a unit weight of fish will tend to rise until they are equal to the value of the catch. There is likely to be an excessive amount of fishing that adds to the costs, but adds little or nothing to the total catch, and may even decrease it. In practice the amount of fishing will often exceed the equilibrium, due to delays in reacting to falling catch rates, year to year fluctuation in the fishery, etc. The labor and capital engaged in fishing is often relatively immobile, and once excess capacity has developed it is not easily reduced without special measures. A number of different measures are available to control both the amount of fishing and the sizes of the fish caught. These are outlined, and the advantages and disadvantages briefly discussed. Several of the methods of controlling the amount of fishing tend to add to unit costs, and therefore offer little long term benefits. These benefits can only be assured by control of the total capacity engaged in a fishery, such as through allocation of shares to individual countries in an international fishery, or by license limitation in a national fishery.

Gulland, John A. and Brian J. Rothschild (eds.) (1984). Penaeid shrimps -their biology and management, Fishing News Books Ltd., Farnham, Surrey, UK.

Proceedings of an international workshop on the scientific basis for the



management of penaeid shrimp held at Key West, Florida, in November, 1981. Primarily biological papers were presented covering policy in different countries, behavior, types of analysis, interaction with other species, environmental factors, and management.

Gutherz, Elmer J. and Gilmore J. Pellegrin (1985). "Report on Snapper-Grouper Mortality by Shrimp Trawlers in the U.S. Gulf of Mexico." Report prepared for the Gulf of Mexico Fishery Management Council. Mississippi Laboratories, Pascagoula Laboratory, Southeast Fisheries Center, National Marine Fisheries Service, NOAA, Pascagoula, MS 39567-0112.

The purpose of this report, utilizing available commercial discard and resource assessment data, is to provide a more precise estimate of juvenile red snapper mortality caused by shrimp trawlers than that reported in the Gulf of Mexico Fishery Management Council Reef Fish Management Plan. In addition, the information provided can be used to establish timing of recruitment into the fishery; not the snapper fishery, but the first exploitation of red snapper by the shrimp fishery.

Gutherz, Elmer J. and Gilmore J. Pellegrin (1988). "Estimate of the Catch of Red Snapper, Lutjanus campechanus, by Shrimp Trawlers in the U.S. Gulf of Mexico." Marine Fisheries Review, 50(1):17-25.

This paper, utilizing available commercial bycatch and resource assessment data, provides a more precise estimate of the catch of juvenile red snapper by shrimp trawlers than that reported in the Gulf of Mexico Fishery Management Council (1980) Reef fish Management Plan. In addition, the information provided may be useful for estimating the timing of first exploitation of red snapper by the shrimp fishery.

Haab, Timothy C. and Robert L. Hicks (1997). Accounting for Choice Set Endogeneity in Random Utility Models of Recreational Demand. Draft, Department of Agricultural Economics, University of Maryland, College Park, MD, January, 24 pp.

Modeling the choice among a discrete set of recreation alternatives is driven by the possible patterns of substitution among sites. Researchers typically assume that the individual's choice set is the same as the set of alternatives included in the recreation survey instrument. This need not be the case. We derive a generalization of the standard multinomial logit random utility model which allows for the possibility of heterogeneous choice sets that are endogenously determined in the model. The possible biases introduced by erroneously specifying each individual's choice set are investigated in two examples. Using these examples, we show that parameter and compensating variation estimates differ greatly between the endogenous choice set model and the traditional logit model. The new endogenous choice set model is shown to be manageable for a small number of alternatives, and two examples provide grounds for optimism in further applications of the model.

Habron, Geoffrey B., Pamela M. Mace, Steven Koplun, and Gerry Scott (1994). United States Imports of Swordfish (1974-June 1994). ICCAT Working Document SCRS/94/120, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD.

Total and country-specific data are presented for U.S. swordfish imports in terms of both dressed weight and value in U.S. dollars. Total imports increased from 11.6 mt in 1975 to 1240 mt in 1984, then jumped to 4114 mt in

1985 and peaked in 1990 at 7475 mt. Imports fell to 5838 mt in 1993, and have only reached 1741 mt through June of 1994. Swordfish imports now exceed domestic Atlantic swordfish production. In recent years, most of the imports have come from the western Pacific. Since 1990, imports have fallen from every country except Canada, Antigua and Barbuda, Barbados, Grenada, St. Vincent, Bermuda, Venezuela, Uruguay, Italy, and New Zealand, where total swordfish imports have steadily increased. Imports from countries such as Trinidad and Tobago, Japan, Singapore, and Taiwan have fluctuated.

Haby, Michael G. and Richard E. Tillman (1992). "The Texas Shrimp Industry: A Briefing Report." TAMU-SG-92-501, Texas Marine Advisory Service, July, 18 pp.

This report presents current trends and conditions in the Texas shrimp industry and evaluates how these factors impact individual production, processing, and marketing firms for 1991.

Haby, Michael G., Richard E. Tillman, and Lucy Gibbs (1991). "The Texas Shrimp Industry: A Summary of Production, Processing, and Marketing Activities." Report, Department of Agricultural Economics, Texas Agricultural Extension Service, Texas A&M University, College Station, Texas.

Shrimp is the backbone of the Texas seafood economy, and is easily the most valuable fishery in the state. Shrimp are harvested year round with 70 percent harvested between July and December. With increased production came investment in shore side processing facilities. Lender participation has been essential in making the Texas shrimp industry an economic success. Every attempt has been made to incorporate the most recent data into this report.

Haby, Michael G., Russell J. Miget, and Gary L. Graham (1992). "A Preliminary Assessment of the 1992 Shrimping Season." Departments of Agricultural Economics and Wildlife and Fisheries Sciences, Texas Agricultural Extension Service, Sea Grant College Program, Texas A&M University, September, 51 pp.

This report quantifies current and anticipated shrimp production in 1992 and offers reasons why landings in some ports are significantly below historic expected values. It begins with a review of shrimp production in Texas from both a long run and seasonal perspective followed by a discussion of habitat requirements of larval and subadult penaeid shrimp. Next, the methods used to evaluate the 1992 season are enumerated. The report concludes with a discussion of the 1992 season (both realized and anticipated) from both a coastal and county perspective. Detailed data tables that support this section are found in the appendix. All data pertaining to each county are presented alphabetically, followed by a coastal summary.

Haby, Michael G., Richard A. Edwards, E. Anthony Reisinger, Richard E. Tillman, and William R. Younger (1993). "The Importance of Seafood-Linked Employment and Payroll in Texas." TAMU-SG-93-503, Texas Marine Advisory Service, May, 10 pp.

This report quantifies the employment and payroll attributable to businesses that depend on the Texas seafood industry for sales or purchases. Seafood linked in 1989 is estimated at 30,036 full time jobs with an annual payroll of \$326.5 million. Among coastal counties, the seafood industry is often the largest taxpayer as well as the largest employer.

Hadden, Gerald (1995). Funding for Fisheries Bycatch Initiatives. In Brad

Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

A list of funding sources for bycatch reduction research within and outside the federal government is presented. In addition, information on preparing proposals, cooperating with academic researchers and the fishing industry, and the most appropriate means of approaching the funding sources is provided.

Hadden, Gerald (1995). Watching the Pot. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

Maine lobstermen have been successful conservationists well before federal regulations required the use of escape hatches and biodegradable vents, the v-notching of female lobster tails, and limiting the number of traps per fisherman.

Hadley, David (1998). Estimation of Shadow Prices for Undesirable Outputs: An Application to UK Dairy Farms. Paper presented at the American Agricultural Economics Association Annual Meetings, Salt Lake City, Utah, August 2-5, 16 pp.

Analysis of agricultural production generally ignores the undesirable outputs (such as nitrate or pesticide contamination of water) that are produced alongside desirable, marketable outputs. This paper presents the results of research which integrates a simple physical model of nitrate leaching from dairy production into a multiple input/multiple output representation of the production technology: the output distance function. Estimation of the output distance function as a frontier allows for the derivation of shadow prices of the undesirable output which can be interpreted as the marginal abatement costs that each producer faces. The study uses an unbalanced panel data set derived from annual survey returns from 330 individual UK dairy farms which span the period 1982 to 1992 and totals to 2130 observations. The shadow price for the undesirable output evaluated at the mean of the data is estimated to be -29.34 Pounds Sterling.

Hagan, Philip and Gary Henry (1986). Potential Effects of Differing Management Programs on the Southern Bluefin Tuna Fishery. Marine Resource Economics, 3(4):353-389.

A model of the Southern Bluefin Tuna (SBT) fishery is developed and used to explore the likely biological and economic consequences of adopting various management programs for the fishery. Issues addressed include both regional and international aspects since SBT are exploited by Japanese and New Zealand fishermen as well as their Australian counterparts. Simulation results from the model suggest that there exists an annual sustainable level of catch on the part of Australian and Japanese fishermen which would maintain fish stocks at a safe level but this level of catch, as well as its composition, is not unique so that there is room for negotiation between the major fishing nations on a mutually agreeable management program; that the effects of heavy fishing of younger fish early in their migratory path has disproportionate consequences for all other users of the resource; and that there exists some scope for some form of socially acceptable tradeoff between biological and economic objectives.

Hair, Jay D. (1984). "Confronting Habitat Constraints." Chapter 14 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National

Coalition for Marine Conservation, Inc., Savannah, Georgia.

Habitat can no longer be ignored in decisions that affect recreational fisheries. Habitat must be protected, enhanced, and restored to develop recreational fisheries.

Hall, Martin A. (1997). Strategic Issues in Managing Fishery Bycatches. In Solving Bycatch, Considerations for Today and Tomorrow, Alaskan Sea Grant College Program Report No. 96-03, University of Alaska, Fairbanks, Alaska, 322 pp.

A brief analysis is made of the strategies that can be used to reduce bycatches in fisheries. They fall under two basic types: reduction of the level of effort, and reduction of the average bycatch per unit of effort (BPUE). The former frequently results in lower catches of the target species. Reduction in BPUE, on the other hand, may offer a way to mitigate the problems with fewer negative impacts on the fisheries. Identifying the environmental, biological, and technological reasons why bycatches happen is the key point of those strategies that attempt to deal with the problems while at the same time maintaining the use of the resources involved. Five lines of defense are identified to try to mitigate or solve bycatch problems. The Tuna-Dolphin Program of the Inter-American Tropical Tuna Commission, is used as a case study to illustrate different issues. Finally, some of the conditions that have helped solve this problem are presented. Even though it is clear that each fishery will have to develop its own set of solutions, there are some common traits that may help in the search for solutions.

Halstead, John M. and Minkang Zhu (1987). "Managing Risk and Uncertainty in Agricultural Nonpoint Source Contamination of Ground Water: Sources and--Solutions (?)." Department of Agricultural Economics, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, June, 25 pp.

This paper describes the nature and sources of uncertainty faced by the economist attempting to analyze alternative policies for management of agricultural nonpoint source pollution of ground water. Since the nature of the nonpoint problem makes many of the techniques used to control point source pollutants infeasible, approaches to the ground water problem often involve a modeling component to simulate both physical movement of agricultural chemicals and decision making of economic units. This paper focuses primarily on how uncertainty affects this modeling process.

Hamalainen, Raimo P., Jukka Ruusunen, and Veijo Kaitala (1986). "Myopic Stackelberg Equilibria and Social Coordination in a Share Contract Fishery." Marine Resource Economics, 3(3):209-235.

A general dynamic model of fishing under harvest share contracts is developed. Vessel owners hire fishermen to work on the vessels and pay them a share of the catch and an additional wage. The harvest rate depends on labor input, capital input, and stock level. Neither of the agents is unionized. On each vessel we have a principal agent setting where the crews labor input decisions and vessel owners decisions about harvest shares are based on myopic optimization. However, in this first analysis of the model risk is not included in the formulation. The paper concentrates on the incentive effects and in this framework the reason for a share contract to exist is the avoidance of transaction costs. In a share contract fishery both labor input and resource use are inefficient. A detailed analysis of the effectiveness of different regulation policies is presented.

Hamalainen, Raimo P., Jukka Ruusunen, and Veijo Kaitala (1990).  
"Cartels and Dynamic Contracts in Sharefishing." Journal of Environmental Economics and Management, 19:175-192.

This paper studies a principal-agent model of a fishery, where cooperative vessel owners hire unorganized fishermen to operate the vessels. On each vessel fishermen's remuneration is a share of the value of the catch. The results show that harvest shares of myopic fishermen will be reduced when cartels are established. Intertemporal optimization of the resource use by the cartel is accompanied by the problem of the cartel's viability. Share contracts are traditionally motivated by risk sharing and by the avoidance of labor monitoring. The results of this paper suggest new important reasons for the commonness of share contracts in fishing. Sharefishing is a self-adaptive and time consistent remuneration system as it automatically accommodates differences in individual crews' labor supplies due to differences in fishermen's skills and cost factors. An essential result found that supports harvest sharing is the relative simplicity of the social management policy; optimal regulation is accomplished by a constant subsidy on the price of fish. The subsidy policy is time consistent and does not change as the stock level changes. The paper also addresses conditions under which stock extinction does not occur in sharefishing.

Hamilton, Marcia S. and Stephen W. Huffman (1997). Cost-Earnings Study of Hawaii's Small Boat Fishery, 1995-1996. SOEST 97-01, JIMAR Contribution 97-314, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, 1000 Pope Road, Honolulu, HI, 102 pp.

The focus of the study was Hawaii's 1995-1996 small pelagic fishery. Vessel owners and operators were surveyed through both in-person and mail-back surveys. Information was obtained on 569 small boat fishermen. Data includes information on vessel operations and characteristics, investment and fixed costs, trip costs, annual catches, sales and gross revenue, as well as operator demographics. Surveys were stratified into four groups based on fishermen's motivations and reliance on fishing income: full-time fishermen were defined as those who reported receiving over 50% of their income from fishing profits, part-time fishermen received 50% or less of their income from fishing, expense fishermen sold fish only to cover trip costs, and recreational fishermen did not sell any part of their catch over the previous 12 months. Clear differences were evident among groups. Fishing intensity (number of trips taken over the previous 12 months), catch, and gross revenue were all found to decrease as operators' reliance on fishing income decreased (from full-time to recreational). A majority of fishermen reported using more than one gear type, however, full-time fishermen reported doing more handlining relative to trolling when compared to other groups. Average trip costs were similar across groups, with full-time fishermen spending more on ice and bait than others. An examination of the data on pelagic vessels by vessel length was also carried out. Sixty-six percent of the completed surveys belonged to vessels between 16 and 24 feet in length overall. In general, investment, costs, and catches rose along with vessel size. Operators of larger vessels reported a greater emphasis on handlining than did smaller vessels but all sizes utilized multiple gear types during the previous 12 months.

Hamilton, Marcia S., Rita E. Curtis, and Michael D. Travis (1996). Cost-Earnings Study of the Hawaii-Based Domestic Longline Fleet. SOEST 96-03, JIMAR Contribution 96-300, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, 1000 Pope Road, Honolulu, HI, 59 pp.

This project provides baseline information to fishery managers and participants in the Hawaii based domestic longline fishery. The focus of study was the 1993 Hawaii based domestic longline fleet. This fishery has been a limited entry fishery since 1991. In 1993, there were 167 permits issued to longline vessels, of which 122 vessels made at least one landing. Total 1993 fleet landings as estimated by National Marine Fishery Service were 25 million pounds with an exvessel value of \$55 million. This report provides a summary of 1993 vessel operations and earnings; information on other years can be expected to vary substantially.

Hamilton, Marcia S., Rita E. Curtis, and Michael D. Travis (1996). Hawaii Longline Vessel Economics. Marine Resource Economics, 11(2):137-140.

This report provides a summary of 1993 vessel operations and earnings. While the Hawaii longline fleet averaged a positive net return from their 1993 operations, the level of profits varied substantially between groups of vessels. When analyzed by target species, mixed target vessels earned the highest net return. Although the gross revenue earned by this group was less than that earned by swordfish vessels, mixed vessels had somewhat lower variable costs and substantially lower fixed costs.

Hammack, Judd and Gardner Mallard Brown, Jr. (1974). Waterfowl and Wetlands: Toward Bioeconomic Analysis. Resources for the Future, Inc., Johns Hopkins University Press, Baltimore.

The book deals with alternative methods of valuing outdoor recreational resources in general and develops a theoretical framework for the valuation of waterfowl in particular. Empirical results are derived from the waterfowl valuation model, biometric relationships are posited and tested with mallard data, crude cost-benefit analyses on existing prairie wetlands are determined, and the questions of how many waterfowl and how many ponds are appropriate in a dynamic setting is explored.

Hamnett, Michael P., Christopher B. Jones, Wendy L. Schultz (1989). "Policy Development and Planning for Global Climate Change and Sea Level Rise in the Pacific Islands." Joint Working Group on Policy and Planning Implications for Global Climate Change in the Pacific Basin, Pacific Basin Development Council, UH Social Science Research Institute.

This paper outlines the approach developed to address the five public policy problems associated with global climate change in the Pacific Islands; i.e. (1) the potential impacts of global climate change could be so catastrophic that neither our policy makers nor the people we serve want to consider the possibility; (2) compared to other policy issues, the potential impacts of global warming appear much less immediate; (3) Pacific Island countries and territories do not contribute even a fraction of global emissions of greenhouse gases, and laws or domestic policies developed in the islands to restrict emissions would have little or no impact on the intensification of the greenhouse effect; (4) the lack of scientific certainty about the relationships between emissions and global warming and between warming and other environmental changes allows policy makers to dismiss the problem; (5) policy makers have been provided with little guidance about what they could possibly do about the global climate change and its impacts. It is organized in terms of those policy problems and concludes with a brief description of the methods to be employed in the pilot project.

Hanemann, W. Michael (1984). "Discrete/Continuous Models of Consumer Demand." Econometrica, 52(3):541-561.

This paper develops a unified framework for formulating econometric models of discrete/continuous consumer choices in which the discrete and continuous choices both flow from the same underlying (random) utility maximization decision. As a special case a number of models suitable for empirical application are developed where the discrete choice is among different brands of a commodity. Since these brands are essentially substitutes, the consumer prefers to buy only one brand at any time; the discrete choice is which brand to select and the continuous choice is how many units to buy.

Hanemann, W. Michael (1984). "Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses." American Journal of Agricultural Economics, 66(3):339-341.

Since the work of Bishop and Heberlein, a number of contingent valuation experiments have appeared involving discrete responses that are analyzed by logit or similar techniques. This paper addresses the issues of how the logit models should be formulated to be consistent with the hypothesis of utility maximization and how measures of compensating and equivalent surplus should be derived from the fitted models. Two distinct types of welfare measures are introduced and then estimated from Bishop and Heberlein's data.

Hanemann, W. Michael (1994). "Valuing the Environment Through Contingent Valuation." Journal of Economic Perspectives, 8(4):19-43.

This paper focuses generally on the use of contingent valuation to measure people's values for environmental resources, rather than specifically on natural resource damages. It will describe how researchers go about conducting reliable surveys. It then addresses some common objections to surveys and, lastly, considers the compatibility between contingent valuation and economic theory.

Hanemann, W. Michael and Edward Morey (1992). "Separability, Partial Demand Systems, and Consumer's Surplus Measures." Journal of Environmental Economics and Management, 22:241-258.

In practice, complete demand systems are not estimated. Rather, either an incomplete demand system is estimated, or separability is invoked and a partial demand system is estimated. This paper considers the relationship between the conventional compensating variation (equivalent variation) and the corresponding welfare measure that can be derived from a partial demand system and the current budget allocation to the separable group. Even assuming the separability assumption invoked is appropriate, these partial measures provide, in general, only a limited amount of information about the compensating variation and no information about the equivalent variation. Great care is therefore needed when using partial welfare measures to evaluate policy.

Hanemann, W. Michael and Ivar E. Strand (1993). "Natural Resource Damage Assessment: Economic Implications for Fisheries Management." American Journal of Agricultural Economics, 75(5):1188-1193

This paper considers similarities and contrasts between the economic concepts and procedures used in connection with natural resources damages assessment and those that arise in connection with fisheries management. The more significant point that we make is the requirement for a consistent approach to economic valuation, to eliminate opportunities for mistakes in the

economic analysis and to provide a coherent economic argument for politicians, bureaucrats, and the public. The problem arises because of the fragmentation in the legal and political setting within which economic analysis is conducted and the fact that these different entities have different viewpoints and adopt different guidelines.

Hanna, Susan S. (1994). Co-management. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Successful common property resource management systems are based on effective control. Effective control of the exploitation of natural resource systems is often extremely difficult to obtain due to underlying ecological uncertainty, resource scale, heterogeneity of users, diverse objectives, high coordination and enforcement costs, and a lack of understanding about organizational structure and process. These difficulties often lead to attempts to manage by technical expertise to obtain efficient solutions. Co-management, as power sharing between government agencies and user groups, is a mechanism for realizing effective control. Co-management extends beyond the efficiency objective to encompass legitimacy and equity. Structuring co-management requires investment in human capital of scientists, decision makers, and user groups to build required skills of coordination and negotiation. The history of a fishery and its existing institutions—both formal and informal—influence the probability of co-management success. This paper focuses on the benefits and costs of co-management; its necessary conditions as well as its vulnerabilities. Some key aspects of building a co-management process are identified and compared to other management processes.

Hannesson, Rognvaldur (1974). Economics of Fisheries: Some Problems of Efficiency. Studentlitteratur, Lund, Sweden.

Thesis focusing on fisheries economics in general and the North Atlantic cod and the fishing limits controversy in particular.

Hannesson, R. (1975). "Fishery Dynamics: A North Atlantic Cod Fishery." Canadian Journal of Economics, 8(2):151-173.

First, the optimal harvesting of a single cohort is discussed, assuming that a unit of fishing effort always removes a constant proportion of the fish stock. Discounting is shown to imply a longer fishing season, and only in special cases should the stock be depleted to an uneconomic level as quickly as possible. Then the relative merits of periodic and sustained fishing of a stock consisting of several cohorts are studied by simulating a Beverton-Holt model of a cod fishery. The impact of cost, discounting, and natural fluctuations on the time-pattern of fishing is discussed, as well as the practicability of periodic fishing.

Hannesson, Rognvaldur (1978). Economics of Fisheries, An Introduction. Universitetsforlaget, Bergen, Columbia University Press, New York.

An introductory text in fisheries economics using comparative statics.

Hannesson, R. (1983). "Bioeconomic Production Function in Fisheries: Theoretical and Empirical Analysis." Can. J. fish. Aquat. Sci. 40:968-982.

The traditional fishing effort approach to fisheries economics implies the existence of a production function with fishing effort and fish abundance as independent variables. The existence of bionomic equilibrium depends on



the shape of this production function, as well as the demand and effort cost functions. The fishing effort approach is integrated with neoclassical production function analysis where labor and capital produce an effort frontier production function that can be estimated for selected Norwegian fisheries. Optimal vessel size and capital intensity can be estimated. Fishing vessels appear to be undersized but not too capital intensive.

Hannesson, Rognvaldur (1983). "Optimal Harvesting of Ecologically Interdependent Fish Species." Journal of Environmental Economics and Management, 10:329-345.

The optimal exploitation of a two-species predator-prey system is considered, using Lotka-Volterra type equations. Due to the density dependence of ecological efficiency, both species should be harvested simultaneously over a range of relative prices. Beyond the limits of this price range, either the prey species should be utilized indirectly by harvesting the predator, or the predator should be eliminated to maximize the prey yield. Neglecting harvesting costs, the simultaneous harvest of prey and predators requires that a unit of prey biomass increase in value by being "processed" by predators. Certain results from single species fishery models are shown not to apply to multispecies models. These are as follows: (i) Optimal regulation of a free access fishery may call for subsidizing instead of taxing the harvest of predator species. (ii) Increasing the discount rate may, at "moderate" levels, imply that the optimal standing stock of biomass increases instead of decreasing. (iii) a rising price of a falling cost per unit fishing effort of a species may raise and not lower the optimal standing stock of that species.

Hannesson, Rognvaldur (1984). "Fisheries Management and Uncertainty." Marine Resource Economics, 1(1):89-96.

This paper explores likely changes in the types and extent of uncertainty resulting from increased regulation of fisheries. Specifically, fisheries management may be a principal source of uncertainty, and institutional uncertainty may be substituted for the uncertainty of nature.

Hannesson, Rognvaldur (1985). "The Effects of a Fishermen's Monopoly in the Market for Unprocessed Fish." Marine Resource Economics, 2(1):75-85.

This paper considers the effects of granting a fishermen's sales organization exclusive rights to sell unprocessed fish. On the assumption that the fishermen's monopoly is able to discriminate between plants and end use alternatives in its pricing policy, the conditions for profit maximization are derived and compared with the conditions for social efficiency. It is found that the monopoly would be efficient if its costs for obtaining the fish are identical to the social costs, the marginal processing cost is constant, and either the price of the finished product is constant or the product is exported so that consumer's surplus is not a part of the social benefit. A fishermen's monopoly may thus achieve the objectives of an export cartel. When the marginal processing cost is rising the monopoly will over conserve the fish resource, provided that its cost of providing the fish is not sufficiently below the social cost. Finally, the analysis is extended to the special case in which processors have established a price discriminating monopoly in the market for the finished products but distribute the resulting profit through higher accounting prices while leaving individual processors to decide how much fish to buy for processing. This system passes the benefits from price discrimination in the markets for finished products on to the fishermen's monopoly.

Hannesson, Rognvaldur (1985). "Inefficiency Through Government Regulations: The Case of Norway's Fishery Policy." Marine Resource Economics, 2(2):115-141.

The fishery is a classic example of market failure. Government intervention does not necessarily correct this, but may instead seek economically inefficient solutions, because of either a deliberate trade off between efficiency and equity or political expediency. Norway's fishery policy is seen as a case in point. Its stated objectives put a low priority on economic efficiency, while various objectives based on equity are put in the foreground. The result is that the contribution of Norway's fisheries to the national income is slight. Norway's fishery policy consists of two largely uncoordinated parts, one concerned with maintaining fishermen's incomes and the other with managing fish stocks.

Since the introduction of the 200 mile limit, most fish stocks exploited by Norway have been managed by total allowable catches (TACs). While this has prevented the depletion of fish stocks, the regulations introduced to enforce the TACs have been an economic failure. The setting of TACs has in some cases revealed a willingness to attain solutions expedient in the short term at the expense of long term benefits.

Hannesson, Rognvaldur (1986). "The Effect of the Discount Rate on the Optimal Exploitation of Renewable Resources." Marine Resource Economics, 3(4):319-329.

In a recent paper, Farzin (1984) has shown that the impact of the discount rate on the optimal rate of depletion of an exhaustible resource is ambiguous. Since Clark's (1973) paper on the extinction of animal species, it has been recognized that a higher discount rate increases the optimal rate of exploitation and increases the likelihood of extinction, but ignores the capital cost implication of a higher discount rate; the effect discussed by Farzin. In this paper, the effect of the discount rate on the optimal rate of exploitation and standing stock of a renewable resource such as fish is examined. This effect is ambiguous with the ambiguity depending on the dual role of the discount rate. On the one hand, the discount rate expresses a required rate of return on a growing asset. For a renewable resource with a concave growth function, a higher rate of discount implies a smaller standing stock. On the other hand, the discount rate expresses the opportunity cost of capital to be invested in harvesting equipment. A higher discount rate thus means more costly harvesting, which in turn implies a less intensive optimal harvesting and a larger standing stock.

Hannesson, Rognvaldur (1987). "Optimal Catch Capacity and Fishing Effort in Deterministic and Stochastic Fishery Models." Fisheries Research, 5:1-21.

This paper is a survey of fisheries economics aimed mainly at fisheries biologists. The paper begins by reviewing the static theory, which established two major results. (i) Free access leads to over-exploitation, and (ii) the optimal rate of exploitation is less than the maximum sustainable yield. The latter could be regarded as an antithesis to the biological doctrine that fish stocks should be managed to give maximum sustainable yield (MSY).

Dynamic theory, which is considered next, showed that the optimal rate of exploitation could be either less or greater than the MSY rate. In particular, a higher discount rate was shown to imply a higher rate of exploitation. This, however, ignores the role of capital invested in the harvesting sector. Once it is recognized that a higher discount rate implies a higher required rate of return on capital, the impact of the discount rate

on the optimal rate of exploitation becomes ambiguous. The paper examines the impact of the discount rate with and without stock-dependent harvesting costs. This leads on to the question of how the risk of extinction under free access depends on the sensitivity of unit harvesting costs, or catch per unit of effort, to the size of the exploited stock.

Finally, stochastic fishery models are briefly considered. The main purpose of this part of the paper is to demonstrate that deterministic fishery models may give poor guidance for managing the stochastic fisheries of the real world, even if risk neutrality and constant prices are assumed. To demonstrate this as clearly as possible, the unit cost of harvesting is assumed to be constant, implying that the optimal rate of exploitation is constant in a deterministic model. First, we consider the simple case of time-invariant stochastic catch quotas (no population dynamics), and demonstrate how optimal catch capacity depends on the cost of investing in the necessary equipment. Then we consider population dynamics, where expected future catch quotas depend on how much is being taken presently. Optimal catch capacity depends on the cost of investment in this case as well, but the derivation of optimal harvesting and investment policies becomes more complicated.

Hannesson, R. (1988). "Fixed or Variable Catch Quotas? The Importance of Population Dynamics and Stock Dependent Costs." Marine Resource Economics, 5(4):415-432.

This article considers two questions concerning fluctuations in fish stocks and catches: are they possible beneficial and would fishery managers opt for a strategy that enhances stock or catch quota variability or both? For this analysis, three models are followed: in the first, variations in stock abundance are stochastic with no population dynamics; in the second, the stock in a certain time period depends on a stochastic recruitment to the stock and survivors from the previous time period; and the third is a year class model that has more complicated population dynamics but is more realistic. The article implicitly assumes that property rights exist by using profit maximizing mathematical techniques.

Hannesson, Rognvaldur (1993). "Enclosure of the Commons: Two Paradoxes." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

de Meza and Gould (1992) show that the rent from enclosing a free access resource may, at the wage rate prior to enclosure, be positive while the social benefit is negative. Hence there may be an incentive to privatize a common resource even when this is not warranted for reasons of efficiency. Books and Heijdra (1990) have criticized Buchanan (1980) for a similar approach when demonstrating that the potential benefits of enclosing the commons may be dissipated through rent seeking. In this paper we show that de Meza and Gould's conclusion that the rent from enclosure will be higher than the social benefit at the free access wage rate still holds when there is a real cost of the enclosure and diminishing returns in both sectors of the economy. It may, however, happen that the resource rent after enclosure is negative while the social benefit of enclosure is positive. Hence we might end up in the curious situation that neither free access nor enclosure is an equilibrium.

Hannesson, Rognvaldur (1993). "Fishing Capacity and Harvest Rules." Marine Resource Economics, 8(2):133-143.

In this note we consider the choice of optimum fishing capacity for fish stocks that vary at random. In models with stochastic variations of fish

stocks, optimum fishing capacity is normally a decision variable separate from fishing effort. It is shown how the optimum fishing capacity depends on the price of fish, the cost of capacity, and the harvest rule linking the permitted catch to the size of the fish stock. Operating costs may also influence the optimum capacity through the effect of stock thinning on the cost per unit of fish caught and the level at which further depletion becomes unprofitable.

Hannesson, Rognvaldur (1994). "Optimum Fishing Capacity and International Transfer of Excess Allowable Catches." Land Economics, 70(3):330-344.

This paper considers optimum fleet capacity for fish stocks that vary randomly and are managed by separate states. Assigning a particular fleet to a particular stock will be less profitable than allowing fleets to move between stocks. Transfer of excess catch quotas between states improves profitability, but produces a global optimum only if payments are attached to the transfer. A free transfer of excess quotas results in overcapacity and dissipation of rents. A Nash bargaining solution with respect to transfer prices, but without side payments, gives solutions very close to the global optimum.

Hannesson, Rognvaldur (1997). "Fishing as a Supergame." Journal of Environmental Economics and Management, 32:309-322.

This paper considers how cooperative solutions to games of sharing fish resources can be supported by threat strategies. With highly mobile fish stocks, the number of agents compatible with a cooperative self-enforcing solution is not very high for reasonable values of the discount rate, but sensitive to changes in the discount rate and costs and to cost heterogeneity. With migrating stocks, where growth and reproduction depend on how much all agents leave behind after harvesting, the likelihood of a cooperative, self-enforcing equilibrium is increased. With a dominant player and a competitive fringe the rents and optimum stock level of the dominant player fall quickly as the share of the competitive fringe increases.

Hannesson, Rognvaldur (1998). Distribution of Benefits from International Trade in Fishery Products? Discussion paper prepared for the FAO E-Mail Conference on Fisheries Trade and Food Security, The Norwegian School of Economics and Business Administration, Bergen, Norway, 7 pp.

The subject of international trade is controversial and at times emotional. Yet the theory of international trade, its generation of economic benefits and its impact on their distribution is well developed and uncontroversial. The generation and the distribution of gains from fish trade can be in unexpected directions, as they depend critically on how well countries manage their fish resources. Countries that do so badly or not at all are more likely than not to lose from trading in fish; opening up trade is like opening up a waste disposal bin into which productive resources will be thrown to little or no good purpose. If on the other hand such countries were to import fish as a result of trade they might in fact gain; lower fish prices would lower the temptation to waste resources. The need for fish exporting countries to manage their fisheries prudently can hardly be overstated.

Hannesson, Rognvaldur (1998). "Marine Reserves: What Would They Accomplish?" Marine Resource Economics, 13(3):159-170.

A marine reserve is defined as a subset of the area over which a fish stock is dispersed and closed to fishing. This paper investigates what will

happen to fishing outside the marine reserve and to the stock size in the entire area as a result of establishing a marine reserve. Three regimes are compared: (i) open access to the entire area, (ii) open access to the area outside the marine reserve, and (iii) optimum fishing in the entire area. Two models are used: (i) a continuous-time model, and (ii) a discrete-time model, both using the logistic growth equation. Both models are deterministic equilibrium models. The conservation effect of a marine reserve is shown to be critically dependent on the size of the marine reserve and the migration rate of fish. A marine reserve will increase fishing costs and overcapitalization in the fishing industry, to the extent that it has any conservation effect on the stock, and in a seasonal fishery it will shorten the fishing season. For stocks with moderate to high migration rates, a marine reserve of a moderate size will have only a small conservation effect, compared with open access to the entire area inhabited by a stock. The higher the migration rate of fish, the larger the marine reserve must be in order to achieve a given level of stock conservation. A marine reserve of an appropriate size would achieve the same conservation effect as optimum fishing, but with a smaller catch.

Hannesson, Rognvaldur and Stein Ivar Steinshamn (1991). "How to Set Catch Quotas: Constant Effort or Constant Catch?" Journal of Environmental Economics and Management, 20:71-91.

This paper considers whether the total allowable catch from a fish stock should be a fixed annual quantity or based on constant fishing effort. It consists of two parts, a theoretical part and an empirical part based on data from the Arcto-Norwegian cod stock. In the theoretical part it is shown that realistic cost and revenue functions have opposite effects on whether a constant quota or a constant effort yields the highest expected profit. A concave revenue function implies that a constant quota will be preferable, while a stock dependent unit cost of landed fish has the opposite implication. The empirical part investigates how large the difference between the average profit yielded by the two strategies is likely to be, on the basis of some stylized facts about the Arcto-Norwegian cod stock. The size of this stock fluctuates considerably over time, due mainly to fluctuations in the size of year classes. Spectral analysis indicates cyclical movements, and so a sine curve was used to generate recruitment cycles. The difference in average profit yielded by the two harvest strategies is very small in most cases, or of the order of 1-2%. This result is relatively robust with respect to alternative specifications of the cost and the revenue functions, but a maximum difference of 20% was produced by a non-stock-dependent unit cost of fish and a kinked revenue function, where catches exceeding a certain quantity are worthless.

Hanson, Gregory D., James W. Dunn, and Ganesh P. Rauniar (1996). Marketing Characteristics Associated with Seafood Counters in Grocery Stores. Marine Resource Economics, 11(1):11-22.

This study provides a benchmark analysis of seafood counter characteristics corresponding to the peaking of per capita seafood demand in the U.S. Logistic regression results show separate seafood counters are less likely in small stores, in rural stores, and in stores in low or medium income areas. Chain stores and stores with a significant number of non-white customers were more likely to have a seafood counter. Stores in the East South Central region were less likely, and stores in New England more likely to have a seafood counter. The likelihood that stores will develop seafood counters was related to differences in sales volume, floor space, urban/rural location, income level of clients and regional location. Continuing innovations in marketing technology of seafood counters are likely to provide

expanded marketing opportunities in the future.

Hanson, J.S., W.L. Griffin, J.W. Richardson, and C.J. Nixon (1985).  
"Economic Feasibility of Shrimp Farming in Texas: An Investment  
Analysis for Semi-Intensive Pond Grow-Out." Journal of World  
Mariculture, 16:129-150.

A firm level simulation model (MARSIM) was developed to analyze the survival of different shrimp farm sizes in Texas. The model simulates the annual activities of a shrimp farm: production, finances, cash receipts, capital replacement and depreciation, cash flows, income taxes, balances, and growth. A firm is replicated 50 times over a 10 year planning horizon. Random values for shrimp growth and survival, temperature, hurricanes, and prices received in each of 10 years are generated from multivariate empirical probability density functions (pdf) for these variables. For the analysis summarized here, a shrimp farm was simulated using 3 different size systems and 4 different pond sizes. Results indicate that higher rates of return and faster payback are associated with larger total farm size and larger ponds. For large farms (400 surface hectares), pond size becomes less critical to obtaining an acceptable rate of return to investment. The amount of time taken to construct a facility significantly impacts the rate of return. Hurricanes, prices, production, and temperature variation are also critical factors affecting the firm's returns and survival.

Harberger, Arnold C. (1971). "Three Basic Postulates for Applied  
Welfare Economics: An Interpretive Essay." Journal of Economic  
Literature, 9(3):785-797.

The postulates are (a) the competitive demand price for a given unit measures the value of that unit to the demander; (b) the competitive supply price for a given unit measures the value of that unit to the supplier; and (c) when evaluating the net benefits for costs of a given action, the costs and benefits accruing to each member of that relevant group should normally be added without regard to the individual to whom they accrue.

Hardin, Garrett (1968). "The Tragedy of the Commons." Science,  
162(December):1243-1248.

The population problem has no technical solution; it requires a fundamental extension in morality.

Hardy, Linda (1995). "Data Request." National Marine Fisheries  
Service, Southeast fisheries Science Center, Beaufort Laboratory,  
101 Pivers Island Road, Beaufort, N.C., March.

Formats describing south Atlantic shrimp landings data for 1991 to 1993 and the vessel operating units file for the southeastern region for 1990 to 1993.

Harper, Douglas E. (1994). "The 1994 Spiny Lobster Update of Trends in Landings, CPUE, and Size of Harvested Lobster." Miami Laboratory Contribution No. MIA-93/94-82, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL, September, 14 pp.

The objectives of this report are to examine (1) trends in commercial landings and effort, (2) catch per unit effort (CPUE), and (3) size of lobster in commercial and recreational catches.

Harper, Douglas E. and David B. McClellan (1997). "A Review of the Biology and Fishery for Gray Triggerfish, Balistes caprisculus, in the Gulf of Mexico." Miami Laboratory Contribution No. MIA-96/97-52, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL, September, 17 pp.

The commercial and recreational harvest trends are examined and the biological, life history, and population parameters presented in the literature are summarized.

Harrington, Dave (1994). "Bycatch Reduction of TEDS." Presented to the Gulf of Mexico Fishery Management Council, Corpus Christi, TX, May, 7 pp.

This paper reviews the reduction in finfish bycatch in shrimp trawls that are equipped with turtle excluder devices. It argues that finfish bycatch should be reduced as much as possible without harm to the shrimp fishery since the impact of bycatch on finfish stock size may not be as great as is sometimes claimed.

Harrington, David L. (1994). "A Case of Double Deception." Georgia Sea Grant College Program, Marine Extension Service and MAS Leader, University of Georgia.

A news release that describes video footage used to promote the cause of the Florida net ban as fraudulent.

Harris, Kenneth C. (1994). "1993-94 Wreckfish Season Quota Report." Memorandum, United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Beaufort Laboratory, Beaufort, N.C. 28516-9722.

Status of the wreckfish fishery ITQ program from 1991 to 1993 fishing seasons.

Harris, Kenneth C. (1996). "1995-96 Wreckfish Fishery Annual Report." United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Beaufort Laboratory, Beaufort, N.C. 28516-9722.

Status of the wreckfish fishery ITQ program from 1991 to 1995 fishing seasons.

Harris, Kenneth C. and Linda F. Hardy (1995). "The 1994-95 Wreckfish Fishery Annual Report." United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Beaufort Laboratory, Beaufort, N.C. 28516-9722.

Status of the wreckfish fishery ITQ program from 1991 to 1995 fishing seasons.

Harrison, David, Jr. and Daniel L. Rubinfeld (1978). "Hedonic Housing Prices and the Demand for Clean Air." Journal of Environmental Economics and Management, 5:81-102.

This paper investigates the methodological problems with the use of

housing market data to measure the willingness to pay for clean air. With the use of a hedonic housing price model and data for the Boston metropolitan area, quantitative estimates of the willingness to pay for air quality improvements are generated. Marginal air pollution damages as revealed in the housing market are found to increase with the level of air pollution and with household income. The results are relatively sensitive to the specification of the hedonic housing price equation, but insensitive to the specification of the air quality demand equation.

Hartley, Michael J. (1976). "The Tobit and Probit Models: Maximum Likelihood Estimation by Ordinary Least Squares." Discussion Paper Number 374, Economic Research Group, Department of Economics, State University of New York at Buffalo.

This paper proposes an alternative method for the calculation of the Maximum Likelihood Estimator (MLE) for the Tobit and Probit models, that resolves the difficulties with the convergence of the Gauss-Newton algorithm, has the virtue that it is computationally much simpler, and affords a unified interpretation of each of these models from the perspective of incomplete data regression models.

Hartwick, John M. (1978). "Exploitation of Many Deposits of an Exhaustible Resource." Econometrica, 46(1):201-217.

Given a known demand schedule for a mineral at each instant of time and many deposits with different known extraction costs per ton (different qualities) and different known sizes, how should exploitation be organized? How does an exogenous change in the size of deposit  $i$  or in the extraction costs per unit in deposit  $i$  affect the program of exploitation? These questions are investigated for the case of extraction costs constant per ton for deposit  $i$ . The comparative static analysis parallels that for a problem with many income classes in location theory.

Harvey, David J. (1992). "Farmed-Raised Shrimp: Impacts on U.S. Seafood Trade." Aquaculture, Situation and Outlook Report, Department of Agriculture, Economic Research Service, Aqua-8, March, 7 pp.

Improvements in techniques for producing farm raised shrimp in the 1980's greatly increased total supplies, which caused real prices for both domestic landings and imports to fall. With real import prices declining 25 percent between 1986 and 1990, U.S. imports increased dramatically, especially from countries with expanding farm raised shrimp production. The effect of these trends has been to increase U.S. shrimp supplies over 73 percent and to make shrimp imports the largest component of the trade deficit in seafood.

Hashim, Ali and Jonathan Cook (1994). "Resource Rent in the Fisheries Sector." Draft, EPCS Economics Paper No. 2, Fisheries Economics and Statistics Program, Third Fisheries Project, Economic Planning And Coordination Section, Ministry of Fisheries and Agriculture, Male, Republic of Maldives, April.

This study analyses the capacity of the major sectors of the Maldivian fishing industry to pay resource rent to the government in relation to its access to the country's fish resources. A major objective of the study is to provide input to a second study being undertaken under the project; Study 4 that analyses the fiscal alternatives open to the government. The ability of the fishing industry to meet an increased proportion of the national budget is a direct function of the profitability of the industry that is analyzed in some detail in this report.



Hashim, Ali and Jonathan Cook (1994). "Resource Rent in the Fisheries Sector." Draft, EPCS Economics Paper No. 6, Fisheries Economics and Statistics Program, Third Fisheries Project, Economic Planning And Coordination Section, Ministry of Fisheries and Agriculture, Male, Republic of Maldives, November, 19 pp.

Fisheries in many countries have been demonstrated to generate super normal profits in either the short or long run. In the short run, such profits may be realized when a new fishery is developed and there are consequently few boats fishing a relatively large resource. In an open access fishery, these rents are normally dissipated as more vessels enter the fishery and catch per unit effort (CPUE) falls. If, however, the resource is large and/or effort is limited by government regulation, super normal profits may continue in the long run. In this case, the government may appropriate some of these profits as a 'resource rent'; a payment by users for the use of a common property resource. Examples, are widely found in the mining sector, where the minerals are owned by the government and companies are granted extraction rights in return for a royalty or rent.

Haspel, Abraham E. and F. Reed Johnson (1982). "Multiple Destination Trip Bias in Recreation Benefit Estimation." Land Economics, 58(3):364-372.

This study examines the consequences of multiple destination trips on travel cost estimates of benefits, suggests a means of correcting the bias that arises under such circumstances, and obtains nearly identical value estimates from the travel cost method and from a direct question on willingness to pay. The magnitude of multiple destination bias is illustrated and possible solutions to this problem are considered using itinerary information from visitors to Bryce Canyon National Park.

Hatch, Upton and Chien Feng Tai (1997). "A Survey of Aquaculture Production Economics and Management." Aquaculture Economics and Management, 1(1): 1-15.

The literature on production economics and management of fish culture has grown as aquaculture has matured as a commercial industry. Salmon, catfish, shrimp, and trout are the focus of this literature survey as a reflection of the volume of research that has been completed on these species and their importance in U.S. production and world trade. In addition, a discussion of low resource production systems is included that is dominated by tilapia and carp culture systems. A brief overview of the principles of aquaculture production economics and management is presented followed by a review of economic studies.

Hatch, Upton, R. Agbayani, and E. Belleza (1996). "Economic Analysis of Prawn (Penaeus monodon) Culture in the Philippines, II: Grow-out Operations." Asian Fisheries Science, 9: 127-141.

The dramatic fall in prawn prices coupled with environmental concerns has resulted in a relative stagnation of prawn grow-out operations in the Philippines. The sector recently experienced a lack of direction and growth, combined with crowded watersheds, excessive use of water bodies, overuse of groundwater and continued destruction of mangrove. A field survey of prawn growers conducted in 1992 was used to develop economic estimates for representative production systems: intensive, semi-intensive, extensive, and prawn-milkfish rotation. Existing intensive facilities can be operated efficiently and profitably, but new intensive operations will most likely need to include water treatment capabilities for water entering and exiting grow-

out ponds. Canals, reservoirs, or ponds used for water quality improvement may be able to concurrently produce a profitable crop, such as milkfish-prawn rotation. Internal rate of return for semi-intensive ponds using earthen ponds was higher than for other culture systems. If, over time, water quality and conservation constraints are sufficiently addressed, stocking densities might be increased. Research and extension programs targeting equity should focus on integrated systems.

Hausman, Jerry A. (1981). "Exact Consumer's Surplus and Deadweight Loss." American Economic Review, 71(4): 662-676.

In this paper, the primary case of a single price change considered by Willig, that is also the situation in which consumer surplus is often used in applied work, no approximation is necessary. From an estimate of the demand curve, the exact consumer surplus can be derived whether it is the compensating variation, equivalent variation, or some measure of utility change. The basic idea used in deriving the exact measure of consumer surplus is to use the observed market demand curve to derive the unobserved compensated demand curve. It is this latter demand curve that leads to the compensating variation and equivalent variation.

Hausman, Jerry A. and Daniel McFadden (1984). "Specification Tests for the Multinomial Logit Model." Econometrica, 52(5):1219-1240.

Discrete choice models are now used in a variety of situations in applied econometrics. By far the model specification that is used most often is the multinomial logit model. Yet it is widely known that a potentially important drawback of the multinomial logit model is the independence from irrelevant alternatives property. While most analysts recognize the implications of the independence of irrelevant alternatives property, it has remained basically a maintained assumption in applications.

In this paper we provide two sets of computationally convenient specification tests for the multinomial logit model. The first test is an application of the Hausman (1978) specification test procedure. The basic idea for the test here is to test the reverse implication of the independence from irrelevant alternatives property. The test statistic is easy to compute since it only requires computation of a quadratic form that involves the difference of the parameter estimates and the differences of the estimated covariance matrices.

The second set of specification tests that we propose is based on more classical test procedures. We consider a generalization of the multinomial logit model that is called the nested logit model. Since the multinomial logit model is a special case of the more general model when a given parameter equals one, classical test procedures such as the Wald, likelihood ratio, and Lagrange multiplier tests can be used.

The two sets of specification test procedures are then compared for an example where exact and approximate comparisons are possible.

Hausman, Jerry A. and David A. Wise (1976). "The Evaluation of Results from Truncated Samples: The New Jersey Income Maintenance Experiment." Annals of Economic and Social Measurement, 5:421-445.

Estimates of the effects of tax and income guarantee values on hours worked by white males in the New Jersey income maintenance experiment are presented after developing a procedure to take explicit account of the truncating sampling procedure used to select participants in the experiment. The estimated effects of an income maintenance scheme like that imposed by the experiment are substantially larger than those obtained by other

investigators.

Hausman, J.A. and D.A. Wise (1978). "A Conditional Probit Model for Qualitative Choice: Discrete Decisions Recognizing Interdependence and Heterogeneous Preferences." Econometrica, Mar., pp. 403-26.

A three response, unordered (general) probit model, an independent logit model, and independent probit model are estimated to explain the modal choice between driving own car, sharing a ride, and riding a bus for 557 workers in Washington, D.C. Logit and independent probit give similar results both in estimation and in the forecast of the probability of using a new mode. General probit differs significantly from the other two models both in estimation and the forecast about the new mode. General probit fits best. Primarily an article about the creation of a new computer program to estimate the parameters of a model.

Havenner, Arthur and Masanao Aoki (1987). "Econometrics and Linear Systems Theory in Multivariate Time Series Analysis." Draft report, Department of Agricultural Economics, University of California, Davis, March, 24 pp.

An approach to modelling multivariate time series based on linear systems theory is presented and related to more traditional econometric methods to the advantage of both. The linear system theory development provides direct information on model choice, a set of exclusion restrictions that are not sequence dependent and are stable, an extension to multiple period forecast error tradeoffs, and a formal norm on the approximation of the model to the observed autocovariance sequence, among other things. The link to econometrics, on the other hand, provides an interpretation of the criterion underlying the estimators, the sampling theory of the resulting estimators, and their properties, an understanding of certain (econometric) identification issues related to these estimators and suggested improvements based on the analysis, and straightforward tests of model order -- in addition to relating the linear systems procedure to a body of logic familiar to econometricians and statisticians.

Hayenga, Wayne A., Ronald D. Lacewell, and Wade L. Griffin (1974). "An Economic and Financial Analysis of Gulf of Mexico Shrimp Vessels." MP-1138, The Texas A&M University System, Texas Agricultural Extension Service, Texas Agricultural Experiment Station.

This report includes budgeted estimates of variable and fixed costs of landing shrimp, estimated break-even annual shrimp catches with various shrimp prices for the vessel sizes of 53-65 foot and 66 to 72 foot lengths, evaluation of a prospective investment in a shrimp vessel entering the Gulf shrimping fleet, using internal rate of return and payback procedures of investment analysis, and an updated estimated cost level for spring 1974.

Hayes, Robert G. (1984). "Recommendations for Action: Panel 1 Marine Recreational Fisheries Development." Chapter 20 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

This paper attempts to define what Marine Recreational Fisheries development is and to suggest appropriate development actions for the future. I would like to start by making two fundamental points: 1) fisheries development cannot be accomplished in a vacuum - it is clear that we need

responsible and good fisheries management to ensure the efficacy of development and viability of the resource, and 2) we have got to look at fisheries development in the recreational sector differently than we've looked at it in the past.

Hayne, Don W. (1990). "Report of my Attendance of Workshop at Pascagoula, Mississippi in mid-May, 1990." Memorandum to Douglas R. Gregory, North Carolina State University, Raleigh, NC, June, 7 pp.

Comments concerning a workshop to compare the results of two studies of the red snapper fishery with divergent results by Gutherz and Pellegrin (1987) and Nichols et al. (1987).

Haynes, Jos and Sean Pascoe (1988). "A Policy Model of the Northern Prawn Fishery." Occasional Paper 103, Australian Bureau of Agricultural and Resource Economics, GPO Box 1563, Canberra 2601.

The northern prawn fishery has been subject to management since the early 1970's in an attempt to control the expansion of effort and prevent the overexploitation of the resource. Many of the management policies developed over this period have proved to be ineffective in controlling effort. Moreover, the increasing cost of management and the need to avoid costly and ineffective measures will lead to increasing demands for analysis of the cost effectiveness of such policies. This report outlines the mathematical programming model of the fishery designed to assess current and alternative management policies on both effort and profitability. Then the short and long run effects of the current and alternative management policies on the fishery are assessed.

Heaps, Terry (1995). Density Dependent Growth and the Culling of Farmed Fish. Marine Resource Economics, 10(3):285-298.

The aquaculture model of Arnason (1992) is extended to allow for density dependent growth. It is then shown that the optimal management policy for a fish farm may include a period in which there is culling of the stock up to a final slaughter date when all the remaining fish are slaughtered. Results in Heaps (1993), who dealt with density independent growth, for the effects of changes in model parameters on the optimal final slaughter weight are shown to generalize to the case of density dependent growth. As well, a numerical example is provided where culling is definitely part of the optimal management plan.

Heckman, James (1974). "Shadow Prices, Market Wages, and Labor Supply." Econometrica, 42(4):679-694.

A common set of parameters that underlie the functions determining the probability that a woman works, her hours of work, her observed wage rate, and her asking wage or shadow price of time is derived in this paper. Two behavioral schedules are relied upon: the function determining the wage a woman faces in the market (the offered wage), and the function determining the value a woman places on her time (the asking wage). If a woman works, her hours of work adjust to equate these wages if she has freedom to set her working hours. If a woman does not work, no offered wage matches her asking wage. If both wage schedules are estimated, the estimated parameters can be used to determine the probability that a woman works, her actual hours of work given that she works, the potential market wage rates facing nonworking women, and the implicit value of time for nonworking women.

Heckman, James (1974). "Sample Selection Bias as a Specification Error." Econometrica, 47(1):153-162.

This paper discusses the bias that results from using nonrandomly selected samples to estimate behavioral relationships as an ordinary specification error or omitted variables bias. A simple consistent two stage estimator is considered that enables analysts to utilize simple regression methods to estimate behavioral functions by least squares methods. The asymptotic distribution of the estimator is derived.

Heckman, James (1976). "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models." Annals of Economic and Social Measurement, 5:475-492.

This paper presents a unified treatment of statistical models for truncation, sample selection and limited dependent variables. A simple estimator is proposed that permits estimation of those models by least squares, and probit analysis. In an empirical example, it is shown that the estimator yields estimates close to the maximum likelihood estimates.

Heen, Knut (1989). Impact Analysis of Multispecies Marine Resource Management. Marine Resource Economics, 6(4):331-348.

In an attempt to study the regional income and employment impact of different harvesting regimes and harvesting patterns of marine resources, this article demonstrates an approach of combining multispecies bioeconomic modeling and input-output (I-) analysis. The applicability and usefulness of this approach is demonstrated by implementing the model with data from North Norway and the Barents Sea fisheries.

Hein, Stephen and Paul Meier (1995). Skimmers: Their Development and Use in Coastal Louisiana. Marine Fisheries Review, 57(1):17-24.

The origin, development, and utilization of the skimmer net is reviewed along with other historical shrimp gears used in coastal Louisiana. The skimmer was developed to catch white shrimp, Penaeus setiferus, observed jumping over the cork line (headrope) of trawls being worked in shallow waters. A description of the gear is presented including basic components and various frame designs used by fishermen during its development. The advantages of skimmers over bottom trawls include; multiple use as both trawl and butterfly net (wing net), ease of deployment, increased maneuverability, reduction and greater survivability of bycatch, and ability to cover more area due to increased speed and continuous fishing capability. Disadvantages may include compromising vessel stability when stored upright on the deck, possible damage to water bottoms when improperly rigged, and limitation to a 12 foot (3.6 m) maximum depth due to size restrictions. The growing popularity of the skimmer net is evident by its introduction into North Carolina and inquiries from other southeastern Atlantic and Gulf coast states.

Heinsohn, George E. (1972). "A Study of Dugongs (Dugong) in Northern Queensland, Australia." Biological Conservation, 4(3):205-213.

The Dugong population in the vicinity of Townsville, Queensland, has been severely decimated as a result of a government sponsored shark netting program begun in 1964. Only 7 out of a total of 158 Dugongs netted from 1964 to 1971 survived drowning and were released. Eight-two Dugongs were caught during the first year (1964-65), after which the yearly catch has fluctuated between 16 and 6. Females constituted 48 (69.6 percent) of 69 sexed Dugongs

caught. Births appear to be seasonal, occurring mainly in August and September. A growth curve has been constructed, making it possible to estimate ages on the basis of body length. Young accompany their mothers for more than a year after birth. Sexual maturity is attained at about 2 years of age by both sexes. Mature Dugongs have a total body length of 2.4 meters or longer. The majority of Dugongs caught after the first 14 months of shark netting were young animals estimated to be from 1 to 3 years old. There were no size and sex data available for the first 14 months of netting. Dugongs prefer extensive protected shallow water areas where they feed selectively on four genera of sea grasses occurring near Townsville. Aspects of Dugong conservation and the need for extensive ecological work discussed.

Helfand, Gloria E. and Brett W. House (1995). Regulating Nonpoint Source Pollution Under Heterogeneous Conditions. American Journal of Agricultural Economics, 77(4):1024-1032.

Because of difficulties in measuring effluent from nonpoint pollution, proposals for regulating agricultural runoff often suggest instruments applied to inputs or management practices. When pollution functions vary across sources, uniform input instruments cannot achieve a least cost pollution reduction, but efficient instruments may be difficult to administer. In this paper we analyze lettuce production on two soils in California's Salinas Valley to consider empirical costs associated with uniform input taxes and regulations. The results suggest that uniform instruments may not be costly relative to an efficient baseline. Though taxes are more efficient, farmers have higher profits with regulations.

Helgath, Sheila and Richard Rainery (1987). "Fishery Management Alternatives." Research Request Number 87-003188, The Alaska Board of Fisheries, Senate Advisory Council, Alaska State Legislature, October, 106 pp.

This report considers some of the pertinent issues central to fisheries management in Alaska in terms of the effectiveness of the Board of Fisheries as presently organized given the collapse of the December, 1986 meeting and the renewed call for a reappraisal of the board structure and process.

Hellerstein, Daniel (1995). Welfare Estimation Using Aggregate and Individual-Observation Models: A Comparison Using Monte Carlo Techniques. American Journal of Agricultural Economics, 77(3):620-630.

Due to the weak behavioral foundations of aggregate demand models, zonal travel cost models have been largely abandoned in favor of models based on individual observations. However, sample selection difficulties in individual observation models often require the use of distribution sensitive limited dependent variables estimators. In this paper I use Monte Carlo simulations to investigate whether the bias from aggregation is worse than possible bias from these narrowly specified estimators. Somewhat surprisingly, the results indicate that zonal models often outperform the individual observation models, especially when using an aggregate model that incorporates intra zonal variance of the explanatory variables.

Hellsten, Martin (1988). "Socially Optimal Forestry." Journal of Environmental Economics and Management, 15:387-394.

The Faustmann rule is the major contribution of economic theory to the analysis of forestry management. It is typical to consider the Faustmann rule in the context of a model of a forestry firm in which there is some periodicity in the rate of harvesting over time. This paper on the other hand

shows the Faustmann rule to be associated with socially optimal sustained yield or steady state regimes. In the course of so doing, attention is placed on the role of the shadow price of a tree in the determination of an optimal harvesting policy.

Helvey, Mark, Stephen J. Crooke, and Peter A. Milone (1987). "Marine Recreational Fishing and Associated State-Federal Research in California, Hawaii, and the Pacific Island Territories." Marine Fisheries Review, 49(2):8-14.

This paper provides an overview of marine recreational fishing within the NMFS southwest region and briefly outlines a few of the ongoing and future state-federal research and assistance programs addressing recreational fishing.

Henderson, J.V. and M. Tugwell (1979). "Exploitation of the Lobster Fishery: Some Empirical Results." Journal of Environmental Economics and Management, 6:287-296.

This paper analyzes the optimal and free market utilization of the lobster fishery and applies the results to two fishing areas in Canada. Biomass relationships and a production function are estimated and the empirical results are used to calculate hypothetical optimal fishing solutions. The welfare losses from overutilization of the fishing areas are examined.

Hendrickson, Holly M. and Wade L. Griffin (1993). "An Analysis of Management Policies for Reducing Shrimp Bycatch in the Gulf of Mexico." North American Journal of Fisheries Management, forthcoming.

Every year the Gulf of Mexico shrimp fleet catches and discards millions of pounds of finfish. Dwindling populations of some commercially and recreationally valuable fish species have raised concerns over the effects of shrimp bycatch on fish stocks. The General Bioeconomic Fisheries Simulation model was used to estimate the changes in economic rent and bycatch of red snapper Lutjanus campechanus, king mackerel Scomberomorus cavalla, and Atlantic croaker Micropogonias undulatus, that would result under two fishery management policies: Bycatch Reduction Devices (BRDs) and season/area closures. The BRDs were found to be more effective than closures at reducing bycatch and also less costly to fishermen. Under the BRD scenarios, reductions in discards ranged from 20.2 to 42.5% for red snapper, king mackerel discards fell approximately 89%, and Atlantic croaker discards fell about 45%. Under closure policies, the change in discards ranged from a 2.1 to 15% decline for red snapper, a 1.9% increase to a 39.3% decrease for king mackerel, and a 0.1 to 12.9% decline for Atlantic croaker. The BRD policies produced present value 10 year rent streams (1985 US\$) ranging from -\$16.434 to -\$27.007 million, and closure policies generated 10 year rent streams ranging from -\$35.181 to -\$54.563 million.

Hendrickson, Holly M. and Wade L. Griffin (1993). "An Analysis of Management Policies for Reducing Shrimp Bycatch in the Gulf of Mexico." North American Journal of Fisheries Management, 13:686-697.

Every year the Gulf of Mexico shrimp fleet catches and discards millions of pounds of finfish. Dwindling populations of some commercially and recreationally valuable fish species have raised concerns over the effects of shrimp bycatch on fish stocks. The general bioeconomic fisheries simulation

model was used to estimate the changes in economic rent and bycatch of red snapper Lutjanus campechanus, king mackerel Scomberomorus cavalla, and Atlantic croaker Micropogonias undulatus, that would result under two fishery management policies: Bycatch Reduction Devices (BRDs) and season/area closures. The BRDs were found to be more effective than closures at reducing bycatch and also less costly to fishermen. Under the BRD scenarios, reductions in discards ranged from 20.2 to 42.5% for red snapper, king mackerel discards fell approximately 89%, and Atlantic croaker discards fell about 45%. Under closure policies, the change in discards ranged from a 2.1 to 15% decline for red snapper, a 1.9% increase to a 39.3% decrease for king mackerel, and a 0.1 to 12.9% decline for Atlantic croaker. The BRD policies produced present value 10 year rent streams (1985 US\$) ranging from -\$16.434 to -\$27.007 million, and closure policies generated 10 year rent streams ranging from -\$35.182 to -\$54.561 million.

Hendrix, Sherman S. (1994). "Marine Flora and Fauna of the Eastern United States, Platyhelminthes: Monogenea." NOAA Technical Report NMFS 121, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, Washington, August, 107 pp.

This manual includes an introduction to the general biology of the platyhelminth class Monogenea, an illustrated key to the generic level, an annotated systematic list of 108 species in 75 genera and 28 families, a glossary of terms, a host-parasite list, a selected bibliography, and a systematic index. The species listed have been reported on fishes taken in the coastal waters of the northwestern Atlantic Ocean from the U.S.-Canada border to Beaufort, North Carolina. Many of the species, however, have wider geographic distributions that are not reported herein unless adjacent to the geographic area above. In addition, a single species of Neodermata, Udonella caliqorum, that is found attached to copepods on fish gills is also listed.

Hennessy, David A. (1995). Microeconomics of Agricultural Grading: Impacts on the Marketing Channel.: American Journal of Agricultural Economics, 77(4):980-989.

In this paper, I focus on how grade prices affect the provision of product transformation skills in the food marketing system. A self-protection model is used to show how resources are allocated to protect the potential value of commodities in the marketing channel. Resource allocations may be complementary, and complementarity may be exploited to expand an industry. Further, uncertainty concerning skill levels may inhibit expansion. Because two primary objectives of agricultural extension involve facilitating skill acquisition and disseminating market information, the model confirms roles for extension personnel. The optimal location of transformation skills in a sequence of operations is also studied.

Henwood, Tyrrell A. (1987). "Age, Growth, Survival and Mortality in Loggerhead Turtles, Caretta, Estimated from Tag-Recapture Experiments." Draft report, NMFS, SEFC, Pascagoula Laboratory, Pascagoula, MS.

Recaptures of previously measured and tagged loggerhead turtles from coastal waters of Florida, Georgia, and South Carolina were analyzed to determine growth rates in the wild. Fitting the von Bertalanffy and logistic growth models to loggerhead data, age estimates are computed and survival and mortality estimates are derived. In Adult turtles mean survival rate was 0.92 and mean mortality rate was 0.08.



Henwood, Tyrrell A. and Jonathan D. Moulding (19??). "Some Morphometric Relationships in the Western Atlantic Loggerhead Turtle, Caretta." Draft Report, NMFS.

The relationship of total tail length to total straight-line carapace length was found to be an accurate indicator of sex in mature male turtles, and is assumed to be a good indicator of sex in adult female turtles as well. In subadult turtles, the tail measurement does not appear to be a usable indicator of sex.

Henwood, Tyrrell A. and Larry H. Ogren (1987). "Distribution and Migrations of Immature Kemp's Ridley Turtles (Lepidochelys kemp) and Green turtles (chelon mydas) Off Florida, Georgia, and South Carolina." Northeast Gulf Science, 9(2):153-159.

This paper presents results of sea turtle research at Cape Canaveral, FL from 1978-1984. Captures of Kemp's ridley and green turtles were analyzed to determine seasonal occurrence, size composition, and movement patterns. For Kemp's ridley, additional capture records from Georgia and South Carolina were included in the analyses for comparative purposes.

Henwood, Tyrrell A. and Warren E. Stuntz (1987). "Analysis of Sea Turtle Captures and Mortalities During Commercial Shrimp Trawling." Fishery Bulletin, Notes, 85(4):813-816.

This report provides a preliminary analysis of existing data collected by fisheries observers during commercial U.S. shrimp trawling. Estimated turtle CPUE and mortalities for loggerhead, Kemp's ridley, and green turtles are provided.

Henwood, Tyrrell A., Warren E. Stuntz, and Nancy Thompson (1991). "Evaluation of U.S. Turtle Protective Measures Under Existing TED Regulations, Including Estimates of Shrimp Trawler Related Mortality in the Greater Caribbean." Draft Report, USDOC, NMFS, SERO, 9450 Koger Blvd., St. Petersburg, FL 33702, 20 pp.

Sea turtle catch and mortality by U.S. shrimp trawlers under current sea turtle conservation regulations and import restrictions were evaluated. This required a rather complex analysis of shrimping effort, turtle catch rates, turtle mortality rates, effectiveness of TEDs and tow time restrictions, and compliance with existing regulations. Results of these analyses were used in determining (1) whether changes in existing regulations to provide additional protection to endangered and threatened sea turtles were warranted and (2) the rates with which foreign, shrimp importing nations would have to comply under P.L. 101-162.

Henwood, Tyrrell A., Warren E. Stuntz, and Nancy Thompson (1992). "Evaluation of U.S. Turtle Protective Measures Under Existing TED Regulations, Including Estimates of Shrimp Trawler Related Mortality in the Wider Caribbean." NOAA Technical Memorandum NMFS-SEFSC-303, USDOC, NMFS, SEFC, 75 Virginia Beach Drive, Miami, Florida 33149, March, 15 pp.

Sea turtle catch and mortality by U.S. shrimp trawlers under current sea turtle conservation regulations were evaluated. This required a rather complex analysis of shrimping effort, turtle catch rates, turtle mortality rates, effectiveness of TEDs and tow time restrictions, and compliance with existing regulations. Results of these analyses were used in determining whether changes in existing regulations to provide additional protection to

endangered and threatened sea turtles were warranted.

Herfindahl, Orris C. (1955). "Some Fundamentals of Mineral Economics." Land Economics, 31:131-138.

The paper provides a simple account of some processes involved in the economics of exhausting assets, especially on account of exploration. The resulting analytic framework should be helpful in evaluating recent suggestions on materials policy and also in thinking about currently pressing problems flowing from widely advertised "shortages" of certain minerals.

Herfindahl, Orris C. and Allen V. Kneese (1974). Economic Theory of Natural Resources, Resources for the Future, Inc., Charles E. Merrill Publishing Company, Columbus, Ohio.

The main goal is to provide theoretical constructs in a somewhat narrow sense that are useful in analyzing problems in the management of natural resources. Empirical material on particular natural resources are included only to show how theory can be used.

Herfindahl, Orris C. and Allen V. Kneese (1974). "Dynamics-Capital Theory." Chapter 3 in Orris C. Herfindahl and Allen V. Kneese, Economic Theory of Natural Resources, Resources for the Future, Inc., Charles E. Merrill Publishing Company, Columbus, Ohio.

Capital theory develops a coherent view of the forces that determine saving and investment and their rates of return from one period to the next. If this task is fulfilled not only for the next period but for many periods into the future, the theory will also have explained the forces determining the size of the capital stock at any time and any equilibria or quasi-equilibria to which the system is moving. A stationary state without capital accumulation is one of the possibilities.

Herrick, Samuel F., Jr. (1984). "U.S. Tuna Trade Summary, 1982." Marine Fisheries Review, 46(1):1-6.

Information pertaining to the production of raw and processed tuna by the U.S. tuna industry during 1983 and the consumption of tuna products by U.S. consumers is reviewed in detail. In the last section, the economic impact of reduced tuna harvesting and processing activity during 1982 is analyzed for the California based segment of the U.S. tuna industry.

Herrick, Samuel F., Jr. and Steven J. Koplín (1984). "1983 U.S. Tuna Trade Summary." Administrative Report SWR-84-1, National Marine Fisheries Service, Southwest Region, 300 S. Ferry Street, Terminal Island, CA, June, 20 pp., 12 tables.

Information pertaining to the production of raw and processed tuna by the U.S. tuna industry during 1983 and the consumption of tuna products by U.S. consumers is reviewed in detail. A number of issues and events are discussed that affected the industry's performance during 1983.

Herrick, Samuel F., Jr. and Steven J. Koplín (1984). "U.S. Tuna Trade Summary, 1983." Marine Fisheries Review, 46(4):65-72.

The 1983 production of white and light meat tuna by the U.S. tuna industry and consumption of tuna products by U.S. consumers is reviewed in detail. Some of the issues and events that affected the industry's performance in 1984 are analyzed in the final section of the paper.

Herrick, Samuel F., Jr. and Steven J. Koplín (1985). "U.S. Tuna Trade Summary, 1984." Administrative Report SWR-85-6, National Marine Fisheries Service, Southwest Region, 300 S. Ferry Street, Terminal Island, CA, June, 24 pp.

The 1984 production of white and light meat tuna by the U.S. tuna industry and consumption of tuna products by U.S. consumers is reviewed in detail. Some of the issues and events that affected the industry's performance in 1984 are analyzed in the final section of the paper.

Herrick, Samuel F., Jr. and Steven J. Koplín (1986). "U.S. Tuna Trade Summary, 1984." Marine Fisheries Review, 48(3):28-37.

The 1984 production of white and light meat tuna by the U.S. tuna industry and consumption of tuna products by U.S. consumers is reviewed in detail. Some of the issues and events that affected the industry's performance in 1984 are analyzed in the final section of the paper.

Herrick, Samuel F., Jr. and Steven J. Koplín (1987). "U.S. Tuna Trade Summary, 1985." Marine Fisheries Review, 49(3):73-84.

The white and light meat tuna produced by the U.S. tuna industry and consumption of tuna products by U.S. consumers is reviewed for 1985. In addition, the economic performance of the U.S. tropical tuna purse seine fleet is analyzed over the period 1979-83.

Herrick, Samuel, Jr., Jeffery G. Lee, and Dale Squires (1992). Documentation for the West Coast Fishing Fleet Cost-Earnings Data Base. Administrative Report LF-92-23, National Marine Fisheries Service, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA, June.

The west coast fishing fleet cost-earnings data base (CEDB) was created to consolidate fishing vessel cost and earnings data into an informational and analytical data base that would support economic research and provide economic information on selected U.S., west coast fisheries.

Herrick, Samuel F., Jr., Byron Rader, and Dale Squires (1997). Access Fees and Economic Benefits in the Western Pacific United States Purse Seine Tuna Fishery. Marine Policy, 21(1):83-96.

Ideally, fees paid by distant water fishing nations for access to tuna resources in exclusive economic zones would approximate the net economic value of the tuna harvested, while leaving fishing operations profitable. This paper develops a linear programming approach to assess short run profitability, optimum access fees, and net economic benefits for U.S. tropical tuna purse seiners operating under the South Pacific Tuna Treaty. Results suggest that there is potential for sizable short run profits and net economic benefits after payment of an access fee equal to the imputed marginal value of the tuna harvested.

Herrick, Samuel, Jr., Ivar Strand, Dale Squires, Morton Miller, Douglas Lipton, John Walden, Stephen Freese (1994). Application of Benefit-Cost Analysis to Fisheries Allocation Decisions: The Case of Alaska Walleye Pollock and Pacific Cod. North American Journal of Fisheries Management, 14:726-741.

The controversy surrounding a proposal to allocate walleye pollock *Theragra chalcogramma* and Pacific cod *Gadus macrocephalus* harvested in U.S. fisheries off Alaska is reviewed. The walleye pollock allocation, which

generated the most concern, would apportion specific shares of the allowable catch to each of the two harvesting sectors, inshore and offshore, along with a set-aside for Alaska community development. The potential transfer is of enormous economic value for industry participants and underscores the importance of identifying the net economic gains or losses to the nation that might arise under the proposed allocation scheme. For these reasons, a benefit-cost analysis was pivotal in the allocation decisions reached by the U.S. Department of Commerce. The benefit-cost analysis of the allocation proposal served to focus attention on the need for consistent social welfare accounting, of the kind that benefit-cost analysis provides, when management actions are evaluated. Conceptual and practical problems associated with the analysis are discussed as well as their solutions, and fundamental concerns that may be peculiar to benefit-cost analysis in fisheries are specifically noted.

Herrmann, Mark (1993). "Using an International Econometric Model to Forecast Alaska Salmon Revenues." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

A revenue analysis was performed as part of a comprehensive review of the Alaska salmon enhancement program to examine the effects of various salmon enhancement production levels on future revenue generated to salmon fishers working in Alaska waters. The results were then used in a cost benefit analysis of the state's enhancement program for sockeye, chinook, coho, chum, and pink salmon. Results of the revenue analysis indicate that for all species, except pink salmon, future revenues would increase if output from salmon enhancement were expanded. For pink salmon, revenues would decrease if salmon enhancement were expanded and increase if salmon enhancement were scaled back. However, a complete elimination of the pink hatchery program would decrease revenues. For all species, there are important regional differences.

Herrmann, Mark (1993). "Using an International Econometric Model to Forecast Alaska Salmon Revenues." Marine Resource Economics, 8(3): 249-271.

As Alaska prices tumbled in the 1990's, Alaska's Senate Special Committee on Domestic and International Commercial Fisheries requested a comprehensive review of the Alaska salmon enhancement program. As a part of this review, a revenue analysis was performed to examine the effects of various salmon enhancement production levels on future revenue generated to salmon fishers working in Alaska waters. The results were then used in a cost/benefit analysis of the state's enhancement program for sockeye, chinook, coho, chum, and pink salmon. This report focuses on the two most important Alaska salmon species, sockeye and pink. Results of the revenue analysis indicate that for sockeye salmon, future revenues would increase if output from salmon enhancement were expanded. For pink salmon, revenues would decrease if salmon enhancement were expanded and increase if salmon enhancement were scaled back. However, a complete elimination of the pink hatchery program would decrease revenues. For both species, there are important regional differences.

Herrmann, Mark and Joshua A. Greenberg (1994). "A Revenue Analysis of the Alaska Pink Salmon Fishery." North American Journal of Fisheries Management, 14: 537-549.

The Alaska salmon industry is suffering from declining prices due to an increasing supply of Salmon worldwide. This has led to a much needed economic evaluation of the Alaska salmon enhancement program and especially of the

hatchery system for pink salmon *Oncorhynchus gorbuscha*. An econometric model of world salmon markets was used to evaluate possible future pink salmon enhancement production scenarios, as requested by the Alaska State Legislature and the Alaska Department of Fish and Game. Results of this model, based on point estimates, indicate that if pink salmon production for enhancement were decreased, revenues to pink salmon fishers in Alaska would rise, although there would be regional differences. However, a complete elimination of the Alaska salmon enhancement program would decrease revenues.

Hewett, Steven W. and Barry L. Johnson (1989). A General Bioenergetics Model for Fishes. American Fisheries Society Symposium, 6:206-208.

Bioenergetics models allow fish growth or food consumption to be estimated from a combination of laboratory and field data. Models for many different species of fish have been developed, with slight variations in approach. Our current microcomputer model merges and simplifies many of the models that have been developed, with the hope that fisheries researchers and managers can apply these models to questions relating to fish growth and consumption under any given environmental or biotic conditions. Model documentation includes energetics parameters for a wide variety of species that have been modeled in the past. Other applications-specific inputs include seasonal temperature regimes, seasonal or ontogenetic changes in energy density, diet composition, and end points of growth over some time interval. Adjustments in biomass, due to biotic or abiotic factors, occur more quickly through growth than through population density. The growth of an individual is an integrator of food consumption over time. This model uses the observed growth over some interval of time to calculate an estimate of the prey biomass consumed over that interval under the given environmental conditions, and thus it is a powerful tool for estimating predator impact on prey populations. It can also be used to predict the effect of an environmental change on growth, or to predict the growth of fish introduced to new conditions.

Hicks, J.R. (1939). "The Foundations of Welfare Economics." The Economic Journal, Dec.:696-712.

The basics of the new welfare economics are set out in this paper.

Hicks, J.R. (1942). "Consumers' Surplus and Index-Numbers." The Review of Economic Studies, 9/10(9):126-137.

What happens to consumer surplus when several prices vary?

Hicks, J.R. (1943). "The Four Consumer's Surpluses." The Review of Economic Studies, :31-41.

A proof of the correct measure of consumer surplus and the Marshallian measure is presented that greatly simplifies the results of the earlier series of articles.

Hicks, Robert L. (1994). "Indirect Environmental Effects of U.S. Marine Mammal and Trade Policies." Chapter 5 in Commercial Fisheries Harvesting, Conservation and Pollution: Preferences and Conflicts, NMFS Contract NA-26FD-0135-01, National Saltonstall-Kennedy Program, Department of Agricultural and Resource Economics, University of Maryland, College Park, Maryland.

The implications for trade liberalization by Japan for beef products of seafood demand and environmental impacts are considered by discussing

important components of Japanese meat demand, development and estimation of a demand model, and using the price elasticity estimates simulate several policy scenarios.

Hicks, Robert L. (1994). "Production and Marine Mammals." Chapter 4 in Commercial Fisheries Harvesting, Conservation and Pollution: Preferences and Conflicts, NMFS Contract NA-26FD-0135-01, National Saltonstall-Kennedy Program, Department of Agricultural and Resource Economics, University of Maryland, College Park, Maryland.

The impact of regulations to prevent marine mammal mortality in association with commercial fishing activities on producers is addressed. Specifically, the welfare affects of a regulation in the eastern tropical Pacific tuna fishery that is designed to reduce dolphin bycatch is assumed to cause firms to make either spacial or technical substitution is investigated.

Hicks, R.L. (1995). "The Cost of Marine Mammal Protection: A Spatial Model of Dolphin Avoidance by Tuna Fishermen in the Eastern Tropical Pacific." Ph.D. Thesis Prospectus, Department of Agricultural and Resource Economics, University of Maryland, College Park, Maryland, March 24, 27 pp.

A proposal to analyze the cost of U.S. marine mammal policies to fishermen by studying the trade-offs resulting from dolphin protection. In the process, a discrete choice model of tuna fishing incorporating uncertainty, dynamic aspects of decision making, and cost estimates of dolphin avoidance will be presented. The model and applied work will add to the marine resource economic literature by introducing geographical modeling and econometric analysis which are more sophisticated than currently practiced.

Hicks, Rob, Scott Steinback, Amy Gautam, and Eric Thunberg (1998). The Economic Value of New England and Mid-Atlantic Sportfishing in 1994. Volume 2, Draft report, National Marine Fisheries Service, Office of Science and Technology, Fishery Statistics and Economics Division, 1315 East-West Highway, Silver Spring, MD, September.

The main goals of the survey of anglers in 1994 in the Northeastern United States were to (1) collect demographic and economic data on marine recreational fishing participants, and (2) estimate statistical demand models for recreational fisheries that were under management in 1994 or were expected to be managed in the near future. This volume presents the results of the estimation of the demand models, and reports the estimated value of recreational fishing in the Northeast.

Hiett, Robert L., Kathryn A. Chandler, Audrey K. Reniere, and A. Richard Bolstein (1983). "Socioeconomic Aspects of Marine Recreational Fishing." Final report, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Contract No. 80-ABC-00152. Prepared by KCA Research, Inc., 5501 Cherokee Avenue, Suite 111, Alexandria, Virginia, May, 101 pp.

The results from the telephone survey of 2,400 households and 7,000 personal interviews to collect information about marine recreational fishermen, information about marine fishing trips in general, trip expenditure information, catch and disposition of catch information, and information about angler satisfaction.

Highly Migratory Species Management Division (1993). "Swordfish Fact

Sheet." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

List of regulations that affect the swordfish fishery of the United States.

Highly Migratory Species Management Division (199?). "A Guide to the Tunas of the Western Atlantic Ocean. Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

The National Marine Fisheries Service has develop this pamphlet to assist commercial, charter/headboat, and recreational users and dealers/buyers in identifying the seven regulated Atlantic tuna species as well as one unregulated Atlantic tuna species.

Highly Migratory Species Management Division (1993). "Framework Seasonal Adjustment of Management Measures under the Fishery Management Plan for Atlantic Sharks, Includes Environmental Assessment and Regulatory Impact Review." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD.

Regulations that impose trip limits on the large coastal sharks for commercial fishing vessels are evaluated and enacted.

Highly Migratory Species Management Division (1994). "Draft Environmental Impact Statement for a Regulatory Amendment for the Western Atlantic Bluefin Tuna Fishery." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

The National Marine Fisheries Service proposes to implement a regulatory amendment for the 1995 Atlantic bluefin tuna fishery consistent with recommendations from the 1993 and 1994 meetings of the International Commission for the Conservation of Atlantic Tunas (ICCAT). Five national quota alternatives are examined, in combination with four domestic quota allocation alternatives, as well as three access control alternatives. There are clear tradeoffs between the commercial and recreational fishery in establishing domestic quota allocations. Overall, long term economic gains, whether from commercial net revenues or angler consumer surplus or a combination of the two, can only occur under short term economic losses. Access control alternatives address overcapitalization in the fishery and vary widely in operation and effects on the fishery, such as equitability, acceptability, management costs, employment, and overall economic efficiency.

Highly Migratory Species Management Division (1995). "Amendment 1 to the Fishery Management Plan for Atlantic Swordfish Including an Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, September, 3 pp.

An outline for developing a permit moratorium amendment to the swordfish fishery management plan.

Highly Migratory Species Management Division (1995). "Amendment 1 to the Fishery Management Plan for Atlantic Shark Including an

Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, December, 134 pp.

An outline for developing a permit moratorium amendment to the swordfish fishery management plan.

Highly Migratory Species Management Division (1995). "Amendment 1 to the Fishery Management Plan for Atlantic Shark Including an Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, May, 135 pp.

A permit moratorium for the shark fishery is developed in this fishery management plan amendment.

Highly Migratory Species Management Division (1995). "Atlantic Sharks Fishery Management. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

Summary of the fishery management plan, plan development, objectives, measures, list of actions, and list of major actions. A description of the fishery from Our Living Oceans (1993) is also attached.

Highly Migratory Species Management Division (1995). "Draft Environmental Assessment and Draft Regulatory Impact Review on a Proposed Rule to Establish 1995 Catch Limits for the Atlantic Swordfish Fishery. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, June, 32 pp.

This document has been prepared to provide background on the fishery and to assess the likely economic effects of the proposed rule which is to impose the 1995 U.S. quota recommendation approved by ICCAT.

Highly Migratory Species Management Division (1995). "Final Environmental Assessment for a Regulatory Amendment for the Western Atlantic Bluefin Tuna Fishery. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, July, 142 pp.

The National Marine Fisheries Service proposes to implement a regulatory amendment for the 1995 Atlantic bluefin tuna fishery consistent with recommendations from the 1994 meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT). Four national quota alternatives are examined in combination with five domestic quota allocation alternatives and three access control alternatives; lottery, limited entry with fleet wide quota, and individual transferable quotas.

Highly Migratory Species Management Division (1995). "Final Environmental Assessment and Regulatory Impact Review on a Final Rule to Establish 1995 Catch Limits for the Atlantic Swordfish Fishery. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, June, 32 pp.



This document has been prepared to provide background on the fishery and to assess the likely economic effects of the proposed rule which is to impose the 1995 U.S. quota recommendation approved by ICCAT.

Highly Migratory Species Management Division (1995). "Framework Seasonal Adjustment of Management Measures Under the Fishery Management Plan for Atlantic Sharks, Final Environmental Assessment and Regulatory Impact Review. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, April, 17 pp.

The proposed action would revise commercial quotas on large coastal sharks. There would be no change in the pelagic quota and there would be no quota imposed on small coastal sharks. This action represents a long term measure to address stock problems associated with the shark fishery.

Highly Migratory Species Management Division (1995). "Initial Regulatory Flexibility Act and Draft Regulatory Impact Review for Regulatory Adjustments for the 1995 Western Atlantic Tuna Fishery. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD, April, 65 pp.

Proposed regulations for the Atlantic bluefin tuna fishery are evaluated in this RIR. Restrictions on days fished, allocations of TAC between commercial and recreational fishermen, monthly quotas, permit moratorium, minimum size limits, and dealer permits are the major actions addressed.

Highly Migratory Species Management Division (1995). "Issues/Options. Options paper, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, June 8, 2 pp.

The significant issues and options to be considered at the shark operations team meeting.

Highly Migratory Species Management Division (1995). "Options for Establishing an Interim Permit Moratorium and Eligibility Criteria for the Atlantic Swordfish Fishery." Discussion Paper, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

The National Marine Fisheries Service is considering a temporary moratorium on issuance of permits for the Atlantic swordfish fishery. This paper discusses possible options for controlling access to the Atlantic swordfish fishery via a permit moratorium. The options discussed are not all inclusive; suggestions for alternative approaches are also encouraged.

Highly Migratory Species Management Division (1995). "Options for Establishing an Interim Permit Moratorium and Eligibility Criteria for the Atlantic Shark Fishery." Options Paper, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD., July.

The National Marine Fisheries Service is considering a temporary moratorium on issuance of permits for the Atlantic shark fishery. This paper discusses possible options for controlling access to the Atlantic shark fishery via a permit moratorium. The options discussed are not all inclusive; suggestions for alternative approaches are also encouraged.

Highly Migratory Species Management Division (1995). "Property Rights-Based Management in the ABT Fishery." Draft Report, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

A discussion of a harvest rights (HR) fishery management plan for Atlantic bluefin tuna similar in structure to an individual transferable quota system.

Highly Migratory Species Management Division (1995). "Regulatory Impact Review and Regulatory Flexibility Analysis for the Final Rule for the 1995 Atlantic Tuna Fishery." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD, July, 64 pp.

RIR and RFA for final regulations concerning quota allocations by category, measures to extend the fishing season, changes in permitting, reporting requirements, and quotas for bluefin tuna fishermen.

Highly Migratory Species Management Division (1995). "Supplemental Draft Environmental Impact Statement for a Regulatory Amendment for the Western Atlantic Bluefin Tuna Fishery." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD.

The National Marine Fisheries Service proposes to implement a regulatory amendment for the 1995 Atlantic bluefin tuna fishery consistent with recommendations from the 1994 meetings of the International Commission for the Conservation of Atlantic Tunas (ICCAT). Four national quota alternatives are examined, in combination with five domestic quota allocation alternatives, and three access control alternatives. There are clear tradeoffs between short term economic benefits (net commercial revenues and angler consumer surplus) and long term biological benefits (increases in stock size). The preferred alternative for 1995 consists of a preferred quota alternative (2200 mt) and a preferred domestic allocation alternative (status quo). A brief discussion of three access control alternatives is provided.

Highly Migratory Species Management Division (1995). "Towards Rationalization of HMS Fisheries." A Draft Concept Paper, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

Discusses the benefits and costs conceptually of a permit moratorium for highly migratory species; tuna, swordfish, and shark. Comments on draft are also included.

Highly Migratory Species Management Division (1995). "Towards Rationalization of Fisheries for Atlantic Highly Migratory Species." A Concept Paper, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

This paper lays out the general options for defining a permit moratorium as an interim management strategy to freeze fishing capacity near current levels while working with the fishing industry and the public to develop a more flexible, comprehensive, long term management solution. Supplemental options papers for the U.S. Atlantic swordfish and shark fisheries have also been prepared. Options for long term management solutions will be outlined in a second forthcoming concept paper.

Highly Migratory Species Management Division (1996). "Amendment 1 to the Fishery Management Plan for Atlantic Sharks Including an Environmental Assessment and Regulatory Impact Review. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, May.

A permit moratorium amendment to the shark fishery management plan.

Highly Migratory Species Management Division (1996). "Amendment 1 to the Fishery Management Plan for Atlantic Sharks Including an Environmental Assessment and Regulatory Impact Review. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, July, 77 pp.

A permit moratorium amendment to the shark fishery management plan.

Highly Migratory Species Management Division (1996). "Amendment 1 to the Fishery Management Plan for Atlantic Sharks Including an Environmental Assessment and Regulatory Impact Review. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, September, 77 pp.

A permit moratorium amendment to the shark fishery management plan.

Highly Migratory Species Management Division (1996). "Amendment 1 to the Fishery Management Plan for Atlantic Swordfish Including an Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, June, 101 pp.

A permit moratorium amendment to the swordfish fishery management plan.

Highly Migratory Species Management Division (1996). "Amendment 1 to the Fishery Management Plan for Atlantic Swordfish Including an Environmental Assessment and Regulatory Impact Review. Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, July, 109 pp.

A permit moratorium amendment to the swordfish fishery management plan.

Highly Migratory Species Management Division (1996). "Atlantic Swordfish Fishery; Quotas, Minimum Size, and Technical Changes." Proposed Rules, Federal Register, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

NMFS proposes to amend the regulations governing the Atlantic swordfish fishery to: Reduce the total allowable catch (TAC) to 2,625 metric tons (mt) dressed weight (dw) via a split season (June 1 - May 31), decrease the minimum size to 73 cm (29 inches) cleithrum to caudal keel measure and eliminate the trip allowance for undersized fish, and make technical changes to ensure consistency of regulations. The intent of this action is to protect the swordfish resource while allowing harvests of swordfish consistent with recommendations of the International Commission for the Conservation of Atlantic Tunas (ICCAT).

Highly Migratory Species Management Division (1996). "Fisheries Service

Proposes Improvements to Bluefin Tuna Angling Category Management." 96-R161, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

The National Marine Fisheries Service today announced immediate further improvements to management of the Atlantic bluefin tuna recreational fishery, known as the Angling category.

Highly Migratory Species Management Division (1996). "Framework Seasonal Adjustment of Management Measures under the Fishery Management Plan for Atlantic Sharks, Final Environmental Assessment and Regulatory Impact Review." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD, March, 19 pp.

The proposed action would revise commercial quotas on large coastal sharks. There would be no change in the pelagic quota and there would be no quota imposed on small coastal sharks. This action represents a long term measure to address stock problems associated with the shark fishery.

Highly Migratory Species Management Division (1996). "Framework Seasonal Adjustment of Management Measures under the Fishery Management Plan for Atlantic Sharks, Final Environmental Assessment and Regulatory Impact Review." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD, August, 23 pp.

The proposed action would revise commercial quotas on large coastal sharks. There would be no change in the pelagic quota and there would be no quota imposed on small coastal sharks. This action represents a long term measure to address stock problems associated with the shark fishery.

Highly Migratory Species Management Division (1996). "Framework Seasonal Adjustment of Management Measures under the Fishery Management Plan for Atlantic Sharks, Draft Environmental Assessment and Regulatory Impact Review." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD, November, 35 pp.

The proposed action is intended as a one year measure to implement the recommendation of the Shark Evaluation Workshop (SEW) for an immediate 50% reduction in effective fishing mortality. The proposed action is intended as a one year measure because the National Marine Fisheries Service (NMFS) believes that a long term rebuilding schedule is needed to address the overfished status of large coastal sharks. The proposed action would ensure that allowable catch levels of Atlantic sharks are consistent with the best available scientific information while NMFS develops a long term rebuilding schedule for large coastal sharks.

Highly Migratory Species Management Division (1996). "National Marine Fisheries Service 1996 Atlantic Tunas Program." GPO:1996-170-603 QL 3, Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

Summary of fishery information and regulations for Atlantic tuna fisheries.

Highly Migratory Species Management Division (1996). "NMFS Proposes Consolidation of HMS Regulations." , Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

A listing of the substantive changes to the rules and regulations applying to the highly migratory species management group caused by the consolidation of regulations required under the President s Regulatory Reinvention Initiative.

Highly Migratory Species Management Division (1996). "Historic Rationale, Effectiveness, and Biological Efficiency of Existing Regulations for the U.S. Atlantic Bluefin Tuna Fisheries." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, September, 85 pp.

This report response to a Congressional directive to describe the biological rationale for each regional and category allocation, including directed and incidental categories, in light of the average size, age, and maturity of bluefin tuna caught in each fishery and the effect of this harvest on stock rebuilding and sustainable yield. The report examines the history and evaluates the level of wasteful discarding, and evaluates the effectiveness of non-quota regulations at constraining harvests within regions. Comments on how the levels of participation in specific fisheries in terms of vessels and trips, enforcement implications, and the importance of monitoring information provided by these allocations affect the precision of the stock assessment estimates are also provided.

Highly Migratory Species Management Division (1997). "1997 Bluefin Tuna Angler Survey." Office of Fisheries Conservation and Management, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, February, 11 pp.

The questionnaire for the 1997 recreational angler survey for bluefin tuna fishermen.

Highly Migratory Species Management Division (1997). "Draft Amendment 1 to the Fishery Management Plan for Atlantic Swordfish Including an Environmental Assessment and Regulatory Impact Review. Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, January, 107 pp.

A permit moratorium amendment to the swordfish fishery management plan.

Highly Migratory Species Management Division (1998). "Atlantic Swordfish Fishery; South Atlantic Quotas; Quota Adjustment Procedures. Federal Register, 63(111):31710-31713, Wednesday, June 10.

Annual quotas for the south Atlantic swordfish fishery are established.

Highly Migratory Species Management Division (1998). "Draft Extended Analysis of the Socio-Economic Effects of the 1997 Regulations on the Atlantic Large Coastal Shark Fishery. Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, March.

Draft analysis of data from existing shark related data bases used to

address the concerns raised in Southern Offshore Fishing Association, et al., vs. William M. Daley. While conclusions have not been written, analysis indicates relatively little is known concerning the economics of the shark fishery. Necessary data on operating costs, switching behavior, production functions have not been analyzed even though data appears to be available.

Highly Migratory Species Management Division (1998). "Draft Consideration of the Economic Effects and Potential Alternatives to the 1997 Quotas on the Atlantic Large Coastal Shark Fishery. Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, April.

This document responds to the judicial order in Southern Offshore Fishing Association, et al., vs. William M. Daley to consider the economic effects and potential alternatives to the 1997 quotas on the Atlantic large coastal shark fishery.

Highly Migratory Species Management Division (1998). "Draft Environmental Assessment and Regulatory Impact Review, Proposed Rule to Establish 1998 Catch Quotas for the South Atlantic Swordfish Fishery. Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, May.

The proposed rule is needed to ensure that the allowable 1998, 1999, 2000 U.S. catch levels of south Atlantic swordfish are consistent with approved ICCAT recommendations based on the best available scientific information.

Highly Migratory Species Management Division (1998). "Draft Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks. Volumes I and II, Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, May.

This document is the fishery management plan (FMP) for Atlantic tunas, swordfish, and sharks, highly migratory species that inhabit the Atlantic Ocean and adjacent waters. It replaces the existing shark and swordfish FMPs and establishes a FMP for tunas.

Highly Migratory Species Management Division (1998). "Final Consideration of the Economic Effects and Potential Alternatives to the 1997 Quotas on the Atlantic Large Coastal Shark Fishery. Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, May, 76 pp.

This document responds to the judicial order in Southern Offshore Fishing Association, et al., vs. William M. Daley to consider the economic effects and potential alternatives to the 1997 quotas on the Atlantic large coastal shark fishery.

Highly Migratory Species Management Division (1998). "Shark Economic Analysis per Judge Merryday. Office of Sustainable Fisheries, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD, March.

Initial data summaries of existing shark related data bases that could be used to address the concerns raised in Southern Offshore Fishing Association, et al., vs. William M. Daley.

Hightower, Joseph E. and William H. Lenarz (1989). Using GENMOD to Develop Harvesting Policies for Multiaged Fish Stocks. American Fisheries Society Symposium, 6:209-210.

Program GENMOD is a microcomputer based simulation program that applies an age structured population model to problems of optimal harvesting policy. It can be used to explore alternative harvesting policies and determine the policy that best satisfies conflicting objectives of fishery management. This public domain program is written for IBM PC and PC compatible systems.

Hilborn, R. (1976). "Optimal Exploitation of Multiple Stocks by a Common Fishery: A New Methodology." J. Fish. Res. Board Can., 33:1-5.

Optimal harvest rates for mixed stocks of fish are calculated using stochastic dynamic programming. This technique is shown to be superior to the best methods currently described in the literature. The Ricker stock recruitment curve is assumed for two stocks harvested by the same fishery. The optimal harvest rates are calculated as a function of the size of each stock, for a series of possible parameter values. The dynamic programming solution is similar to the fixed escapement policy only when the two stocks have similar Ricker parameters or when the two stocks are of equal size. Normally, one should harvest harder than calculated from fixed escapement analysis.

Hilborn, Ray (1985). "Fleet Dynamics and Individual Variation: Why Some People Catch More Fish than Others." Canadian Journal of Fisheries and Aquatic Science 42:2-13.

Most fisheries problems arise from a failure to understand and manage fishermen, and that the study of fishermen should be a major part of fisheries research. The dynamic behavior of fishing fleets can be broken into four components: investment, movement, catching power, and discarding. The literature in each area is reviewed and the needed research described. The second part of this paper examines the causes and consequences of individual variation in catch in a commercial purse seine fishery and a recreational hook and line fishery. It is shown that the catch is highly concentrated in the recreational fishery with a small proportion of frequent anglers catching a large portion of the fish. Catch is more equitable distributed in the purse seine fishery. The consequence of individual variation includes the observation that small annual bag limits in the sport fishery could reduce the total catch significantly while leaving most anglers unaffected and the fact that buy back of the most successful vessels would reduce the commercial catch by relatively little.

Hilborn, Ray and Randall M. Peterman (1995). "The Development of Scientific Advice with Incomplete Information in the Context of the Precautionary Approach." TCPA/BP4, Technical Consultation on the Precautionary Approach to Capture Fisheries (TCPA), FAO Scientific Meeting, Lysekil, Sweden, May, 20 pp.

Scientists and decision makers involved in fisheries management will always be faced with uncertainties and risks, yet decisions have to be made. We discuss seven sources of uncertainties and illustrate how these have affected the success or failure of past decisions in fisheries management. We then describe how scientists should incorporate information on uncertainties into the advice given to decision makers by using the formal techniques of decision analysis and statistical power analysis. Despite the limitations of quantitative techniques, these methods are the best way of informing decision

makers about the implications of uncertainties in fisheries management, regardless of whether decisions are made in a risk-neutral or a risk-adverse, precautionary context. In addition, we discuss the findings of cognitive psychologists on how best to communicate information about uncertainties to managers, user groups and scientists. Finally, in situations where weak data create large uncertainties, institutional mechanisms that internalize feedbacks may create incentives for a longer term viewpoint among harvesters.

Hildebrand, Henry H. (19??). "A Study of the Fauna of the Brown Shrimp (Penaeus aztecus Ives) Grounds in the Western Gulf of Mexico." Institute of Marine Science, The University of Texas, Port Aransas, Texas.

A major undertaking was the collection and compilation of information on the distribution and relative abundance of the animals taken in trawls in the brown shrimp fishery as a base for ecological studies and more generally they add considerably to the general picture of the fauna of the western Gulf.

Hildebrand, Henry H. (1980). "Report on the Incidental Capture, Harassment, and Mortality of Sea Turtles in Texas." Final report, NMFS Contract No. NA80-GG-A-00160, Pascagoula, laboratory, SEFC, NMFS.

This report attempts to evaluate the impacts of all types of fishing gear on the five species of sea turtles by gear, locality, and season.

Hinkle, Robert L. (1999). Order Denying Petitions Challenging Regulations. The Florida Wildlife Federation, et al., v. William M. Daley, et al. Case No. 4:98cv01-RH, United States District Court for the Northern District of Florida, Tallahassee Division.

A decision on the law suit by the Texas Shrimp Association that charge among other things that the economic analysis was done incorrectly. The judge found that the economic analysis was done well and that a finding of a negative net benefit for a regulation is not sufficient for that regulation to be dismissed. Other factors can be taken into consideration in determining if a regulation can be promulgated. The summary judgement requested by the plaintiffs was denied.

Hinga, Kenneth R., Heeseon Jeon, and Noelle F. Lewis (1995). Marine Eutrophication Review. Decision Analysis Series No. 4, NOAA Coastal Ocean Program, Coastal Ocean Office, National Oceanic and Atmospheric Administration, 1315 East-West Highway (NCOP), Silver Spring, MD, January.

Quantifying the effects of nitrogen enrichment on phytoplankton in coastal ecosystems. The results of three different approaches are used to investigate relationships between nitrogen availability and phytoplankton primary production and abundance in coastal ecosystems. The three approaches are controlled experiments in marine enclosures, history of changes in coastal ecosystems, and cross system comparisons. Most systems can be expected to have increased primary production with increased nitrogen loadings or long term average concentration. Nitrogen availability alone is not a very precise predictor of phytoplankton production or abundance. The magnitude of the change in phytoplankton production or abundance found for most systems is typically in the range of 1.4 to 3 times for a doubling in nitrogen loading or concentration. However, there are coastal ecosystems that have not followed the general relationships found. Until the characteristics that sets those systems apart from other systems can be identified, there is no guarantee that



any individual system will have the typical response.

Hinman, Ken (ed.) (1996). In Defense of the Councils. National Coalition for Marine Conservation, 3 West Market Street, Leesburg, Virginia.

An editorial claiming that inaction by NMFS in the management of Highly Migratory Species is sufficient reason to return management to the Council system for these species of fish. It displays a certain amount of naivety since inaction by the Councils was the original reason Congress assigned the responsibility to the NMFS in the first place. However, without reorganization, the appearance of progress is impossible.

Hinman, Ken and Carl Paulsen (1993). The Crowded Sea, An Issue paper on Limiting Entry to Marine Fisheries. National Coalition for Marine Conservation, 3 West Market Street, Leesburg, Virginia, November.

While urging a reasoned and deliberate pace in planning the application and implementation of limited entry schemes, we suggest some basic principles to guide the use of limited entry as a management tool and enhance its potential for success and conclude with recommendations for legal and policy changes at the federal level.

Hoagland, Porter, and Di Jin (1997). A Model of Bycatch Involving a Passive Use Stock. Marine Resource Economics, 12(1):11-28.

We develop a simple extension of the theory of multispecies fisheries management to analyze a problem where one fish or animal stock has no commercial market but instead is valued passively. We interpret a typical bycatch problem as a standard multispecies fisheries management problem, and we develop a multispecies model incorporating both monetary damages associated with bycatch and variable biological relationships. We examine the behavior of the model with a numerical example focusing on the case of the bycatch of sported and other dolphins in the eastern tropical Pacific (ETP) yellowfin tuna fishery.

Hoagland, Porter, Di Jin, Patricia Lee, Christopher Croft, Lyn Davidson, and Sarah Wallis (1996). Market-Based Incentives to Reduce Fisheries Bycatch. NOAA Contract No. 50-DGNF-5-00172, National Marine Fisheries Service, Silver Spring, MD, February, 120 pp.

This report represents a first step at considering the potential for the use of market based incentives to aid in the resolution of fishery bycatch problems. Market-based incentives have several advantages over more traditional command and control approaches, including cost effective allocations of environmental controls; incentives for firms to seek technological solutions; flexibility; returns to the public for the use of its resources; and lower administrative costs in some cases.

Hoar, Peter, John Hoey, Jim Nance, and Chris Nelson (eds.) (1992). "A Research Plan Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries." Final report, Gulf and South Atlantic Fisheries Development Foundation, Inc., Lincoln Center, Suite 669, 5401 West Kennedy Boulevard, Tampa, Florida, August.

The program of study to address the biological, economic, and social impacts of reducing the incidence of bycatch in the southeastern region shrimp fishery. The plan emphasizes biological research and gear modifications, but does recognize the need for economic analysis and nongear bycatch reduction alternative regulations.

Hoar, Peter, John Hoey, Chris Nelson, and Jim Nance (eds.) (1992). "A Research Plan Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries." Draft report, Gulf and South Atlantic Fisheries Development Foundation, Inc., Lincoln Center, Suite 669, 5401 West Kennedy Boulevard, Tampa, Florida, May.

The program of study to address the biological, economic, and social impacts of reducing the incidence of bycatch in the southeastern region shrimp fishery. The plan emphasizes biological research and gear modifications, but does recognize the need for economic analysis and nongear bycatch reduction alternative regulations. An executive summary is included as a separate document.

Hobart, W.L. (1987). "Scientific and Technical Publications on Marine Recreational Fisheries." Marine Fisheries Review, 49(2):182-186.

List of primarily biological publications concerning recreationally caught fish species.

Hobart, W.L. (1993). "Authors, Titles, and Subjects in the Marine Fisheries Review 55(1-4), 1993." Marine Fisheries Review, 55(4):31-35.

An index and list of titles of articles published in the journal during 1993.

Hobart, W.L. (Ed.) (1995). Baird's Legacy: The History and Accomplishments of NOAA's National Marine Fisheries Service, 1971-1996. NOAA Technical Memorandum NMFS-F/SPO-18, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, December.

The accomplishments of the National Marine Fisheries Service from the time of its first commissioner, Spencer Fullerton Baird, to the present.

Hobson, Edmund S. and William H. Lenarz (1977). "Report of a Colloquium on the Multispecies Fisheries Problem, June 1976." U.S. Dep. Comm. Marine Fisheries Review, 39:8-13.

The colloquium concentrated on identifying the types of research that could be expected to best benefit fisheries management, and immediately recognize that sound research programs would be unlikely without stable management objectives. Because management objectives determine the information needed, and thus research plans, changes in these objectives, amplified by the many interactions among the system's components could be profoundly disruptive.

Hodge, Scott A. and Adam Thierer (1995). A Blueprint to Abolish the Department of Commerce. The Heritage Foundation.

A plan that dismantles the Department of Commerce by eliminating or transferring existing programs to other agencies.

Hoey, John, Rebecca Lent, and Alycia Anderson (1995). Long Term Allocation Issues for Atlantic Swordfish. Draft Discussion Paper, National Fisheries Institute and the Highly Migratory Management Division, National Marine Fisheries Service, Silver Springs, MD, September, 12 pp.

An overview of the trends in Atlantic swordfish landings by the major

fishing nations is presented. The statistics include landings in the North and South Atlantic as well as the share of total landings attributable to individual countries. In addition, because the United States is a major market for swordfish, trends in imports by country of origin are also presented, in an effort to demonstrate cases in which increased landings (sometimes contrary to the spirit of the ICCAT agreement) have appeared on the United States market.

Hoey, John, A. Bertolino, J. Cramer, and C. Rogers (1994). Recent Trends in the U.S. Atlantic Longline Fishery. ICCAT - SCRS/94/123, Fishery Review, 35 pp.

A review of the Atlantic longline fisheries generated from voluntary and mandatory monitoring programs. Information presented includes fleet size, longline effort, species composition, and regional trends. Direct and indirect impacts of domestic and international regulations on swordfish, tuna, marlin, sailfish, sea turtles, marine mammals, and shark are discussed.

Hof, John G. and David A. King (1982). "On the Necessity of Simultaneous Recreation Demand Equation Estimation." Land Economics, 58(4):547-552.

A critique of Burt and Brewer (1971) and Cicchetti, Fisher, and Smith (1976) approach to recreation benefit estimation and a suggested alternative approach that is less costly to employ. See Ward (1983) comment and reply.

Hof, John G. and David A. King (1983). "On the Necessity of Simultaneous Recreation Demand Equation Estimation: Reply." Land Economics, 59(4):459-460.

The authors concur with the comments of Ward (1983) and offer two points of clarification concerning the use of line integrals and the difference between consumer surplus and the compensating variation caused by the presence of income effects.

Hogan, William and Daniel Georgianna (1989). U.S. Fish Processing Capacity and Imports of Whole Groundfish from Canada. Marine Resource Economics, 6(3):213-225.

Capacity in the U.S. fish processing industry increased with the U.S. fishing fleet following establishment of the 200 mile limit in 1977. As U.S. landings declined after 1983, whole imports from Canada have increased. Focusing on cod, haddock, and flounder, this study specifies a system of equations to model the U.S. processing sector. The model analyzes short run decisions in processing and hypothesizes that both the hoarding of skilled labor and the desire to maintain specific retail customers prompts processors to attempt to maintain output when their principal product sources, U.S. landings, decline. Specifically, processors are hypothesized to bid higher U.S. exvessel prices and to demand more whole imports from Canada. Underutilization of processing capacity is found to have a significant positive effect on U.S. processors demand for whole imports. Whole imports are found to have a significant negative effect on U.S. exvessel prices.

Hogarth, William T. (1996). Executive Summary - Shark OT Meeting. Memorandum for members of the Shark Operations Team, Highly Migratory Management Division, Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Spring, Maryland, September, 3 pp.

An executive summary of the shark operations team meeting that

recommended a 50% reduction in total allowable catch for 1997.

Hoggarth, Daniel D. (1994). "Management Strategies and Their Sensitivity to Parameter Uncertainties in a Model of Artisanal River Fisheries." C.M. 1994/T:30, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 8 pp.

This paper examines the effects of four management strategies - effort limitations, closed seasons, mesh size increases, and gear bans - on different social groups in artisanal fishing communities. In the floodplain river fisheries examined, strong technical interactions exist between the many different gears. The management strategies often give rise to substantial reallocations of yields between these gears, but, due to the balance of benefits and losses, overall total yields are fairly insensitive to management. None of the scenarios examined particularly benefit the gears most used by the poorer or most vulnerable fishermen.

Holiman, Stephen Glenn (1994). "A Discussion of the Economic Implications of Regulatory Change in the Gulf of Mexico Recreational Reef Fish Fishery." National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL, August, 15 pp.

This document presents a discussion of the current management, catch performance, management options, and the economic implications of regulatory change for the recreational reef fishery of the U.S. Gulf of Mexico with emphasis on red snapper, red grouper, and gag.

Holiman, Stephen Glenn (1994). "Management History and Recreational Catch and Effort for Gulf of Mexico Red Snapper, Red Grouper, and Gag, 1992-93." National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL, August, 13 pp.

This document presents a management history and summary statistics for the recreational reef fishery of the U.S. Gulf of Mexico. The discussion focuses on red snapper, red grouper, and gag.

Holiman, Stephen Glenn (1994). "Recreational Fisheries Reference Material." National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, November.

A bibliography of references pertaining to recreational fishery resources.

Holiman, Stephen Glenn (1994). "Status of the Recreational Fisheries of the South Atlantic and Gulf of Mexico." Draft report, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL.

A review of the status of landings and management measures in place for the recreational fisheries of the southeastern region of the United States.

Holiman, Stephen Glenn (1995). "Hard Clam (Mercenaria Mercenaria) Aquaculture Under Production Uncertainty." Presented at the 15th Milford Aquaculture Seminar, February 21-23, 20 pp.

Dynamic programming methods were applied to a stochastic analysis of hard clam grow out in Florida to determine the impacts of uncertainty on production design and financial returns. The sources of uncertainty incorporated into the model were production uncertainty resulting from variable growth response to environmental and production conditions, and revenue uncertainty resulting from variable prices.

Holiman, Stephen Glenn (1996). "Estimating Recreational Effort Using the Marine Recreational Fisheries Statistics Survey Data." NOAA Technical Memorandum NMFS-SEFSC-389, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, July, 20 pp.

This document provides programs for estimating three measures of recreational effort (target effort, catch, and directed effort) using the Marine Recreational Fisheries Statistics Survey (MRFSS) data set. The programs produce results that indicate that catch effort exceeds target effort and directed effort exceeds catch and target effort taken separately. This information can be used to evaluate trends in fishing effort and aid in estimating the potential impacts of regulation.

Holiman, Stephen Glenn (1996). "Landings Estimates Under A Zero King Mackerel Bag Limit for Charterboat Captains and Crew in the Gulf of Mexico." National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, September.

Gulf of Mexico king mackerel recreational landings projections produced under a zero bag limit for charterboat captains and crew is presented based on Marine Recreational Fisheries Statistics Survey, NMFS Charter boat Survey, NMFS Headboat Survey, and the Texas Parks and Wildlife Survey data.

Holiman, Stephen Glenn (1996). "Recreational Fisheries Reference Material." National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, August.

A bibliography of references pertaining to recreational fishery resources.

Holiman, Stephen Glenn (1996). "Summary Document, Recreational Marine Demand Estimation Studies." National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, November, 28 pp.

Annotated bibliography of recreational demand studies emphasizing southeastern region studies and an assessment of independent variable performance.

Holiman, Stephen Glenn (1997). "For-Hire Sector Data Relevant to Closure Considerations in the Red Snapper Fishery of the Gulf of Mexico." National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, August.

This document contains catch and effort data useful for evaluating the relative importance of red snapper to the for-hire sector in the Gulf of Mexico and some potential impacts of closure under a quota monitoring system.

Holiman, Stephen Glenn (1997). "Summary Data for the South Atlantic Reef Fish Fishery, 1982-96." National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, September.

Summary statistics for the recreational reef fish fishery of the Gulf of Mexico derived from the NMFS MRFSS survey, the NMFS Headboat Survey, and the Texas Parks and Wildlife Survey data sets. These summaries may contain some errors due to the expansion of the MRFSS data set.

Holland, Daniel S. (1999). On Direct and Indirect Management of Fishing Capacity. Thalassorama, Marine Resource Economics, 14(3):263-267.

Excess capacity is a severe and costly problem that has led both to overfishing and reduction in the net benefits derived from fishery resources. However, excess capacity is only a symptom of an underlying failure of the management system. Attempts to reduce or control capacity will likely be offset by expansion of uncontrolled inputs. Failure to address the causes of excess capacity will ensure that managers will face the same problems again sooner or later.

Holland, Daniel S. and Richard J. Brazee (1996). Marine Reserves for Fisheries Management. Marine Resource Economics, 11(3):157-171.

Conventional methods of regulating commercial fisheries restrict catch by limiting either the quantity or efficiency of fishing effort, or by putting direct limits on catch. These regulatory practices are neither feasible nor desirable for many fisheries, and have failed to conserve fishery stocks in other fisheries. Marine reserves may be an effective alternative management strategy for some fisheries. Here we develop a dynamic model of marine reserves applicable to inshore fisheries. In contrast to previous models of reserves, the model is fully dynamic and provides information on both equilibrium conditions and the path to equilibrium. A simulation model based on red snapper data from the Gulf of Mexico is presented. The simulation results suggest that marine reserves can sustain or increase yields for moderate to heavily fished fisheries but will probably not improve yields for lightly fished fisheries.

Holland, Daniel S. and Jon G. Sutinen (1997). Draft Guidelines on Excess Capacity in Fisheries. Draft report, Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, RI, December, 18 pp.

This draft of technical guidelines on the management of fishing capacity is prepared in the general context of the Code of Conduct for Responsible Fisheries. The draft guidelines cover the definition of fishing capacity and excess capacity, measurement aspects, control mechanisms and approaches to reducing capacity. The draft guidelines introduce concepts and issues, identifies options, and provides guidance and advice to fisheries managers/policy makers from a world wide perspective. Special issues addressed include intra-sectoral and international mobility, regional and international dimensions, subsidies and buybacks, basic monitoring requirements, small-scale tropical fisheries, complementary roles of conventional management techniques, precautionary considerations, allocation among competing user groups and equity.

Holland, Daniel S. and Jon G. Sutinen (1998). Draft Guidelines on Fishing Capacity. Draft report, Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, RI, December,

18 pp.

This draft of technical guidelines on the management of fishing capacity is prepared in the general context of the Code of Conduct for Responsible Fisheries. The draft guidelines cover the definition of fishing capacity and excess capacity, measurement aspects, control mechanisms and approaches to reducing capacity. The draft guidelines introduce concepts and issues, identifies options, and provides guidance and advice to fisheries managers/policy makers from a world wide perspective. Special issues addressed include intra-sectoral and international mobility, regional and international dimensions, subsidies and buybacks, and small-scale tropical fisheries.

Holland, Daniel S. and Cathy R. Wessells (1997). Predicting Consumer Preferences for Seafood: What s in a Label? Draft report, Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, RI, April, 15 pp.

This paper addresses relevant questions which should be answered by the seafood industry regarding seafood labeling. Questions answered by this paper are: 1) do consumers want seafood safety information; 2) does it matter which agency of the government is in charge of seafood safety programs; 3) do they want method of production information; and, 4) which production method do they prefer? A rank-ordered logit model is estimated using data collected by a mail survey of consumers in the Northeastern and Mid-Atlantic U.S. The questions, based on conjoint analysis, are used to determine the average relative importance and value of the three product attributes, and to estimate the relative attractiveness of particular products to consumers. When used in combination with demographic data and responses to questions on perceptions, the analysis suggests market segmentations and potential marketing strategies based on the heterogeneity in preferences among consumers.

Holland, Daniel S. and Jon G. Sutinen (1999). An Empirical Model of Fleet Dynamics in New England Trawl Fisheries. Can. J. Fish. Aquat. Sci., 56:253-264.

Regulations and changes in market and environmental conditions that change the profitability of one fishery or area will result in a redistribution of fishing effort among alternative fisheries or areas. The magnitude of this effort displacement will depend on the relative profitability of the alternatives for the individual fishers affected. When fishing areas and fishers are heterogeneous, simple aggregate effort models such as those based on ideal free distribution theory may provide inaccurate predictions. We present an empirical model of individual vessel fishery and location choice based on trip data for a group of over 400 large trawlers fishing in New England. The model uses lagged average revenue rates for different alternatives and the individual vessel s past behavior to predict choice of species group and fishing location on a trip-by-trip basis. This model is used to predict aggregate effort levels in different fisheries and areas over time.

Holland, Daniel S., Eyjolfur Gudmundsson, and John Gates (1999). Do Fishing Vessel Buyback Programs Work: A Survey of the Evidence. Marine Policy, 23(1):47-69.

Vessel and license buyback programs are being used increasingly as a tool to reduce overcapacity in fisheries. This paper examines buybacks programs in a number of fisheries around the world, to evaluate their effectiveness in achieving their objectives. We show that, though the

objectives are usually similar, the design of different buyback programs varies widely with important ramifications. Although proper design can improve the performance of buyback programs, we conclude buyback programs are generally not an effective way to address the problems they are meant to solve.

Holland, Stephen M. and J. Walter Milon (1989). "The Structure and Economics of the Charter and Party Boat Fishing Fleet of the Gulf Coast of Florida." Final MARFIN Report, Contract No. NA87WC-H-06141, Department of Recreation, Parks, and Tourism and Department of Food and Resource Economics, University of Florida, Gainesville, FL, June, 278 pp.

A study of the Florida west coast charter and party boat fishing fleet with a comparison to an earlier study.

Holland, Stephen M., Robert B. Ditton, and Duane A. Gill (1991). "The U.S. Gulf of Mexico Charter Boat Industry: Activity Centers, Species Targeted, and Fisheries Management Opinions." Paper submitted to Marine Fisheries Review, March 15, pp 26.

The charter boat industry in U.S. Gulf of Mexico provides access to offshore fishing opportunities for approximately 570,000 passengers per year on 971 boats. A 25 percent random sample of charter boat operators was interviewed during 1987-1988 to determine species targeted, percent time committed to targeting each species and reactions to existing catch restrictions. Three-fourths of the charter boat fleet was in Florida, 13 percent in Texas, 5 percent in Louisiana, 4 percent in Alabama, and 2 percent in Mississippi. Responses were diverse regarding species focus within the region. Species of dominant importance included groupers, snapper, king mackerel, spotted seatrout, and red drum. Catch restrictions were generally supported with higher levels of opposition to restricted high effort fish and/or one fish or closed fishery limits.

Holland, Stephen M., Robert B. Ditton, and Duane A. Gill (1992). "The U.S. Gulf of Mexico Charter Boat Industry: Activity Centers, Species Targeted, and Fisheries Management Opinions." Marine Fisheries Review, 54(2):21-27.

The charter boat industry in U.S. Gulf of Mexico provides access to offshore fishing opportunities for approximately 570,000 passengers per year on 971 boats. A 25 percent random sample of charter boat operators was interviewed during 1987-1988 to determine species targeted, percent time committed to targeting each species and reactions to existing catch restrictions. Three-fourths of the charter boat fleet was in Florida, 13 percent in Texas, 5 percent in Louisiana, 4 percent in Alabama, and 2 percent in Mississippi. Responses were diverse regarding species focus within the region. Species of dominant importance included groupers, snapper, king mackerel, spotted seatrout, and red drum. Catch restrictions were generally supported with higher levels of opposition to restricted high effort fish and/or one fish or closed fishery limits.

Holliday, Mark (1987). "United States Recreational Fisheries, 1986." Marine Fisheries Review, 49(2):166-173.

A review of landings in the United States recreational fisheries for 1986.

Holliday, Mark C. (1996). "Re-engineering NMFS Fisheries Statistics ...



Creation of a Core Program." Fishery Statistics Division, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, MD, March, 22 pp.

A concept paper presenting the design and need for a centralized fisheries statistics program that would collect biological, economic, and socio/anthropological data. This data base would be used to assist fishery managers in developing solutions to pressing allocation problems in U.S. domestic fisheries. Its main attractive feature is its cost effectiveness in developing relational data bases that rely on presently existing NMFS expertise without creating additional burdens on time or resources.

Holliday, Mark and Morton Miller (1992). "Minutes of National Marine Fisheries Service Economics Workshop." Southwest Fisheries Science Center, La Jolla, CA, December 2-3, 15 pp.

Minutes of the Economics Workshop meeting concerning various economic responsibilities in the NMFS regions and plans for the development of an economic assessment of fishery stocks nation wide. Richard Raulerson's comments are also included in the file.

Holliday, Mark C. and Barbara K. O'Bannon (1990). "Historical Catch Statistics, Atlantic and Gulf Coast States, 1879 - 1989." Current Fishery Statistics No. 9010, Historical Series 5-9 revised, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, MD, October.

Federal fishery statistics have been collected by a number of agencies, including the Fish Commission, Bureau of Fisheries, Fish and Wildlife Service, Bureau of Commercial Fisheries, and Bureau of the Census. The data have been published in several series of reports. Since funds for conducting statistical surveys have been limited, there have been wide variations in the frequency of the surveys in the various areas. This has made it difficult to determine the years in which data were available for the various sections, and also to locate the reports in which the results of surveys were published. The following bibliography was prepared to make it easier to locate the results of the various canvasses of the fisheries of the Atlantic and Gulf states. No attempt has been made to include those publications giving fragmentary or summary data only, or data on only certain fisheries or states. Unless otherwise noted, all are publications of the National Marine Fisheries Service or its predecessor agencies.

Hollin, Dewayne and Steven R. Windh (1984). Cutting Fuel Costs, Alternative for Commercial Fishermen. TAMU-SG-84-504, Sea Grant College Program, Texas A&M University, College Station, Texas.

This study, funded by the National Shrimp Congress, gathered energy conservation information that might help fishermen make decisions about ways to conserve fuel on both a short-term and long-term basis.

Hollowed, Anne B., Rebecca T. Baldwin, Richard Ferrero, Lowell Fritz, and Bernard Megrey (1994). "An Examination of Marine Mammal and Walleye Pollock Fisheries in the Gulf of Alaska Using A Stochastic Bio-Economic Simulation Model." C.M. 1994/7:16, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting,

St. John's, Newfoundland, Canada, September.

In this paper, we describe the multidisciplinary effort of scientists at the Alaska Fisheries Science Center (AFSC) to gather the type of information necessary to parameterize a bioeconomic model. The framework for developing a quantitative bioeconomic modeling approach to explore the potential tradeoffs of various fisheries management strategies in the Gulf of Alaska ecosystem is presented. The model quantifies risks associated with adopting a given harvest strategy in terms of the value of increased yield, and the maintenance of both walleye pollock and marine mammal populations. The simulation model included process error in estimating recruitment and measurement error in the stock assessment procedures.

Holm, Petter and Leigh Mazany (1995). Changes in the Organization of the Norwegian Fishing Industry. Marine Resource Economics, 10(3):299-312.

The wealth and prosperity of the Norwegian fishing sector is due to its corporatist arrangements giving it great political power and influence. Changes in this institutional structure are underway toward a pluralist system that has weakened the fishing sector. The consequences of this reform and its impact on the prosperity of Norwegian fishermen is the focus of this article. The corporatist institutions of the Norwegian fishery sector and their interrelationships are first described. Second, the current reform process is outlined and its causes are discussed. Finally, the extent to which the prosperity and influence of the Norwegian fishery sector can be attributed to the corporatist arrangements and whether the present reforms mean an end to this situation are discussed.

Holmes, Krys (1994). Three Roads to Bycatch Control, The Ferment of the North Pacific. In Brad Warren (ed.). Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

The individual fishing quota, harvest priority, and full retention/full utilization program regulations to control bycatch in the north Pacific fisheries are presented and briefly discussed.

Homans, Frances and James E. Wilen (1997). A Model of Regulated Open Access Resource Use. Journal of Environmental Economics and Management, 32(1):1-21.

This paper develops a model of regulated open access resource exploitation. The regulatory model assumes that regulators are goal oriented, choosing target harvest levels according to a safe stock concept. The harvest quotas are implemented by setting season lengths, conditioned on the industry fishing capacity. The industry enters until rents are dissipated, conditioned on season length regulations. Harvest levels, fishing capacity, season length, and biomass are determined jointly. Using parameter estimates from the long regulated North Pacific Halibut fishery, predictions of these variables from the regulated open access model are compared to predictions that arise from the Gordon model.

Hooper, Peter (1976). "Forecasting U.S. Export and Import Prices and Volumes in a Changing World Economy." Federal Reserve board, International Finance Discussions Paper No. 99.

This paper describes the construction and performance of a forecasting model that follows in the tradition of partial equilibrium econometric models of U.S. trade, but with several important modifications in light of recent changes in the world economy.

Hopkins, Jane Chadwick (1983). "An Analysis of the Impact of Alternative Import Management Policies for Shrimp." Thesis, Department of Agricultural Economics, Texas A&M University, December, 117 pp.

A five equation econometric model was specified and estimated using 1955-1980 data to analyze restrictive import policies. Benefits of such measures were found to be tenuous in simulations with benefits dissipated through new entrants. While all of the policies led to only modest improvements in the price level, the variability in prices was reduced. The benefits from restricting imports may not be as readily apparent as has been suggested by some advocates.

Hornbaker, Robert H., Bruce L. Dixon, and Steven T. Sonka (1989). "Estimating Production Activity Costs for Multioutput Firms with a Random Coefficient Regression Model." American Journal of Agricultural Economics, 71(1): 167-177.

A random coefficient regression model provides an approach for estimating the mean variable costs of specific enterprise production activities for each output over a population of multioutput firms. The model specifically acknowledges that these farm level costs vary from farm to farm. In addition, best linear unbiased predictions can be estimated for each activity for an individual farm. The mean estimates are quite useful for ex post cost analysis, thereby providing per unit cost estimates for farmers, governmental agencies, and researchers. The best linear unbiased predictions can be used by individual farmers for planning yearly operations, applying for operating loans, and analyzing marketing strategies.

Hotelling, Harold (1931). "The Economics of Exhaustible Resources." Journal of Political Economy, 39(2):137-175.

The comparative static theory of economics does not lend itself to an analysis of natural resources that are nonrenewable or are renewable at slow rates (forests, oil, etc.). A dynamic approach to solving resource allocation over time is presented using the calculus of variations.

Houde, Edward D. (1993). Results of the 1993 Species Working Group Workshop. Report of the Swordfish Working Group ICCAT Advisory Committee Meeting.

Recommendations of the working group to the Advisory Committee on stock identification and structure, age and growth, minimum size regulations, catches and CPUE, and the need for earlier assessments.

Houston, Jack E. and Amelia E. Nieto (1988). "Regional Shrimp Market Responses to Domestic Landings and Imports." Journal of Food Distribution Research, Feb:99-107.

U.S. shrimp landings are divided into four geographic regional markets and may be further subdivided into species and size characteristics. Seemingly unrelated regressions are used to analyze regional price responses of variable annual landings of shrimp. The contemporaneous correlation of competing market supplies and demands accounted for an improvement in forecasting reliability in each area and for species and size relationships. Imports were shown to affect regional markets unevenly, having a significantly higher impact on south Atlantic shrimp prices than on Gulf of Mexico, West Coast, or New England markets. Real disposable personal income affected West Coast and south Atlantic prices much more dramatically than those of Gulf

Coast markets. The composition of the catch by size and species in each season introduced variable responses by regional market. Also, south Atlantic appeared least price-sensitive to its own catch.

Houston, Jack E., Amelia E. Nieto, James E. Epperson, Ho-Shui Li, and George W. Lewis (1989). "Factors Affecting Local Prices of Shrimp Landings." Marine Resource Economics, 6:163-172.

Variation in the species and size composition of local and regional shrimp landings result in uncertain and sometimes volatile ex-vessel prices paid to fishermen. A seemingly unrelated regressions price-modeling framework was used to forecast contemporaneous price effects of the composition of shrimp landing in closely associated market regions. Price responses to U.S. regional shrimp landings and to imports were significantly related to differentiated markets by species and location. Regional consumer income impacts on average ex-vessel prices for each species were also significantly different. Implications of shrimp price response differences in related local markets are also discussed.

Hu, Teh-Wei, Donald R. Whitaker, and D. Lynne Kaltreider (1983). "The New England Groundfish Industry. An Economic Profile for Policy and Regulatory Analysts." Final report, Saltonstall/Kennedy Project, National Fisheries Institute, Washington, D.C.

A description of the New England Groundfish fishery, its biology, industry structure, and markets is provided in the report. A simplistic demand analysis indicates that a 8.3 or 5.4 percent reduction in consumption for haddock or ocean perch occurs with each 10 percent increase in price.

Hu, Teh-Wei, David M. Dressel, Donald R. Whitaker, and D. Lynne Kaltreider (1983). "The Maine Sardine Industry, An Economic Profile for Policy and Regulatory Analysts." Final report, Saltonstall/Kennedy Project, National Fisheries Institute, Washington, D.C.

A description of the Maine sardine fishery, its biology, industry structure, and markets is provided in the report. A simplistic demand analysis indicates that a 6 percent reduction in consumption occurs with each 10 percent increase in sardine price.

Hu, Teh-Wei, Donald R. Whitaker, and D. Lynne Kaltreider (1983). "The U.S. Menhaden Industry, An Economic Profile for Policy and Regulatory Analysts." Final report, Saltonstall/Kennedy Project, National Fisheries Institute, Washington, D.C.

The use of whole menhaden for fertilizer has been documented as far back as the American Indians prior to settlement of the country by the European colonists, and this use of menhaden for fertilizer continued into the 1800's. The menhaden oil industry has grown steadily since its genesis in Rhode Island in 1811. In the 1900's, menhaden's primary use changed from fertilizer to feed for poultry, swine, and cattle, and the oil began to be used in manufacturing soap, certain paints, linoleum, waterproof fabrics, and margarine and shortenings (in Europe). These uses of the meal and oil still predominate.

Hu, Teh-Wei, Donald R. Whitaker, and D. Lynne Kaltreider (1983). "The U.S. Shrimp Industry, An Economic Profile for Policy and Regulatory Analysts." Final report, Saltonstall/Kennedy Project, National Fisheries Institute, Washington, D.C.

While other studies have discussed the economic status and problems of the U.S. shrimp harvesting sector (e.g. Hutchinson, 1978), this study focuses on the U.S. shrimp processing industry. Three separate economic profiles of the shrimp industry are contained in this volume: (1) a profile of the overall shrimp industry with special reference to headless and peeled shrimp, (2) a profile of the breaded shrimp industry, and (3) a profile of the southern canned shrimp industry. In each profile, the data were obtained from processors whose plants made at least 95 percent of their sales from the particular shrimp product profiled.

Hu, Zulu and Mohsin S. Khan (1997). Why is China Growing So Fast? Economic Issues 8, International Monetary Fund, Washington, D.C.

In 1978, after years of state control of all productive assets, the government of China embarked on a major program of economic reform. While pre-1978 China had seen annual growth of 6 percent a year, post-1978 China averaged 9 percent a year. Although capital accumulation was important in explaining this shift, as were the number of Chinese workers, a sharp, sustained increase in productivity was the driving force behind the economic boom. This marks a departure from the traditional view of development in which capital investment takes the lead.

Huang, Hann-Jin, Wade L. Griffin, and David V. Aldrich (1984). "A Preliminary Economic Feasibility Analysis of a Proposed Commercial Penaeid Shrimp Culture Operation." Journal of World Mariculture, 15:95-105.

This analysis utilized the production data obtained in 1982 from ponds at the Cedar Bayou Texas A&M Mariculture Facility, east of Baytown, Texas. The Aquaculture Budget Simulation System developed at Texas A&M University was applied to create budgetary information including the net return, economic profit, break even quantities and prices, and net present values over a 10 year horizon. This information was used to evaluate the economic feasibility of different stocking strategies at a proposed 76 ha commercial penaeid shrimp culture operation. The stocking strategies consist of monoculture of Penaeus stylirostris at 10 and 20/m<sup>2</sup> respectively and polyculture of P. stylirostris with P. vannamei at two ratios (3:1 and 1:3) with a total density of 20/m<sup>2</sup>.

The results indicated that only the polyculture of 75% P. vannamei with 25% P. stylirostris is economically profitable. This stocking strategy yields an economic profit of \$54,589 for the first year of operation. The break even production of 1,526 kg/ha is less than the expected annual production of 1,919 kg/ha. The break even price of \$6.11/kg is less than the market price of \$8.23/kg. The net present value is \$839,424 over 10 years considering the beginning \$20,000 cash and 20% of the total investment as owner's investment. The payback occurred following the second year's harvest.

Huang, Kuo S. (1988). "An Inverse Demand System for U.S. Composite Foods." American Journal of Agricultural Economics, 70(4):902-909.

This article provides a theoretically consistent framework for estimating a complete price dependent demand system, where the concept of distance function and its related substitution and scale effects are used. The approach is applied to a U.S. demand system consisting of thirteen food and one nonfood categories.

Huang, Kuo S. (1994). "A Further Look at Flexibilities and Elasticities." American Journal of Agricultural Economics, 76:313-317.

relationships between price elasticities and price flexibilities are examined with emphasis on comparing sizes of difference between a directly estimated demand matrix and an inverted demand matrix. Results show that by using inverted elasticities to represent flexibilities or vice versa, sizable measurement errors may be committed. In agricultural policy and program analysis, a directly estimated demand matrix should be used.

Hudson, J. Harold, Donald M. Allen, and T.J. Costello (1970). "The Flora and Fauna of a Basin in Central Florida Bay." U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries, No. 604, May, iii+14 pp., 2 Figs., 1 Table.

One hundred ninety-six species of plants and animals are reported from a nursery area for pink shrimp, Penaeus duorarum, in a basin of central Florida Bay. Many of the organisms are benthic and associated with shallow beds of turtle grass, Thalassia testudinum. Although abrupt habitat variations may affect species distribution, the general distribution of organisms in the basin and bay defines environments influenced by different water masses.

Hudson, Russell (1996). Statement of the Directed Shark Fishery Association. Prepared for the Atlantic Shark Operations Team meeting of August 27-28, Silver Spring, Maryland, Directed Shark Fishery Association, 505 NW 90 Avenue, Chiefland, Florida, September, 3 pp.

Comments by the commercial shark fishermen s association on the proposed regulation to reduce harvest quotas in the directed shark fishery delivered at the shark operations team meeting. The quota reductions are emotionally driven without a sound scientific basis, the existing quotas already have lead to a stabilization of the shark stocks, other countries need to be involved in the quota reductions, and juvenile sharks need protection as well as the adults in the offshore waters.

Huppert, D.D. (1979). "Implications of Multipurpose Fleets and Mixed Stocks for Control Policies." J. Fish. Res. Board Can. 36:845-854.

Management of harvests from mixed stocks and multipurpose fleets requires the use of concepts not discussed in single species fishery models. Optimum harvest of a group of mixed stocks implies that an aggregate objective pertaining to the multispecies catch is maximized. This usually prohibits the attainment of the maximum sustained yield or the maximum economic yield for each individual stock. Operation of a multipurpose fleet is economically justifiable when there are significant annual or seasonal fluctuations in fish stock abundance. A simple linear model is developed in this paper to demonstrate how the multipurpose fleet can be a necessary part of rational management.

Huppert, D.D. (1983). "NMFS Guidelines on Economic Valuation of Marine Recreational Fishing." NOAA, NMFS, Technical Memorandum, NOAA-TM-NMFS-SWFC-32, June.

This guideline provides a rudimentary explanation of what an economic evaluation of recreation is all about. The guidelines emphasizes the tactics of producing a defensible statement of economic value rather than the quantitative techniques and theoretical models needed to actually measure the value.

Huppert, Daniel D. (ed.) (1987). "Limited Access Alternatives for the Pacific Groundfish Fishery." NOAA Technical Report NMFS 52, U.S. Department of Commerce, National Oceanic and Atmospheric

Administration, National Marine Fisheries Service, May, pp. 46.

This report contains the results of a working group that examined alternative approaches of limiting access to the Pacific coast groundfish fishery.

Huppert, Daniel D. (1988). "Managing Alaska Groundfish: Current Problems and Management Alternatives." FRI-UW-8805, Fisheries Research Institute, School of Fisheries WH-10, University of Washington, Seattle Washington 98195.

This study reviews the current problems in the fishery, the various regulatory options, and analyzes the advantages of various feasible approaches.

Huppert, Dan D. (1990). "Economic Benefits From Commercial Fishing." Draft report in Kearney/Centaur (1990). "Evaluation and Demonstration of Valuation Methodologies Applicable to Sport and Commercial Fisheries." Draft report, Alexandria, VA.

It is often asserted that measuring benefits from marketed goods is a relatively easy task compared to the problem of measuring nonmarket values. However, this approach becomes more problematical when market data is confidential and unavailable to the analyst, when externalities and unpriced inputs are important, and when pervasive regulations and institutional norms impose nonprice constraints on firms, consumers, and primary resource suppliers. The commercial fisheries exhibit all these complications. Hence, practical assessment of economic benefits from fisheries involves a variety of special models, approximations, and approaches which are tailored to specific circumstances. Choosing from among these necessarily calls upon the independent judgement of the analyst. This chapter seeks to assist in those judgements.

Huppert, Dan D. (1990). "Analysis of Commercial Fishermen Behavior, Fishing Costs and Net Benefits Estimation." Draft report in Kearney/Centaur (1990). "Evaluation and Demonstration of Valuation Methodologies Applicable to Sport and Commercial Fisheries." Draft report, Alexandria, VA.

This report summarizes the existing economics literature concerning open access, bioeconomic dynamics, behavior of the fishing fleet under regulatory constraints, and conditions of labor supply and provides specific guidance incorporating the following in benefits estimates: Entry and exit of fishing firms, Labor supply in fisheries, measurement and costs of fishing effort, and effects of multi-species fisheries with targeting behavior.

Huppert, Daniel D. (1995). "Risk Assessment, Economics, and Precautionary Fishery Management." TCPA/8P3, Technical Consultation on the Precautionary Approach to Capture Fisheries (TCPA), FAO Scientific Meeting, Lysekil, Sweden, May, 20 pp.

Widespread alarm over depletion of the world's marine fish stocks and possible collapse of ocean ecosystems is one of the most predominant perceived risks in fishery management. The perception is that high levels of harvest could more or less permanently diminish the economically valuable fish resources and marine mammal populations. Cod on the Grand Banks off Newfoundland, red king crab in the Bering sea, and the listing of northern sea lion populations in the western Gulf of Alaska and Aleutian Island as endangered species are three examples of the most dramatic risks. This paper

will survey more broadly the sources of risk and related aspects of decision making under uncertainty, dealing with stock collapse and extinction as one end of the spectrum. The purpose of this paper is to explore concepts and processes common in risk assessment, extend the discussion to include economic aspects of risk management, and relate that information to the ongoing discussion of risk and biological reference points in the fisheries management literature. I assume the ultimate objective of this technical process is to contribute information to a specific decision making system. The approach I take is discursive and selective. I will mention in passing economic perspectives on endangered species conservation, discuss some problems in valuing economic outcomes of decisions, raise the issue of whether standard economic optimization approaches address concerns for risk, and touch upon the problems posed by introduction of discount rates in economic assessment of risk management strategies.

Huppert, Daniel D. and Dale Squires (1986). Potential Economic Benefits and Optimum Fleet Size in the Pacific Coast Trawl Fleet. Marine Resource Economics, 3(4):297-318.

Limited entry to the Pacific coast groundfish fishery poses two principal questions: (1) How large are the potential economic returns under limited access management and (2) will the economic benefits exceed the program costs plus costs associated with transitory dislocations in the fishery? This paper reports on a partial evaluation of the first question, based on a mixed integer programming model that computes optimum fleet size, fishing effort configuration, and associated economic surplus. The multispecies fishery, economic parameters, annual harvest constraints, and summary results are presented. Overall a maximum economic profit of about \$12 million can be generated by a trawl fleet that is about 38 percent smaller than the baseline 1984 fleet with a 23 percent reduction in weeks fished. Another important conclusion is that economic profits would suffer if fishing vessels are prevented from shifting among groundfish, pink shrimp, and joint venture fisheries.

Huppert, Daniel D. and Todd W. Mittleman (1993). Economic Effects of the United Nations Moratorium on High Seas Driftnet Fishing. NOAA-TM-NMFS-SWFSC-194, NOAA Technical Memorandum, National Marine Fisheries Service Southwest Fisheries Science Center, December, 59 pp..

The report documents the status and trends in the driftnet fleet, summarizes industry and governmental plans for the near future, and assesses possible fleet adaptations to the moratorium from a political/economic perspective. Status and trends include information on numbers, size, age, and capabilities of the existing fleet, and institutional restrictions on opportunities for vessels and labor to shift into alternative fisheries. Information on plans includes expressed intentions of fleet operations and government officials in the three Asian nations, and an extended assessment of logical options for the fleet. The political and economic assessment will focus on strategies and actions likely to flow from private economic decision making and from international and domestic political pressures in the Asian fishing nations.

Hutchings, Jeffrey A., Carl Walters, and Richard L. Haedrich (1997). Is Scientific Inquiry Incompatible With Government Information Control. Canadian Journal of Fisheries and Aquatic Science, 54:1198-1210.

Government administered science in Canada and its potential for bureaucratic and political interference merits examination in the wake of the biological and socioeconomic catastrophes associated with recent fishery



collapses. We cite specific research on Atlantic cod (Gadus morhua) and Pacific salmon (Oncorhynchus spp.) habitat to illustrate how nonscience influences can interfere with the dissemination of scientific information and the conduct of science in the Canadian Department of Fisheries and Oceans. The present framework for linking fisheries science with fisheries management has permitted, intentionally or unintentionally, a suppression of scientific uncertainty and a failure to document comprehensively legitimate differences in scientific opinion. We suggest that the conservation of natural resources is not facilitated by science integrated within a political body. The formation of a politically independent organization of fisheries scientists, or some such reorganization of the link between scientific research and the management of natural resources, merits serious and open debate.

Hutchinson, Roger W. (1978). "Status and Problems of the American Shrimp Industry." Marine Fisheries Review, 40:29-31.

The shrimp industry of the U.S. enjoyed two successful years in 1976 and 1977 and expectations are that 1978 will also prove to be successful. This account gives the current status of the U.S. shrimp industry plus a brief description of various problems facing it.

Idyll, C.P. (1973). "The Anchovy Crisis." Scientific American, 228:22-29.

Over the past decade the world's largest fishery has been in the Peru Current. A periodic ecological disturbance, combined with the heavy fishing, now threatens to destroy the industry.

Impact Assessment Inc. (1991). Community Profiles Developed for the Social Impact Assessment of the Inshore/Offshore Amendment Proposal. Submitted to the North Pacific Fishery Management Council, January, 39 pp.

A series of community impact assessments for the inshore/offshore allocation proposal. It provides background information for six fishing communities for use in future discussions of proposed fishery management regulations. Communities included are Kodiak, Sand Point, St. Paul, Unalaska in Alaska, Bellingham, Washington and Newport, Oregon.

International Commission for the Conservation of Atlantic Tunas (1988). "Report for biennial Period, 1988-89." Madrid, Spain.

Annual report of the ICCAT for Atlantic tunas.

International Commission for the Conservation of Atlantic Tunas (1992). "Report of the Standing Committee on Research and Statistics (SCRS)." Madrid, October 26-November 6.

The report includes Tunas and Swordfish.

International Commission for the Conservation of Atlantic Tunas (1994). "Swordfish. SCRS Report, November 22.

The report includes a description of the swordfish fishery, the state of the stock, the effects of current regulations, and recommendations for the future.

International Council for the Exploration of the Sea (1994). "Abstracts of Scientific Papers." 82<sup>nd</sup> Statutory Meeting, St. John's,

Newfoundland, Canada, September 22-30.

Annotated bibliography of papers presented at the meeting.

International Trade Centre (1983). Shrimps: A Survey of the World Market. UNCTAD, GATT, Geneva.

Market study of frozen and canned shrimps; international coverage gives summary of market opportunities for developing countries; comments and data on world supply and demand, market characteristics, competition, prices, distribution network; production for major producing areas and countries; gives recommendations on quality and marketing aspects; and specifically for Belgium, France, Germany F.R., Italy, Netherlands, Spain, UK, USA, Japan, Hong Kong, and Australia gives comments and data on production, foreign trade, market characteristics and access, competition, distribution network, food standards and regulations; and gives an annotated bibliography of publications relevant to shrimp marketing.

Interorganizational Committee on Guidelines and Principles (1994). "Guidelines and Principles for Social Impact Assessment." U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-F/SPO-16, May, 29 pp.

The purpose of the Interorganizational Committee on Guidelines and Principles for Social Impact Assessment (SIA) is to outline a set of guidelines and principles that will assist agencies and private interests in fulfilling their obligations under National Environmental and Policy Act (NEPA), related authorities and agency mandates.

Isaac, R. Mark (1987). "The Value of Information in Resource Exploration: The Interaction of Strategic Plays and Institutional Rules." Journal of Environmental Economics and Management, 14:313-322.

Several characteristics of information used in resource exploration have led to conjectures that the private market will provide a suboptimal amount of such information. A public information provision has been proposed as a remedy, both for problems of underproduction and overproduction of private information. This paper demonstrates that, barring exceptional conditions, public provision of information cannot be guaranteed to be a generic solution to the private information overprovision problem. In fact, an example is developed to demonstrate the possibility that public information exacerbates the private overprovision problem.

Isaakson, K.G., W.I. Grant, and W.L. Griffin (1982). "General Bioeconomic Fisheries Simulation Model: A Detailed Model Documentation." Journal of the International Society of Ecological Modeling, 4(1-2):61-85.

A general bioeconomic fisheries simulation model (GBFSM) designed for use in annual-crop marine fisheries management programs is described. The purpose of the model is to predict the effects of alternative management policies on a fishery. Effects are assessed in terms of total harvest; species, size class, and seasonal distributions of the harvest; total revenue, fishing costs, and rent in the fishery; and the distribution of revenue, costs, and rent among different classes of fishing vessels. A variable number of species, size-classes, fishing areas, depths, and vessel classes can be represented in the model at the user's discretion. The model can be deterministic or can have stochastic components.

Information needed and the steps involved in use of the model are presented in two sections. The first section provides user documentation and indicates the model's capabilities, General program structure, available options, data requirements, and an example problem are presented. The second section provides programmer documentation. Model algorithms are presented in detail and the fisheries system processes represented in each subroutine are described.

Itano, Glen, Richard Condrey, and James Geaghan (198?). "Count Laws on Overwintering White Shrimp: Effect on Yield-Per-Recruit." Draft report, Louisiana State University, Baton Rouge, LA.

The study was designed to assess the change in yield associated with existing state laws that prevent the landing of "small" white shrimp during the winter months. This evaluation has been accomplished using a yield per recruit analysis in which estimates of natural and fishing mortality, average initial number of shrimp recruited to the overwintering fishery, and the annual temperature regime with temperature and size dependent growth rate equation (Phares, 1980) have been combined.

Iversen, E.S., D.M. Allen, and J.B. Higman (1993). Shrimp Capture and Culture Fisheries of the United States. John Wiley & Sons, Inc., New York.

A simplistic discussion of the biology and the fisheries for shrimp from the Carolinas to Texas is presented. Primarily warm water species are included with limited discussions on the cold water species of shrimp. The commercial fisheries are described, but little economic information is included. The section on fisheries management outlines many of the problems facing shrimp managers and biologists, but does not indicate the root causes of growth overfishing of shrimp or bycatch of finfish in the shrimp fishery. Overall, it is a good general discussion of the southeastern region shrimp fishery from a biological point of view.

Jacobson, Susan and Daniel D. Huppert (1986). "Pacific Fisheries Information Network: Documentation for Construction of the Research Data Base." Administrative Report LJ-86-34, National Marine Fisheries Service, Southwest Fisheries Center, P.O. Box 271, La Jolla, CA, December, 66 pp.

The Pacific Fisheries Information Network (PacFIN) consists of two main components: a management data base and a research data base. This document describes the content and design of the research data base. It traces the computerized method of combining individual fishery data files submitted by participating member states -- California, Oregon, and Washington -- into contiguous data file sets by year. This document was written as an encompassing description for user and programmer. Thus, it contains generalized schemes complemented by specific tables outlining their exact content.

Jamison, Judy (1994). "Foundation Conducts Shrimp Meeting: Bycatch Found Highly Exaggerated." News release, Gulf and South Atlantic Fisheries Development Foundation, Inc., October, 2 pp.

Results of the shrimp trawl bycatch study workshop indicate that the correct bycatch ratio is three to four pounds of finfish to one pound of shrimp. Testing of proposed bycatch reduction devices have indicated that gear modifications can reduce bycatch by as much as one-third.

Jennings, M.G. (1993). "Fisheries Enforcement : The UK Approach."

Paper presented at the Workshop on Enforcement Measures,  
Organization for Economic Co-Operation and Development,  
Directorate for Food, Agriculture, and Fisheries, Committee for  
Fisheries, Paris, September 21-22.

There is a tendency to impose greater controls and more restrictions in the face of reducing fish stocks, themselves often caused in part by noncompliance by fishermen with current regulations. It is not obvious that the more complex regime will be more effective than the lesser, particularly if as is likely it requires additional enforcement resources; such additional complexity can itself be self defeating, both as lacking the understanding and support of fishermen and the ability to enforce compliance. Any regime requires regular review as to its enforceability, the implications of some degree on noncompliance, and the level of resources required to maintain its effectiveness.

Jennings, M.G. (1993). "Surveillance and control of Marine Resources."  
Paper presented at the Workshop on Enforcement Measures,  
Organization for Economic Co-Operation and Development,  
Directorate for Food, Agriculture, and Fisheries, Committee for  
Fisheries, Paris, September 21-22.

This paper is a brief review of the surveillance and control implications of the Law of the Sea that places on coastal states both obligations and rights in relation to the exploitation of marine resources in their exclusive economic zones or extended fisheries jurisdiction. It emphasizes the need for international agreement that still arises where a fish stock can be exploited in more than one coastal state's zone or partly on the high seas and points out the difficulties in achieving such agreements where data is lacking, where there are varying conservation measures or where standards of control differ from state to state. It points out that the surveillance and control system may, in certain circumstances be the instrument for obtaining some basic data required to determine the fisheries management regime and then examines in some detail the requirements of various elements in the surveillance and control system - both at sea and ashore.

Jensen, A.L. (1984). "Logistic Surplus-Production Model with Explicit Terms for Growth, Mortality, and Recruitment." Transactions of the American Fisheries Society, 113:617-626.

Conventional interpretations of the logistic equation and the logistic surplus-production model appear to indicate that regulation of population size occurs as a result of competition for resources among the recruited members of a population. Compensation for fishing mortality may involve increased growth of adults and an increase in fecundity, but the major compensatory factor is increased survival of early life stages. In this study, the logistic surplus-production model is formulated in explicit terms for growth, reproduction, and mortality, and in this new formulation the capacity of a population to increase and sustain a fishery is based on a stock-recruitment relation that is a more realistic interpretation of fishery dynamics. All parameters can be estimated with catch and effort data. The models were applied to the American lobster Homarus americanus fishery in Maine and the spiny dogfish Squalus acanthias fishery. There is a considerable difference in the stock-production curves between the two fisheries that can be interpreted in terms of a similar difference in the spawner-recruit curves. Because spiny dogfish produce relatively few young, they have a lower potential for increase than American lobsters and their rate of recruitment does not increase with exploitation as greatly as that for lobsters.

Jensen, Carsten Lyngge (1998). "Investment Behavior and Tax Policy."  
Marine Resource Economics, 13(3):185-196.

This paper concerns the behavioral modeling of the aggregated capital dynamics in the Danish fishing fleet. The emphasis is placed on testing the impact of the after-tax user cost of capital and aggregated profit on capital dynamics in the fishing fleet. It is argued that the investment behavior is driven by the incentives created by implemented tax and depreciation legislation. The policy implication of the study is that a tax on capital is seen as an effective tool in controlling incentives for overcapitalization in the fishing fleet.

Jensen, Frank and Niels Vestergaard (1999). "Regulation of Renewable Resources in Federal Systems: The Case of Fishery in the EU." Working Paper No. 3/99, University of Southern Denmark, Denmark, July, 51 pp.

The EU regulation of fisheries is decided in two levels. The level of the total allowable catch (TAC) for the most important species is decided every year by the Council of Ministers. The TACs are allocated to the Member States as quotas. The Member states determine who is going to harvest the quota. There is, however, an information problem associated with this structure. It does not take into account how efficient fishermen in different countries are. In this paper we model the information problem as an adverse selection problem and analyze an EU tax coupled to effort as an alternative to the TAC system. We work with the hypothesis that EU suffers from a fiscal illusion and includes tax revenue in the objective function in order to finance other, also inefficient, operations. Even in the light of these imperfections there are at least two reasons for recommending an EU tax. First, it can be used to correct part of the market failure associated with fishery. Second, it can be used to secure correct revelation of types in the light of asymmetric information.

Jensen, William and Hans Radtke (1987). "Recreational Fishing: A Conceptual Overview for Economic Impact Modeling." Draft report.

This paper is concerned with the concept of impact assessment as it relates to recreational fishing activities. More narrowly, it focuses primarily on the ocean fisheries. It is hoped that a well defined impact assessment procedure will limit the misuses of economic information and reduce the number of confusing statements made. Contains an overview of the assessment of economic impacts.

Jensen, William and Hans Radtke (1988). "Recreational Fishing Economic Assessment Model." (Version 1.1), Resource Valuations, Inc., 17618 S.W. Lake Haven Dr., Lake Oswego, Oregon.

A menu driven computer program that allows the evaluation of the economic impact of recreational fishing activities.

Jentoft, Svein (1989). "Fisheries Co-Management: Delegating Government Responsibility to Fishermen's Organizations." Marine Policy, 13:137-154.

This article addresses the role of cooperative organizations in fisheries management and the extent to which fishermen's organizations are capable of handling regulatory functions. What are the problems inherent in the cooperative management approach, and what may be the benefits compared to other regulatory systems? Which circumstances may be beneficial for the

success of co-management? The author draws on comparative international experiences to form conclusions regarding the efficacy of a cooperative management regime.

Johansson, Per-Olov and Karl-Gustaf Lofgren (1985). The Economics of Forestry and Natural Resources. Basil Blackwell, New York.

This book's objective is to synthesize and integrate the existing work of forest economic theory. In a number of cases, however, this involves pushing the theory forward in new directions of treating new cases that have escaped earlier investigators, but nevertheless seem worth pursuing.

Johnson, Jeffrey C. and Michael K. Orbach (1996). Fisheries Research Reports to The Fisheries Moratorium Steering Committee. UNC-SG-96-08, North Carolina Sea Grant College Program, Technical Report 96-07, Institute for Coastal and Marine Resources, Department of Sociology, East Carolina University, Greenville, North Carolina.

This report assesses the current state of North Carolina fisheries with respect to the relationship between effort, catch, and landings and the social and economic conditions in the fisheries. It collects data on effort control or reduction systems which are currently in use in other fisheries, and their characteristics and effects with respect to the needs of North Carolina fisheries. It conducted fishery constituent workshops on limited entry alternatives. Finally, it develops a framework to evaluate the appropriateness of various limited entry alternatives for North Carolina fisheries.

Johnson, Jeffrey, David C. Griffith, and James D. Murray (1987). "Encouraging the Use of Underutilized Marine Fishes by Southeastern U.S. Anglers, Part I: The Research." Marine Fisheries Review, 49(2):122-137.

This paper is the first of a two part series that describes and discusses the integration of research and extension increase to the use of nontraditional fishes among marine recreational fishermen in the southeastern United States. Recreational fishermen within this region target and use or reject fish on the basis of a variety of criteria. Many fish caught incidentally are discarded because of myth, rumor, or perceived negative characteristics that mask the species' positive values. To discover the factors influencing the angler's evaluations concerning the desirability of fish that ultimately affects their decision to accept or reject a particular species, we collected judged-similarity and belief-frame comparison data in Florida, North Carolina, and Texas, analyzing these data with the use of multidimensional scaling, hierarchical clustering, and entailment analysis. We briefly describe the use of these procedures in providing for a systematic understanding of fishermen's perceptions concerning fish and discuss the implications of our findings for the development of educational material directed at enhancing the image of certain underutilized species among marine recreational fishermen.

Johnson, Neal S. and Richard M. Adams (1989). "On the Marginal Value of a Fish: Some Evidence from a Steelhead Fishery." Marine Resource Economics, 6(1):43-55.

Policy makers and other interested parties frequently request information on the recreational value of a fish. Although fishing valuation studies date back at least 25 years, most studies focus on the average value of a fish. If the purpose of such estimates is to measure the value of

incremental changes in fish numbers, then use of average estimates may lead to an incorrect policy decisions. The objective of this analysis is to estimate the marginal value of a steelhead trout in a recreational fishery on the John Day River of Oregon. The study uses contingent valuation procedures to elicit willingness to pay estimates for improvements in fish numbers and success rates. For the anglers in this survey, the value of an additional steelhead is \$6.65 under current catch conditions. This value is much lower than values currently used in public debates in the Pacific Northwest, but similar to some marginal values reported in the recent literature. Implications of these values relative to average values are discussed.

Johnson, Ronald N. (1996). "Implications of Taxing Quota Value in an Individual Transferable Quota Fishery." Marine Resource Economics, 10(4):327-340.

Taxing pure rents is usually considered the least distortionary method for raising revenues. In the literature on fishery economics, the term rent is regularly employed, suggesting that pure rents exist in that sector. Indeed, with the recent development of individual transferable quotas, the resulting market value of quota has been treated as reflecting pure resource rents. In this paper, the view that the market value of quota represents a pure rent that can be readily extracted in a nondistortionary manner by the taxing authority is challenged because that argument ignores both economic incentives and political realities.

Johnson, Ronald N. (1996). "Implications of Taxing Quota Value in an Individual Transferable Quota Fishery: Reply." Marine Resource Economics, 11(2):129-130.

A reply to Grafton (1996) comments on the original article. Major points of disagreement are on the governments role in capturing resource rents generated by ITQ management programs.

Johnson, Ronald N. and Gary D. Libecap (1982). "Contracting Problems and Regulation: The Case of the Fishery." The American Economic Review, 72(December):1005-1022.

This paper addresses why fisheries retain common property aspects with overcapitalization and excessive labor input given the large and growing literature on the persuasiveness of the economic efficiency criteria. The failure of the regulatory response to address these problems is also addressed.

Johnson, Terry (1996). "Changing Fisheries of the Russian Far East." Marine Resource Economics, 11(2):131-135.

Compared to the mature and relatively orderly fisheries of the U.S., the Russian Far East (FRE) industry is in a period of rapid and dramatic change. The new Russian entrepreneurs are breaking into markets previously controlled by Americans, and this is affecting prices paid for some products, such as king crab and halibut. On the other hand, change has not come as quickly as some observers had predicted, and the effects of Russian salmon on world markets, for example, has so far been less than many had expected. The huge and gradually more affluent domestic market is absorbing much of the FRE's fisheries output. Russian industrialists will continue to pour cash into the fisheries as long as the fisheries continue to produce attractive returns, and at present it seems that will be the case for some time to come.

Johnston, Richard S. (1990). "International Issues in Valuation of

Commercial Fisheries." Draft report in Kearney/Centaur (1990).  
"Evaluation and Demonstration of Valuation Methodologies  
Applicable to Sport and Commercial Fisheries." Draft report,  
Alexandria, VA.

Events in international markets can have enormous consequences in domestic markets and may importantly affect the relationship between fish landings and marginal net economic value. Attempts to implement the equi-marginal rule may require reallocation in response to those events. Failure to recognize interdependencies between international trade policy and resource management may lead to unexpected results. Collaboration between fishery managers and trade policymakers may reduce this problem. Whether or not the equi-marginal principle, as a norm, is adopted by fishery managers who must consider political and other "non-economic" criteria, it may offer guidance for potentially useful research. For fishery managers, this suggests a better understanding of the markets into which the resources they manage move.

Johnston, Richard S. (1992). Fisheries Development, Fisheries Management, and Externalities. Discussion Paper No. 165, The World Bank, 1818 H. Street, NW, Washington, D.C.

Because of the externalities that exist within fisheries and between fisheries and other sectors of the economy, fishery management may be an important component of a fishery development strategy. Recognizing that there may be gains from internalizing externalities within the fishery may contribute significantly to meeting the goals of fishery development. Also recognizing the interdependencies with other sectors of the economy may prevent unanticipated consequences from the adoption of fishery development strategies. A development policy that looks at the potential contribution of the fishery to the entire economy and considers development from that perspective, rather than from a solely fishery point of view, should minimize frustration and increase the chances of achieving development goals.

Johnston, Richard S. and James R. Wilson (1987). "Interdependencies Among Fisheries Management, Fisheries Trade, and Fisheries Development: Experiences with Extended Jurisdiction." Marine Fisheries Review, 49(3):45-55.

This paper discusses the new environment created by the passage of the Magnuson fisheries Conservation and Management Act (MFCMA) and what it means for the development and management of U.S. fisheries resources with particular reference to international trade. Two views regarding extended jurisdiction presented by the authors are (1) the endogeneity of the level of property rights and the pattern and terms of trade of a nation, and (2) the effect of exogenous factors, particularly global macroeconomic trends, on trade.

Johnston, Robert J. and Jon G. Sutinen (1996). "Uncertain Biomass Shift and Collapse: Implications for Harvest Policy in the Fishery." Land Economics, 72(4):500-518.

This paper addresses uncertain biomass shifts in renewable resources. A biomass shift occurs when a dominant renewable resource stock collapses and its ecosystem niche is filled by a replacement species which increases in abundance after the initial collapse. This paper develops a bioeconomic model for a fishery subject to random biomass shift. Optimal policy for three causes of biomass shift - environmental perturbation, overfishing, and a combination of these two factors - is derived and compared to optimal policy when the risk of biomass shift is not present. For each cause of biomass shift, the model allows for a valued and non-valued replacement species.



Jones, Albert C. and James R. Zweifel (1982). "Shrimp Fleet Mobility in Relation to the 1981 Texas Closure." Marine Fisheries Review, 44(9-10):50-54.

This study was undertaken to provide information on the seasonal fishing activities of the Gulf shrimp fleet. The study describes the mobility of western Gulf shrimp vessels, compares fleet mobility in 1981 with that in earlier years, and relates the results to the 1981 closure of the Texas brown shrimp fishery. Companion studies in this series address the effect of this fishing activity on catch rates and utilization of shoreside facilities.

Jones, Albert C., Edward F. Klima, and John R. Poffenberger (1982). "Effects of the 1981 Closure on the Texas Shrimp Fishery." Marine Fisheries Review, 44(9-10):1-4.

An introduction that summarizes the results of the Texas Closure Analysis for the 1981 shrimp fishing season.

Jones, Albert C., James M. Nance, and William O. Antozzi (1994). "A Review of the Royal Red Shrimp Resource and Fishery in the Gulf of Mexico." Report prepared for the Gulf of Mexico Fishery Management Council by the Southeast Fisheries Science Center and the Southeast Regional Office, National Marine Fisheries Service, September 19.

Possible management options for royal red shrimp are reviewed in this report. The report also presents information on the biology, fishery, and market situation for royal red shrimp.

Jones, Christopher B. (1989). "Sea Level Rise: Assessing the Scientific Debate." Joint Working Group on Policy and Planning Implications for Global Climate Change in the Pacific Basin, Pacific Basin Development Council, UH Social Science Research Institute, March, pp. 27.

This paper summarizes the background of scientific issues and debates surrounding the climate change headlines. While the goal is to present a balanced, reflective portrait of those debates, the overall message sent to policy-makers and planners must still be the need to act now to plan for this emerging global crisis. In other words, while various interpretations exist as to whether the sea level is rising, it is abundantly clear to this author that policies and planning for action must be developed soon.

Jones, Lonnie L., John W. Adams, Wade L. Griffin, and Jeffrey Allen (1974). "Impact of Commercial Shrimp Landings on the Economy of Texas and Coastal Regions." TAMU-SG-75-204, NOAA Grant No. 04-3-158-18, December, pp. 18.

The value of commercial shrimp landings for 1971 in the state of Texas was \$63.9 million. In the three coastal regions of Brownsville-Aransas, Port Lavaca-Galveston, and Beaumont-Port Arthur in 1971 this value was \$37.6, \$23.6, and \$2.7 million, respectively. These commercial shrimp landings have a significant impact on the economy of Texas and on the economies of the three coastal regions. The estimated direct, indirect and induced impact of 1971 commercial shrimp landings on the Texas economy was \$197.2 million in output; \$56.8 million in personal incomes; and 6,083 persons employed. Within the Brownsville-Aransas region, the \$37.6 million landings by the commercial shrimp industry stimulated total economic output of \$92.5 million. The \$23.6 million landings by the commercial shrimp industry within the Port Lavaca-

Galveston region stimulated total economic output of \$55.9 million. Total economic output of \$8.5 million was stimulated by the \$2.7 million landings by the commercial shrimp industry within the Beaumont-Port Arthur region.

Jones, Robert P. and Chris Doolin (1990). "Industry and Regulatory Interface to address Concerns for Seafood Product Quality and Safety." Southeastern Fisheries Association, Inc., Tallahassee, Florida, June.

A series of meetings were arranged to discuss regulatory and industry responsibilities and concerns concerning seafood product quality and safety.

Jones, Robert P., Chris Doolin, Barbara Jean Gravlee, Malinda U. Jones, and Kayce Stewart (1992). "An International Conference on Bycatch in the Shrimp Industry." Conference Schedule & Abstracts, May 24-27, Lake Buena Vista, Florida, Southeastern Fisheries Association, Inc. and National Oceanic and Atmospheric Administration.

Abstracts from an international conference on bycatch whose objectives were to summarize information on the status of the bycatch problem and alternative shrimp harvesting techniques for bycatch reduction, identify future research needs for addressing bycatch, obtain input from scientists, fishermen, fishery managers, and environmentalists on future management strategies, and provide for the dissemination of research and conference recommendations for evaluation by representatives of the scientific, commercial and recreational, and environmental communities.

Jones, T.M., J.W. Hubbard, and K.J. Roberts (1979). "Productivity and Profitability of South Carolina Shrimp Vessels, 1971-75." Marine Fisheries Review, 41:8-14.

This study uses data from a 45 vessel sample of South Carolina's double rig resident shrimp trawlers to analyze resource productivity and profitability in the fishery from 1971 to 1975. Smaller vessels (<55 feet) were more profitable, and averaged 14 years older than the larger (>55 feet) vessels and had lower operating costs. Placing vessels of both size classes on the same risk and financing cost basis would result in slightly higher percentage returns, i.e. lower losses, to investment in the larger trawlers than to investment in the smaller trawlers. The opportunity cost analysis indicated that shrimping labor is earning less than its opportunity income, as is new capital investment, but that management (the vessel captains) is earning above what it would in its best alternative. The larger vessels typically possessed about 1.4 times the fishing power of the typical smaller vessels; engine horsepower was the most significant predictor of fishing power. However, multiplication of the vessel fishing power index by the transformed fuel consumption variable showed that the average larger vessel exerted only 15 percent more effort in the fishery than did the typical smaller vessel.

Josuweit, Helga (1989). "The European Shrimp Market - Coldwater Versus Warmwater." Globefish Research Programme, Vol. 3, Food and Agriculture Organization of the United Nations, Fishery Industries Division, 00100 Rome, Italy, November, pp. 48.

This study examines current markets and future market prospects for coldwater and warmwater shrimp in the European Community. The study is divided into 4 parts. A brief analysis is given of the present production situation for coldwater shrimp in European countries, the general supply patterns as well as brief information on competing markets for European

coldwater shrimp.

Jovanovic, Boyan and Saul Lach (1989). "Entry, Exit, and Diffusion with Learning by Doing." The American Economic Review, 79(4):690-699.

Early entry has the advantage of higher revenues per unit of output early on. Late entry has the benefit of learning from the experience of earlier entrants, and hence lower production costs. These advantages are balanced off in a continuous time perfect foresight equilibrium. Competition generates S-shaped diffusion, and staggered entry and exit. A monopolist will innovate less than a competitive industry, but the innovation that he does do, he will do sooner.

Juan, Ya-Sheng, Wade L. Griffin, and Addison L. Lawrence (1988). "Production Costs of Juvenile Penaeid Shrimp in an Intensive Greenhouse Raceway Nursery System." Journal of the World Aquaculture Society, 19(3):149-160.

This analysis compared the use of an intensive nursery raceway system with direct stocking of post-larval shrimp (PLS) into growout ponds. The intensive raceway system allows two crops to be produced in Texas where only one crop is feasible with direct stocking. Both investment and operational costs are analyzed for three types of greenhouses and three types of raceways where the types vary in cost and lengths of life. Three growout pond stocking densities and two farm sizes were evaluated for each combination of greenhouse and raceway type. Investment costs ranged from \$142,000, for the small farm using the least expensive greenhouse and raceway and utilizing the lowest stocking density, to about \$2.3 million, for the large farm using the most expensive greenhouse and raceway, respectively, per 1,000 one gram juveniles produced. Under technology available at the time of this analysis, direct stocking growout ponds with PLS and producing one crop per year is more profitable than stocking one gram juveniles and producing two crops per year on the Texas coast.

Judd, Kenneth L. (1991). "A Review of Recursive Methods in Economic Dynamics." Journal of Economic Literature, 29(March):69-77.

Book review.

Juhl, Rolf and Shelby B. Drummond (197?). "Shrimp Bycatch Investigation in the United States of American, A Status Report." National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Pascagoula Laboratory, Pascagoula, Mississippi.

Shrimp have supported the most valuable fishery in the United States for many years. Although the fishery for the cold water species Crangon and Pandalus has increased in recent years in the New England and Alaska areas, the mainstay is still the penaeid shrimp of the southeastern United States. Three species make up the bulk of the catch, Penaeus aztecus, P. duorarum, and P. setiferus. The center of this fishery is in the Gulf of Mexico and along the southeastern seaboard of the United States. The average annual catch of penaeids over the past 25 years has been close to 100,000 tons in those areas. Production in recent years from other countries in the CICAR area, including Brazil, has been 70,000 tons; worldwide the total annual catch is close to 700,000 tons. Minor periodic annual variations in production have occurred, attributed generally to adverse environmental or economic factors. Although the shrimp bycatch problem was long known in the United states, it was not until late 1972 that a project was implemented to study the situation. Basic

information was needed for management purposes, for possible use of bycatch and for application to design of gear that would reduce the catch of fish (savings gear), e.g., electric or separator trawls. In view of the relevance of the bycatch problem to other nations in the CICAR area, a description of the ongoing work and preliminary results are presented.

Juneau, Conrad L. Jr. and Judd F. Pollard (1981). "A Survey of the Recreational Shrimp and Finfish Harvests of the Vermilion Bay Area and Their Impact on Commercial Fishery Resources." Technical Bulletin No. 33, Louisiana Department of Wildlife and Fisheries, New Orleans, Louisiana, July, 40 pp.

A creel survey was conducted within a portion of Vermilion Bay, Louisiana, that included data on both finfish and shrimp. Data collected included instantaneous counts and pertinent information from field interviews. Effort, catch per hour, and harvest were calculated for both recreational and commercial finfish fishermen and shrimpers. Comparisons of catch, effort, and harvest were also made among user groups and how each related to the resource. Recommendations are made concerning the management of the associated fisheries.

Just, Richard E. and Darrell L. Hueth (1977). "Welfare Measures in a Multimarket Framework." Working Paper No. 11, California Agricultural Experiment Station, Giannini Foundation of Agricultural Economics, November, 15 pp.

This paper has studied welfare measures in a vertically structured sector. The area behind a general equilibrium demand curve in an intermediate market does not measure benefits to buyers in that market alone, but rather measures the sum of rents to producers selling in all higher markets plus final consumer's surplus. Symmetrically, the area behind the general equilibrium supply curve in an intermediate market measures not only rents for producers selling in that market, but also rents for all producers selling in more basic markets plus initial resource supplier's surplus. A simple and practical approach to studying the distribution of welfare effects over all other market groups in a sector is thus to estimate areas behind general equilibrium supply and demand curves in the market of interest.

Just, Richard E. and Darrell L. Hueth (1979). "Welfare Measures in a Multimarket Framework." American Economic Review, 69(5):947-954.

This paper has studied welfare measures in a vertically structured sector. The area behind a general equilibrium demand curve in an intermediate market does not measure benefits to buyers in that market alone, but rather measures the sum of rents to producers selling in all higher markets plus final consumer's surplus. Symmetrically, the area behind the general equilibrium supply curve in an intermediate market measures not only rents for producers selling in that market, but also rents for all producers selling in more basic markets plus initial resource supplier's surplus. A simple and practical approach to studying the distribution of welfare effects over all other market groups in a sector is thus to estimate areas behind general equilibrium supply and demand curves in the market of interest.

Justen, Michael E. (1988). "The Federal Fisheries Permit Program of the Coastal Migratory Pelagic Fishery Off the Southeastern United States." Draft report, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, Florida.

As part of a management strategy to rebuild the depleted stocks of king

and Spanish mackerel, the Gulf of Mexico and South Atlantic Fishery Management councils developed ceilings on catches and Allocated portions to the recreational and commercial harvesters. Recreational anglers must comply with bag limits and a quota while the commercial anglers comply with a quota. Federal fisheries permits identify and allow the owner or operator to possess mackerels in excess of the bag limits. To qualify for a permit, an owner or operator of the fishing vessel must derive at least 10 percent of their earned income from commercial fishing. Earned income means wages and salaries of crew on a commercial fishing vessel, gross income from the sale of fish for a commercial fishing business, or income from services involving the sale of fish. Since the permit and earned income requirements became regulations in 1985, this combination has been effective at identifying those anglers exempt from the bag limits and those anglers who must comply with them.

Kaczynski, Wlodzimierz (1979). "Responses and Adjustments of Foreign Fleets to Controls Imposed by Coastal Nations." J. Fish. Res. Board Can., 36:800-810.

Foreign distant water fishing fleets expanded quickly during the last 15 years and in some ocean areas accounted for a larger portion of the coastal fishery resources harvest than neighboring coastal nations. Extension of national jurisdiction sharply decreased these activities. Catch and fishing effort limitations imposed by coastal states were of particular concern for foreign fleets. To attenuate adverse effects of these restrictions, distant water fishing operators are considering three basic and mutually complementing solutions: better utilization of their own coastal resources until now frequently neglected, shifting a part of their fleets to open ocean fishing operations, and continuing highly restricted and reorganized fisheries in coastal zones of other nations. Fishing activities within the 200 mile economic zone involve utilization of surplus quotas allocated by coastal states, quicker development of joint venture operations with coastal partners, increased purchases of fresh fish from local fishermen, and transfer of technology and know how mainly to the developing coastal countries. Supplies of goods and services are also accepted by foreign fleets in exchange for access rights to the marine living resources of the coastal nations.

However, all these adjustments of foreign fleets are considered an intermediate stage of the long run trend in which the coastal state will be able to develop the resources without substantial participation of foreign fishermen. This trend is analyzed in the North Pacific distant water fisheries development during recent years.

Kagawa, Kenji, Yoshihiro Kuronuma, and Osamu Baba (1998). Economic Analysis Concerning Fishing Capacity. Prepared for the FAO Expert Consultation on Excess Capacity, La Jolla, CA by the Far Seas Fisheries Division, Fisheries Agency, Government of Japan, Tokyo, Japan, April, 20 pp.

Chapter 1 envisages the causes of excessive fishing capacity, its consequences and the measures to be taken on a comprehensive basis from the viewpoint of fisheries management. Specific explanations are given, taking the case of distant-water tuna longline fishing based on East Asia. Chapter 2 analyzes the possibility of reducing excessive fishing capacity by means of output control such as TAC and the effectiveness of such measures. Chapter 3 analyzes the possibility of input control such as control on the number of fishing vessels and its effectiveness.

Kahn, James R. (1988). "Measuring the Economic Damages Associated with Terrestrial Pollution of Marine Ecosystems." Marine Resource Economics, 4:193-209.

This paper looks at the problem of modeling the welfare consequences of the effects of environmental changes on the bioeconomic equilibrium of fisheries. The equilibrium catch equation is suggested as the most appropriate mechanism for modeling these effects. Several different models are presented, based on the availability of data. It is shown that a model in which the equilibrium catch function is estimated directly as a function of environmental quality will be superior to a model that takes the stock effects from an independent ecosystem model. Models are also suggested for those cases in which only proxies for stock levels are available, and for those cases in which no stock data are available. An earlier draft report is also included in the file.

Kahn, James R. and W. Michael Kemp (1985). "Economic Losses Associated with the Degradation of an Ecosystem: The Case of Submerged Aquatic Vegetation in Chesapeake Bay." Journal of Environmental Economics and Management, 12:246-263.

This study employs theoretical and empirical concepts from ecology and economics to derive a lower bound of the marginal damage function for reductions in the level of submerged aquatic vegetation (SAV) in Chesapeake Bay. These reductions in SAV are believed to be a consequence of the runoff of agricultural chemicals, discharges from waste treatment plants and soil erosion. The study examines the indirect ecological consequences of pollution in Chesapeake Bay fisheries in a fashion that is consistent with the economic theory of benefit measurement.

Kahn, James R. and Mark Rockel (1987). "Measuring the Economic Effects of Brown Tides." Draft report, Department of Economics, State University of New York at Binghamton.

This paper develops behavioral models for examining the reactions of marine resource users to reduced resource quality associated with brown algal blooms. Models of recreational and commercial fishing are developed, as well as other recreational uses that emphasize the concept that the presence of brown tides at certain sites will cause the substitution of other sites and other species. These substitutions will have additional implications for economic welfare. The conceptual models are applied to the bay scallop fishery where annual economic losses are of the order of two million dollars.

Kaitala, Veijo and Gordon R. Munro (1993). "The Management of High Seas Fisheries." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

This paper discusses the background to the high sea fishery resource issue and explores some of the economic aspects of the problem. A considerable part of the paper points out the many areas where economic research is still required. Also, important aspects of the problem are in a state of flux, since the surrounding legal framework is bound to be influenced by the forthcoming U.N. conference.

Kaitala, Veijo and Gordon R. Munro (1993). "The Management of High Seas Fisheries." Marine Resource Economics, 8(4): 313-329.

A new and acute management problem, now the focus of a major U.N. conference, has arisen in recent years in international fisheries. The problem concerns the management of transboundary fishery resources, in the form of resources to be found in both the coastal state EEZ and the adjacent high seas. The resources are commonly referred to as "straddling" stocks. This article provides a preliminary exploration of the management issue. It

reviews the historical and legal background and asks how far the now well developed economic analysis of the management of transboundary fishery resources in the form of resources "shared" by two or more coastal states will take us in examining this second and more recent transboundary fishery management problem. The answer is only a very limited distance. The article concludes by pointing to questions arising from this resource management issue demanding further research.

Kallio, John R. (1973). "European Demand Helps Spur New England Shrimp Catches." Marine Fisheries Review, 35(3/4):7-8.

A review of shrimp landings in Massachusetts, New Hampshire, and Maine.

Kalt, Joseph P. (1989). "Exhaustible Resource Price Policy, International Trade, and Intertemporal Welfare." Journal of Environmental Economics and Management, 17:109-126.

This study examines the welfare effects of alternative price policies for exhaustible resource markets. Dynamically optimal plans for resource producers are derived under laissez faire, temporary price controls, and import tariffs. The associated paths of consumer, producer, and aggregate social surplus are compared to produce rankings of the policies. In the presence of monopsonistic power on the part of a net importing nation, an import levy can be optimal. In general, price controls are welfare-inferior to laissez faire, unless the social cost of imports exceeds the private cost by an amount that rises rapidly over time.

Kan, Ting Tien, Joseph B. Aitsi, John E. Kasu, Tatsuro Matsuoka, and Henry L. Nagaleta (1995). Temporal Changes in Tropical Nekton Assemblage and Performance of a Prawn Selective Gear. Marine Fisheries Review, 57(3-4):21-34.

Bycatch problems in the regional prawn fisheries and their possible impacts on fishery planning and development in Papua New Guinea as a developing country are discussed. The gear tested may offer enormous ecological and economic benefits. The gear is multipurpose, extremely simple, and can also be used as a biological sampler.

Kanninen, Barbara J. (1995). Bias in Discrete Response Contingent Valuation. Journal of Environmental Economics and Management, 28:114-125.

The empirical literature on discrete response contingent valuation has found that seemingly innocuous changes in the statistical models estimated result in significantly different point estimates of willingness to pay. This paper hypothesizes and tests several potential explanations for these results. First, it investigates and compares the biases inherent in single-bounded and double-bounded maximum likelihood estimation procedures and examines how they react to various bid designs and sample sizes. Then, it examines the presence and identification of outliers in binary choice data and how these outliers influence estimation. Finally, it presents an alternative approach to addressing the issue of outliers which explicitly acknowledges the possibility of upwardly biased response probabilities.

Kanninen, Barbara J. and M. Sami Khawaja (1995). Measuring goodness of Fit for the Double-Bounded Logit Model. The American Journal of Agricultural Economics, 77(4):885-890.

The traditional approaches of measuring goodness of fit are shown to be

inappropriate in the case of the double-bounded logit models. An alternative approach called the sequential classification procedure is presented as a possible alternative to the standard tests. The double-bounded logit model is reviewed along with the standard goodness-of-fit measures. The sequential classification procedure and its features are presented in the context of an empirical example.

Kaoru, Yoshiaki, V. Kerry Smith, and Jin Long Liu (1995). Using Random Utility Models to Estimate the Recreational Value of Estuarine Resources. American Journal Agricultural Economics, 77(1):141-151.

In this paper we describe a model using a household production framework to link measures of nonpoint source pollution to fishing quality and a random utility model to describe how that quality influences sport fishing parties decisions in North Carolina. The results provide clear support for using a model that evaluates the effects of pollution on the activities and decisions associated with the fishing activity once a trip is taken. Site selection decisions are then conditioned on the anticipated quality of fishing sites. The framework also has the advantage of linking the spatial, technical, and economic information required to evaluate the management plans required for estuaries under the National Estuarine Program.

Karas, Nick (1995). "History of Giant Tuna in Atlantic." Outdoors column, source unknown.

A history of the bluefin tuna fishery in the western North Atlantic as a game fish and commercial fishery.

Karp, Larry, Arye Sadeh, and Wade L. Griffin (1986). "Cycles in Agricultural Production: The Case of Aquaculture." American Journal of Agricultural Economics, 68(3):553-561.

The problem of determining optimal harvest and restocking time and levels is considered. A continuous time deterministic control problem is used to study the case where production occurs in a controlled environment. A stochastic control problem is then used to determine rules for the cultivation of P. stylirostris which occurs in a stochastic environment. The deterministic analog of the problem is also solved. The two solutions are used to develop a measure for the value of a controlled environment and for the value of information about the stochastic environment.

Karpoff, Jonathan M. (1984). "Insights from the Markets for Limited Entry Permits in Alaska." Can. J. Fish. Aquat. Sci., 41:1160-1166.

Under Alaska's entry limitation program, transferable permits convey fishing rights. Information from permit markets is used to study several key issues regarding the behavior of fishermen and the effects of fishery management policy. I conclude that (1) expectations of future fishing incomes are the primary determinants of permit prices, (2) Alaska Department of Fish and Game forecasts of fish recruitment are capitalized in permit values, (3) a state program that provides low interest loan money to some purchasers of permits has coincided with a significant increase in permit prices, (4) the "average memory" of fishermen in projecting future incomes is about 2.5 years, and (5) it is possible to infer the rate at which the markets discount future fishing income flows.

Karpoff, J.M. (1985). "Time, Capital Intensity, and the Cost of Fishing Effort." Western Journal of Agricultural Economics, 10(2):254-



If the short run marginal costs of setting and retrieving a net one more time, fishing an extra day, or setting an extra pot or trap are constant, then the prediction by Anderson (1976) that entry limitations preserve a portion of the fishery's value could be invalid. A vessel's optimum capital intensity depends on the length of the fishing season. The shorter the fishing season, the less time each fisherman has to utilize his capital to harvest fish, and the less total fishing effort is applied to the fishery. Since higher levels of catching power are now utilized over a shorter fishing season, they lose some of their cost advantages, and less capital intensive vessels become more cost effective. Stricter time constraints penalize more capital intensive vessels relatively heavily and create wealth transfers among classes of fishermen.

The logical extension of this line of reasoning would be that less capital intensive vessels tend to dominate fisheries that have severely limited fishing seasons. However, in practice it would appear that more capital intensive vessels appear in fisheries that are the most time restricted, e.g. the herring fisheries in the Pacific northwest. Perhaps this result occurs because of the author's use of time in a static analysis or because of the failure to consider the common property externality explicitly in his analysis.

Karpoff, Jonathan M. (1987). "Suboptimal Controls in Common Resource Management: The Case of the Fishery." Journal of Political Economy, 95(11):179-194.

The discrepancy between elaborate proposals to solve the common pool fishery problem and actual fishery regulations is examined. The self-interest hypothesis of regulation and fisherman heterogeneity can explain two historically popular types of fishery regulations, season closures and capital constraints. These have differential impacts on fishermen and typically redistribute the fishery's harvest from more efficient toward less efficient producers. To the extent that fishermen indigenous to a regulatory body's jurisdiction also tend to be relatively inefficient, it is predicted that these regulations will withstand the theory and data that demonstrate their suboptimality.

Karpoff, J.M. (1989). "Characteristics of Limited Entry Fisheries and the Option Component of Entry Licenses." Land Economics, 65(4), pp. 386-393.

The paper examines conditions under which fishermen are likely to support entry restrictions. Entry restrictions generate positive (quasi-) rents precisely because they exclude or have the potential to exclude some fishermen. The probability of exclusion is positive for most fishermen, so advocacy of entry restrictions is not riskless. For many fishermen the risk of exclusion outweighs the expected gain from restricted competition. When fishermen do advocate entry restrictions, they do so when the expected net gain is positive.

Kates, Robert W. (1996). Ending Hunger: Current Status and Future Prospects. Consequences, 2(2):2-11.

This assessment describes what is now known about global hunger, past and present trends, and the possibility of ending hunger in a world with at least twice the current population. It begins by defining what hunger means, and reviewing current estimates and trends in the number and location of hungry people in the world today.

Kato, Y. (1996). Expert Consultation on Fishing Capacity. FAX to William Fox, Chief Scientific Advisor, NMFS, Silver Spring, MD, from Director FIP, fisheries Department, FAO, Rome, Italy.

Expert consultation on management of fishing capacity prospectus.

Kaufmann, Barry, and Gerry Geen (1997). Cost-Recovery as a Fisheries Management Tool. Marine Resource Economics, 12(1):57-66.

The current widespread use of taxpayer-funded public sector institutions to deliver fisheries management services limits the likelihood of successfully implementing any solution. Our opinion is that full cost-recovery of fisheries management services, by motivating fishers to demand cost effective management and stronger property rights, represents a powerful stimulus to the evolution of more effective institutional and operational arrangements. Such arrangements are likely to feature an increasing provision of fisheries management services by the private sector.

Kazmierczak, Richard F., Jr. and Rex H. Caffey (1995). Management Ability and the Economics of Recirculating Aquaculture Production Systems. Marine Resource Economics, 10(2):187-209.

A bioeconomic model of fish growth in recirculating aquaculture systems was constructed by developing a bioenergetic model comprised of metabolic submodels for growth, ammonia production, and oxygen consumption. Metabolite accumulations are determined by exogenous control variables for filtration and aeration and used to indirectly represent management ability. Numerical solutions to model parameters were obtained using a two point boundary shooting algorithm within a dynamic profit maximization framework. Optimal trajectory, isoquant, and bioeconomic optimization analyses describe specific tradeoff relationships existing between nutrition, density, and technology. Results demonstrate the economic importance of these relationships changes over time in response to fish weight, and not always in ways suggested by the physical importance of individual factors. Specifically, economically viable tradeoffs between dietary protein and stocking density occur over relatively narrow regions to management ability. Without highly experienced and capable management, the biological realities of recirculation systems may preclude profitable system operation.

Kazmierczak, Richard F., Jr., Hector O. Zapata, and Hamady Diop (1997). Noncompetitive Pricing and Exchange Rate Pass-Through in Mauritanian Octopus Export Markets. Journal of Agribusiness, 15(1):85-102.

Octopus exports are an important source of foreign exchange earnings for Mauritania. The export market has historically been dominated by coordinated Japanese buyers, a situation that led Mauritania to create the Societe Mauritanienne de Commercialisation de Poisson (SMCP) to negotiate with buyers and manage all octopus exports. Issues concerning competitiveness, price discrimination, and exchange rate pass-through in the Mauritanian octopus export market were empirically examined in this study using a seemingly unrelated regression model corrected for contemporaneous and serial correlation. Results indicate some degree of price discrimination across destination markets, market share enhancement through local currency price stabilization, and increases in marginal costs of production following nationalization of the Mauritanian trawler fleet. Thus, while creation of the SMCP did not result in the development of complete countervailing market power, Mauritania has managed to enhance the position of its octopus exports in the lucrative Japanese market.

KCA Research, Inc. (1992). "Management Summary, Socio-Economic Survey of Reef Anglers, 1991 Marine Recreational Fishery Statistics Survey." Prepared for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Contract No. 50-DGNF-0-00062, KCA Research, Inc., 5501 Cherokee Avenue, Suite 111, Alexandria, Virginia 22312, March.

A contract report on the data collection of socio-economic data pertaining to reef anglers fishing in the Gulf of Mexico. The report includes quota and refusal rate tables, respondent comments, respondent logbook review survey, and results.

Kealy, Mary Jo and Richard C. Bishop (1986). "Theoretical and Empirical Specifications Issues in Travel cost Demand Studies." American Journal of Agricultural Economics, 69(3):660-667.

A travel cost demand model is derived from a utility function that postulates that individuals choose the optimal total number of site recreation days given by the product of the number of length of their recreation trips. By relaxing the assumption that on-site time is constant across recreationists, the applicability of the travel cost method is extended. The model is estimated using a maximum likelihood procedure appropriate for the truncated sample data that is characteristic of most user specific recreation data. Failure to do so would result in overestimating the value of Great Lakes fishing by 3.5 times.

Kearney/Centaur (1984). "Economic Impact of the Commercial Fishing Industry in the Gulf of Mexico and South Atlantic Regions." Final report, Gulf and South Atlantic Fisheries Development Foundation, Inc., February, 202 pp.

This report describes and estimates the overall economic impact of the commercial fishing industry in the South Atlantic and Gulf region.

Kearney/Centaur (1986). "Socio-Economic Analysis of Commercial and Recreational Fisheries in Everglades National Park." Final report, Everglades National Park, National Park Service, U.S. Department of Interior, September, 146 pp.

This report examines the economic impact of fishing in Everglades National Park. The first section describes the methods that were employed to make the various economic impact estimates. The second section summarizes the economic impact trends for the various Park fisheries and compares the economic impact of fishing in the Park with the surrounding Florida areas. Section 3 presents more detailed economic impact estimates for the Park and the surrounding areas. Section 4 briefly summarizes background demographic and land use trends for the Florida areas surrounding the Park. Literature cited is presented in section 5. Exhibits presenting tabular and graphic data are presented in Appendices 1, 2, 3, and 4 corresponding to the material covered in sections 1, 2, 3, and 4.

Kearney/Centaur (1988). "Development of Value Added, Margin and Expenditures for Marine Fishery Products." Final Report prepared for the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Silver Spring, MD, Purchase Order No. 40AANF701801, by Kearney/Centaur, Division of A.T. Kearney, 225 Reinekers Lane, Alexandria, VA 22313, February.

The objectives of this study are to describe and estimate the overall economic impact of the commercial fishing industry in terms of their sales and value added contribution to the U.S. economy, estimate total consumer expenditures for fishery products, allocate these key economic measures between the sectors of the industry (fishermen, processors, distributors, etc.), standardize the process so that the framework can be applied in subsequent years, and provide documentation of the approach.

Kearney/Centaur (1988). "Working Papers for the Development of an Economic Health Index for the Fishing Industry." Final Report prepared for the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Silver Spring, MD, Purchase Order No. 40AANF802385, by Kearney/Centaur, Division of A.T. Kearney, 225 Reinekers Lane, Alexandria, VA 22313, February.

By relating changes in revenues to changes in cost over the 1976 to 1986 time period, indicators of the economic health of each major domestic commercial fishery under federal management are measured.

Kearney/Centaur (1989). "The First Ten Years: An Overview of U.S. Fisheries Managed Under The Magnuson Act, 1976-1986." Final Report prepared for the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Silver Spring, MD, Purchase Order No. 40AANF900823, by Kearney/Centaur, Division of A.T. Kearney, 225 Reinekers Lane, Alexandria, VA 22313, July, 153 pp.

This report summarizes the key factors and status associated with each of 28 Fishery Management Plans initiated between 1976 and 1986. This document summarizes the biological status, management measures, key economic information, and the overall status of the resources in each Fishery Management Plans.

Kearney/Centaur (1990). "Evaluation and Demonstration of Valuation Methodologies Applicable to Sport and Commercial Fisheries." Draft report, Alexandria, VA.

The draft report covers ex-vessel demand models, recreational benefit valuation, international trade issues in valuation of commercial fisheries, commercial fisherman behavior, and multiple objectives in fishery allocation decisions. The report does not provide a combined approach to addressing allocation problems between sport and commercial fishermen.

Keen, E.A. (1983). "Common Property in Fisheries. Is Sole Ownership an Option?" Marine Policy, (July):197-211.

Limited entry has been instituted in a variety of fisheries in different countries. The volume of literature evaluating its use and developing ways to make it more effective as a fisheries management tool is large and growing. It has not worked well, primarily because rights have created a focus on harvest, not on husbandry. The efficacy of sole ownership rights in management of resources of the forest and field are clear. A case for research and development of sole ownership as a rights system for fishery resources is made in this article.

Keen, Elmer A. (1991). "Ownership and Productivity of Marine Fishery Resources?" Fisheries, 16(4):18-22.

The incentives of the commons ceased to suffice as a management framework for marine fishery resources during the 1960's. The laws of demand and supply went awry. Demand rose; supply of the more valuable species declined as fishing effort increased. Measures taken to solve the resulting overfishing problem have failed to remove the root cause, the incentives of harvester rights inherent in a commons. The resulting management system creates ill will and friction that severely impedes management of the resources. The efficacy of a management framework based on ownership of the ocean pastures is compared to one based on rights to harvest. The conclusion is reached that a full owner framework provides a well tested basis for management of marine fishery resources that can result in a large increase in resource benefits.

Keiser, Richard K., Jr. (1976). "Species Composition, Magnitude and Utilization of the Incidental Catch of the South Carolina Shrimp Fishery." South Carolina Marine Resource Center, Technical Report Number 16, September, 1976.

The quantity of fish caught incidental to shrimping activities in South Carolina was estimated by determining fish/whole shrimp ratios from commercial catches. The overall median fish/shrimp weight ratio was 1.94:1; however, the median ratio varied seasonally being smaller from September to December (1.24:1) than from May to August (3.58:1). The confidence interval for this estimate was defined by the 25<sup>th</sup> and 75<sup>th</sup> percentiles. An estimated fish catch of between 3,358,000 and 15,197,000 kgs was derived from expansion of detailed ratio estimates derived from this study. Sciaenids were the predominant family during the study except for the months of January and April when clupeids and gadids, respectively, comprised the greatest percentage of the catch. In general, fish caught incidental to shrimping were small; mean total lengths of 25 species ranged from 6.90 to 18.58 cm. At the present time, only a fraction of the total incidental catch is landed; the majority is discarded at sea. This apparently reflects a lack of demand for most species captured. It is estimated that 74% of the flounder catch is landed and sold as food fish compared to less than 2% of the sciaenids and scombrids.

Keiser, Richard K., Jr. (1977). "The Incidental Catch from Commercial Shrimp Trawlers of the South Atlantic States." South Carolina Marine Resources Center, Technical Report Number 26, October, 38 pp.

Fish:shrimp (heads-on) ratios ranged from a low of 1.2:1 to a high of 4.0:1. Expansion of ratios indicated that an average of 69.4 million pounds of fish were caught by shrimp trawlers each year from 1973 to 1975. This was more than 24 times the 2.9 million pounds reportedly landed each year. Flounders and edible size kingfish, spot, and croaker were the predominant species landed, while industrial size fish (primarily small sciaenids) were discarded.

Keithly, Walter R. (198?). "An Analysis of Foreign Competition and Implications for the U.S. Shrimp Industry." Draft report, Coastal Fisheries Institute, Center for Wetland Resources, Louisiana State University, Baton Rouge, LA.

Imports represent a large and growing component of the total U.S. shrimp supply. Industry, concerned with their trend, has in the past attempted to control imports. Before national policy can be made, policy makers must have an understanding of the role of imports in the U.S. market. The purpose of this study was to provide an understanding of the U.S. shrimp industry, the underlying factors responsible for the recent rise in imports, the role of

imports in establishing prices, and the effects of alternate policy options. Results indicate that tariffs, at least within realistic ranges, would be only marginally successful in limiting imports and increasing domestic prices. Quotas would be more successful than tariffs at achieving the aforementioned objectives.

Keithly, Walter (1991). "Louisiana Seafood Industry Study, A Summary." Report prepared for the Louisiana Seafood Promotion and Marketing Board New Orleans, Louisiana, June, 32 pp.

A summary of commercial seafood and aquaculture production, employment, processing and wholesaling activity, and economic impacts of commercial fishing industry in Louisiana.

Keithly, Walter R. (1994). "Report to the Panel and Meeting Participants on a Test for Possible Bias Due to Interview Frequency." Draft report, Center for Coastal, Energy, and Environmental Resources, Louisiana State University, Baton Rouge, LA.

There is a significant, but subtle trend from a flat or slightly more frequent sampling of high CPUE vessels in the early 1980's to a more frequent sampling of low CPUE vessels in the late 1980's and 1990's. This trend is in the direction that would be expected to inflate the estimates of shrimp fishing effort. The overall effect may not be great, but this remains as one potential source of bias.

Keithly, Walter R. (1994). "Report to the Gulf Council on Shrimp Effort." Presented at the Gulf of Mexico Fishery Management Council Meeting in Corpus Christi, Texas, May, 30 pp.

This report presents the results of a review of the Gulf of Mexico shrimp landings data set. The panel of experts found that a bias in the data of between 0 and 20 percent exists in the data set. A number of recommendations are included in the report including the suggestion that another panel be created to determine the exact magnitude of the bias and methods that could correct it.

Keithly, Walter R. (1999). Analysis of a Short Run Production Function for Highly Migratory Species (HMS). NMFS contract Number 40GANF600144, Louisiana State University, Coastal Fisheries Institute, October, 34 pp.

An economic analysis of the U.S. based surface long-line fishery operating in the Atlantic, the Gulf of Mexico, and the Caribbean Region is provided. The analysis is conducted at the trip level since this is likely to be the level at which short run decisions are most relevant to the individual firm whose other components of effort are fixed during this period of time. This aggregate analysis will help explain the response in aggregate catch to changes in the short run inputs under the control of the individual fishing firm at the trip level and can be used to help analyze the potential in aggregate trip catch that might be forthcoming as a result of regulations that limit activities at the trip level but are not specific to individual species. Non-separability in outputs and jointness in inputs suggests that attempts to manage any particular species in this multi-product sector must consider possible spillover effects into the other fisheries.

Keithly, Walter R. and Assane Diagne (1998). "An Economic Analysis of the U.S. Shrimp Market and Impacts of Management Measures." Final Report, Saltonstall-Kennedy Contract # NA57FD0070, Louisiana State

University, Coastal Fisheries Institute, May, 113 pp.

The primary purpose of this study was to analyze world trade in warm-water shrimp, with emphasis given to the United States and Japan. Toward this end, a ten equation system of import demand and export supply functions was developed and estimated using quarterly time-series data covering the 1985-95 period. In addition, an equation depicting the Gulf of Mexico dockside price was developed and estimated using quarterly time-series data for the 1980-95 period. Results from this exercise were then used to forecast expected changes in certain relevant endogenous variables, particularly the Gulf of Mexico dockside price, that would likely be forthcoming as a result of specific changes in the levels of some key exogenous variables, such as regional aquaculture production.

Keithly, Walter R., Jr. and Anthony Martin (1997). "Southeast Finfish Processing Activities of Federally Managed Species, Particularly Reef Fish, and Potential Impacts of Regulation." Final Report, National Marine Fisheries Service, NA47FD0290, Coastal Fisheries Institute, Louisiana State University, May, 107 pp.

This study provided a detailed analysis of the Southeast Reef Fish processing industry for 1995 (which includes almost all processors of species under jurisdiction of the South Atlantic and Gulf of Mexico Management Councils) to help identify potential impacts related to management measures imposed on the harvesting sector. The primary conclusion reached from this research effort is that the extreme diversity of the southeast U.S. processing industry (in terms of number of species utilized etc.) and the large supply of domestic and imported raw material relative to current usage among processors will tend to insulate processors somewhat from restrictions imposed on the harvesting sector that would limit the overall supply of domestic product.

Keithly, Walter R., Jr. and Liz Baron-Mounce (1990). "An Economic Assessment of the Louisiana Shrimp Fishery." Final Report, National Marine Fisheries Service, NA88WC-H-MF179, Coastal Fisheries Institute, Louisiana State University, October, 129 pp.

The goal of this report is to provide a general economic evaluation of Louisiana's shrimp harvesting sector focusing on the inshore component since it is not well understood and because of the possibilities for management available to the state.

Keithly, Walter R., Jr. and Liz Baron-Mounce (1991). "Louisiana's Shrimp Fishery: An Economic Perspective with Emphasis on the 1987 Inshore Fleet." Draft Report, Coastal Fisheries Institute, Center for Wetland Resources, Louisiana State University, Baton Rouge, Louisiana.

Louisiana leads the nation in the poundage of shrimp produced. Its fleet, numbering upwards of 20 thousand in total, is exceedingly diverse which complicates any attempt at developing an "optimal" management strategy. For example, the smaller boats in the fleet tend to fish in and around the shoreline of the state and target relatively small shrimp as they migrate offshore. The larger boats are more offshore based and tend to target a larger shrimp which has a higher per pound price. Actions taken by the smaller inshore and near-shore boats impact the performance of the offshore fleet through a reduction in shrimp availability in offshore waters. This paper provides a general economic evaluation of the Louisiana shrimp fishery; particularly the inshore component. It was accomplished through the use of secondary and primary data. The secondary data consisted of National Marine

Fisheries Service data on shrimp landings and related effort data and also the Louisiana Department of Wildlife and Fisheries data on commercial shrimp license sales. The primary data were obtained through a 1987 survey of the Louisiana shrimp fleet. Such an evaluation is necessary before sound policy and management can be implemented.

Keithly, Walter R. and Fred J. Prochaska (1985). "The Demand for Major Reef Fish Species in the Gulf & South Atlantic Regions of the United States." Draft report.

A price dependent demand equation for reef fish species (grouper and snapper) is estimated using a sample of 15,000 households in the U.S. as a function of commercial landings, imports, disposable income, and a dummy variable representing institutional changes in market demand.

Keithly, W.R. and K.J. Roberts (1991). "An Economic Analysis of U.S. Shrimp Imports and Dockside Prices with Policy Implications." Draft Report, Center for Wetland Resources, Louisiana State University, Baton Rouge, La.

U.S. imports of shrimp have been increasing at record levels during the 1980's. These increased imports, and their potential impact on the domestic dockside price structure, have been of significant concern to the U.S. shrimp harvesting sector and have recently led to a Federal investigation conducted under Section 332(g) of the Tariff Act of 1930 which evaluated conditions of competition affecting the Gulf and south Atlantic shrimp fishery. This paper presents a model, developed within an appropriate statistical and economic framework, that explains the growth in U.S. imports of shrimp and their impact on dockside shrimp prices. Significant factors which were found to determine annual levels of shrimp imports include: (1) the price of imports, (2) southeastern shrimp landings, (3) beginning shrimp inventories, (4) U.S. real disposable income, (5) exchange rates, (6) the Japanese import price of shrimp, (7) world production of shrimp, and (8) foreign real income. Increased imports were found to have a significant negative impact on southeast shrimp dockside prices.

Keithly, Walter R. and Kenneth J. Roberts (1994). "Shrimp Closures and Their Impact on the Gulf Region Processing and Wholesaling Sector (Expanded to Include South Atlantic). Draft final report, MARFIN Contract No. NA17FF0376-01, Coastal Fisheries Institute, Louisiana State University, October, 94 pp.

The overall goal of the report is to provide an analysis of the Southeast shrimp processing sector at a level of detail sufficient to examine the impacts associated with seasonal/area closures. Specifically, the proposal called for the collection of data from a representative sample of Gulf Region processors and wholesalers pertaining to monthly production activities and impacts related to potential closures.

Keithly, Walter R. and Kenneth J. Roberts (1994). "Shrimp Closures and Their Impact on the Gulf Region Processing and Wholesaling Sector (Expanded to Include South Atlantic). Final report, MARFIN Contract No. NA17FF0376-01, Coastal Fisheries Institute, Louisiana State University, October, 107 pp.

The overall goal of the report is to provide an analysis of the Southeast shrimp processing sector at a level of detail sufficient to examine the impacts associated with seasonal/area closures. Specifically, the proposal called for the collection of data from a representative sample of



Gulf Region processors and wholesalers pertaining to monthly production activities and impacts related to potential closures.

Keithly, Walter R. and Kenneth J. Roberts (1994). "The Southeast U.S. Shrimp Processing Sector: An Economic Analysis of Structure and Impacts Related to Alternative Management Measures. Final report, Gulf and Caribbean Fisheries Institute, Inc., Coastal Fisheries Institute, Louisiana State University, November, 21 pp.

The southeast U.S. shrimp fishery has been the focus of considerable attention in recent years, the result of both its size and impacts on other fisheries. Seasonal and/or area closures of the shrimp fishery have been proposed in the gulf region as one means of protecting juvenile fish as well as increasing the shrimp yield. The impacts of seasonal/area closures on the shrimp processing sector, while important to this \$1.0 billion component of the southeast U.S. shrimp industry, are largely unknown to regulatory agencies responsible for imposing any such restrictions. This paper provides an analysis of 1991 Southeast U.S. shrimp processing activities based on a survey of processors throughout the region. The results can be used to help assess potential impacts on the processing sector resulting from harvesting regulations.

Keithly, Walter R. and Kenneth J. Roberts (1997). "An Economic Analysis of Private Market Wetland Values in Coastal Louisiana and Relevance in Designing Appropriate Economic Instruments for Restoration. Sea Grant Proposal, Coastal Fisheries Institute, Louisiana State University, 16 pp.

A proposal to conduct a hedonic analysis of prices for private sales of wetlands along the Louisiana Gulf of Mexico coast.

Keithly, Walter R. and Kenneth J. Roberts (1998). "Shrimp Closures and Their Impact on the Gulf Region Processing and Wholesaling Sector (Expanded to Include South Atlantic). National Marine Fisheries Service Contract Number NA17FF0376-01, Coastal Fisheries Institute, Louisiana State University, October, 107 pp.

The goal of this report was to provide an analysis of the southeast shrimp processing industry at a level of detail sufficient to assist in the analysis of the impacts on the processing sector related to area/seasonal closures at the harvesting level. Small and mid-size firms would be disproportionately impacted from any management measures that reduces overall domestic shrimp supply. Management measures that would increase the average size of shrimp at harvest would negatively impact the peeled raw component of the southeast shrimp industry. The raw headless component of the industry may benefit from any such action.

Keithly, Walter R., Jr. and Yunsheng Song (1996). A Review of World Shrimp Production and Trade: 1980-93. Center for Coastal, Energy, and Environmental Resources and the Department of Oceanography and Coastal Science, Louisiana State University, Baton Rouge, Louisiana.

Shrimp is one of the world's largest fisheries when measured in terms of the value of output. With the increased success of farming activities throughout the world, during the 1980's, world shrimp production, i.e., combined wild and farm raised harvests, expanded substantially. Trade in this important seafood commodity simultaneously expanded and became more complex in nature. First, shrimp production by primary producing areas of the world (i.e., Central America, South America, and Asia) are examined in this paper

during the 1980-93 period and changes therein are related to farming activities. Then, exports of shrimp products by region of the world are analyzed with respect to the two primary import markets, the United States and Japan. Changes in volume of trade, export prices and product composition are evaluated and related to production trends.

Keithly, Walter R., Jr., Assane Diagne, and Ronald J. Dugas (1998). The Demand for Oyster Relaying Activities in Louisiana: 1976-95. Draft Report, Coastal Fisheries Institute, Wetland Resources Building, Louisiana State University, Baton Rouge, Louisiana, December, 28 pp.

Louisiana leads the nation in terms of annual production of oyster meats. Production is derived from both leased water-bottoms and the public seed grounds. A sizeable amount of the water-bottoms under lease is under either conditional or restricted status. To make the best economic use of leases under these two statuses, lease holders will, at times, relay oysters from leases in conditional or restricted areas to leases in approved areas. This paper examines relaying activities in Louisiana during the 1976-95 period. Specifically, an econometric model was developed and estimated to examine the demand for relaying activities in the state. Results suggest that demand depends significantly on economic as well as environmental factors.

Keithly, Walter R., Andrea Wagner Liebzeit, and Michael Liffmann (1987). "Louisiana's Boating Sector: An Overview of the Industry." Coastal Fisheries Institute and Louisiana Sea Grant College Program, Center for Wetland Resources, Louisiana State University, Baton Rouge, LA, April, 30 pp.

This report examines the Louisiana boating sector through the use of secondary data detailing several facets of the industry. Aspects covered in the document include boat building and repairing, boat dealing and retailing, state registered boats and Coast Guard documented vessels. The Louisiana boating sector is also related to comparable sectors in other Gulf States and at the national level. Finally, while not discussed in great detail, statistics pertaining to the Louisiana ship building and repair industry are presented in Appendix A.

Keithly, Walter R., Kenneth J. Roberts, and Hope Eyster-Kearney (1993). "An Analysis of Economic Change in the Southeastern U.S. Blue Crab Processing Industry, 1973-90." Draft report, Coastal Fisheries Institute, Center for Coastal, Energy, and Environmental Resources, Louisiana State University, Baton Rouge, Louisiana, submitted to Marine Fisheries Review.

Processing is an often overlooked component of the U.S. seafood industry. This paper presents an economic analysis of the southeast U.S. blue crab processing industry, and changes therein, during the 1973-90 period. The analysis was conducted based on unpublished NMFS records on processing activities among individual blue crab processing firms in the Southeast. The analysis found that while blue crab processing activities, as measured in pounds processed, increased significantly during 1973-90, the deflated value of these activities increased only marginally due to a sharp decline in the deflated price of the processed product.

Keithly, Walter R., Kenneth J. Roberts, and Hope Eyster-Kearney (1993). "The Southeastern Seafood Processing Industry: An Economic Assessment for Private and Public Management Decision Making." Final Report to National Marine Fisheries Service Contract # NA90AA-H-SK-53, Coastal Fisheries Institute, Center for Coastal,

Energy, and Environmental Resources, Louisiana State University, Baton Rouge, Louisiana, December.

This report provides the results of an economic analysis of the southeastern seafood processing sector and uses this analysis for the purpose of examining historical and potential processor level impacts related to harvesting constraints; either natural or man induced.

Keithly, Walter R., Kenneth J. Roberts, and Hope Eyster-Kearney (1994). "Structural Changes in the Southeast U.S. Shrimp Processing Industry." Draft report, Coastal Fisheries Institute, Center for Coastal, Energy, and Environmental Resources, Louisiana State University, Baton Rouge, Louisiana.

The purpose of this paper is to examine structural changes in the southeast shrimp processing industry. The analysis, based on NMFS end-of-the-year surveys of seafood processing establishments, covers the 1973-90 period. Issues considered in the analysis included (1) changes in numbers of firms and shrimp products produced, (2) changes in productivity measured in terms of firm output and output per worker, and (3) changes in industry concentration and specialization. In general, results indicate a decline in the absolute number of southeast shrimp processors but a large increase in productivity per firm, measured on a poundage basis. Because of a decline in the per pound price of the processed products, however, deflated shrimp processing revenues per firm have remained essentially unchanged since the late 1970's.

Keithly, W.R., K.J. Roberts, and J.M. Ward (1991). "Farm-Raised Shrimp Production and Its Impact on the U.S. Market." Draft Report, Louisiana State University, Baton Rouge, Louisiana 70803.

A simultaneous model including the U.S. and Japan shrimp import markets and U.S. dockside demand was used to quantify the impacts of highly successful shrimp farming activities in the 1980's on U.S. imports and domestic warm water dockside shrimp prices. Results of the modeling effort suggest that current, i.e., 1988-1989, U.S. shrimp import levels would be in the neighborhood of 200 million pounds below observed levels in the absence of farm raised shrimp production on the world market and that the import price would be about 80% higher. The domestic dockside warm water shrimp price would also be significantly higher. Any rise in domestic warm water shrimp prices, brought about by a reduction in imports of the farm based product, was shown to encourage additional effort in the domestic shrimp fleet and a concurrent decline in industry profit.

Keithly, W.R., K.J. Roberts, and J.M. Ward (1991). "Effects of Shrimp Aquaculture on the U.S. Market: An Econometric Analysis." Draft Report, Louisiana State University.

Rapid expansion in the production of farm-raised shrimp during the 1980's concerns the domestic shrimp industry and is the basis for recent attempts at limiting imports. A simultaneous equation model including the U.S. and Japan shrimp import markets and U.S. dockside demand was used to quantify the impacts of shrimp aquaculture on U.S. imports and domestic warm water dockside shrimp prices. Results suggest that current, i.e., 1988-1989, U.S. shrimp import levels would be about 175 million pounds below observed levels in the absence of shrimp aquaculture and that the U.S. import price would be about 70% higher. The domestic dockside warm water shrimp price would also be significantly higher. Quotas and tariffs were also shown to positively influence domestic dockside prices. It was suggested, however, that any rise in domestic warm water shrimp prices, brought about by a

reduction in imports would encourage additional effort in the domestic shrimp fleet and a dissipation of initial gains in profit.

Keithly, Walter R., Kenneth J. Roberts, and John M. Ward (1993). "Effects of Shrimp Aquaculture on the U.S. Market: An Econometric Analysis." Chapter 8 in Upton Hatch and Henry Kinnucan (eds.). Aquaculture, Models and Economics. Westview Press, Boulder, Colorado.

Rapid expansion in the production of farm-raised shrimp during the 1980's concerns the domestic shrimp industry and is the basis for recent attempts at limiting imports. A simultaneous equation model including the U.S. and Japan shrimp import markets and U.S. dockside demand was used to quantify the impacts of shrimp aquaculture on U.S. imports and domestic warm water dockside shrimp prices. Results suggest that current, i.e., 1988-1989, U.S. shrimp import levels would be about 175 million pounds below observed levels in the absence of shrimp aquaculture and that the U.S. import price would be about 70% higher. The domestic dockside warm water shrimp price would also be significantly higher. Quotas and tariffs were also shown to positively influence domestic dockside prices. It was suggested, however, that any rise in domestic warm water shrimp prices, brought about by a reduction in imports would encourage additional effort in the domestic shrimp fleet and a dissipation of initial gains in profit.

Kellogg, Robert L., J.E. Easley, Jr., and Thomas Johnson (1988). "Optimal Timing of Harvest for the North Carolina Bay Scallop Fishery." American Journal of Agricultural Economics, 70(1):50-62.

Substantial improvement in returns for the North Carolina bay scallop fishery by delaying the opening of the season beyond its traditional date. A general bioeconomic harvesting model was developed for use in determining the optimal season opening/closing schedule for a seasonal fishery with the control specified as an on/off switch. One hundred and twenty separate scenarios were created by setting five exogenous variables to reasonable alternative values. The optimal season is contrasted with the unregulated case for each scenario. The optimal opening was typically two to three weeks later than the model of past practices.

Kelly, Carolyn E. and Anthony W. Harmon (1972). "Method of Determining Carotenoid Contents of Alaska Pink Shrimp and Representative Values for Several Shrimp Products." Fisheries Bulletin, 70(1):111-113.

An extraction method is described for estimating the amount of carotenoid in pink shrimp. The carotenoid index is useful as a measure of quality and as an indicator of changes during storage. Values for several shrimp products are reported.

Kemp, Murray C. and Ngo Van Long (1983). "On the Economics of Forests." International Economic Review, 24(1):113-131.

The paper describes a productive process involving the point input of labor, the repeated input of land and the point output of forest products, and then imbed the process in a model of the economy as a whole. The optimal duration or maturity of the process is to be determined in terms of the parameters of the model.

Kemmerer, Andrew J. (1994). "Overfishing." Texas Shores, Summer, pages

13 and 24, Sea Grant College Program, Texas A&M University.

A summary of the fisheries management problem in the southeastern region. Problems related to habitat, allocation between user groups, bycatch, individual transferable quotas, etc. are discussed and placed in a broader context.

Kemmerer, Andrew J. (1996). Letter to the Gulf of Mexico Fishery Management Council, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL, November, 9 pp.

Comments based on a review of Amendment 9 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, Regulatory Impact Review, Draft Supplemental Environmental Impact Statement, and Social Impact Analysis (9/20/96).

Kemmerer, Andrew J. (1996). Briefing for Upcoming Gulf of Mexico Fishery Management Council Meeting (November 11-14, 1996) in Point Clear, Al. Memorandum for Rolland Schmitt, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL, November, 3 pp.

Briefing memorandum for the Gulf of Mexico Fishery Management Council meeting in Pt. Clear, Alabama covering shrimp amendment 9 (bycatch reduction), reef fish, and stone crab.

Kenchington, T.J. and A.T. Charles (1989). A Definition of Fishing Capacity. Submitted to the Canadian Journal of Fisheries and Aquatic Sciences, 46:XXX-XXX.

We identify both the importance of fishing capacity to modern fisheries management and the lack of a definition of this parameter. A review of the concepts of capacity in the fisheries literature is used to elucidate the properties that the missing definition should have. Fishing capacity is then defined in terms of the fishing mortality that a boat or a fleet could exert under specified conditions. Capacity thus defined is contrasted with fishing effort, fishing power, and capital investment in the fishery. The remaining problems with this definition of capacity are examined and it is suggested that these are inevitable consequences of attempting to measure fishing capacity, regardless of the definition chosen.

Kennedy, F.S., J.J. Crane, R.A. Schlieder, and D.G. Barber (1977). "Studies of the Rock Shrimp, Sicyonia Brevirostris, A New Fishery Resource on Florida's Atlantic Shelf." Florida Marine Research Publications, Florida Department of Natural Resources, Marine Research Laboratory, Number 27, June, 69 pp.

Life history, fishery dynamics, and potential stock locations of the Florida east coast continental shelf population of rock shrimp were studied over a two year period.

Kennedy, John O.S. (1987). "A Computable Game Theoretic Approach to Modeling Competitive Fishing." Marine Resource Economics, 4(1):1-14.

A fishery is considered in which the young are harvested by one nation and the adults by another. The harvests are sold on separate markets. Finding the optimal strategies of the two nations is treated as a problem in dynamic noncooperative game theory. While in most other models players make

decisions simultaneously at each stage, in this model each player makes his decision separately in time, knowing the action of the previous player. The model is applied to the southern bluefin tuna fishery that is jointly exploited by Australia and Japan. The results of noncooperative and cooperative strategies are compared.

Kennedy, John O.S. and James W. Watkins (1986). "Time-Dependent Quotas for the Southern Bluefin Tuna Fishery." Marine Resource Economics, 2(4):293-313.

It is now officially recognized by the governments of Australia and Japan that the southern bluefin tuna fishery has been overexploited and that harvest must be controlled. A dynamic programming model applicable to multicohort fisheries is developed for finding approximately optimal time-dependent quotas. Results from applying the model to the southern bluefin tuna fishery indicate that restricting or eliminating the Australian catch of under 4 year olds would benefit both countries.

Kent, Samuel B. (1996). Final Judgement. Center for Marine Conservation, et al. V.S. Ronald Brown, et al., Civil Action No. G-94-660 and Texas Shrimp Association, et al. V.S.. Ronald, et al., Civil Action No. G-95-265 Consolidated, February 21, 55 pp.

The decision of the federal district court on the suit filed by the Center for Marine Conservation seeking to require the NMFS to perform its duties as required under the Endangered Species Act to prevent sea turtle strandings on the coast of the southeast region of the United States. The court rejected their claims and found in favor of the NMFS.

Kesteven, G.L. (1997). MSY Revisited. Marine Policy, 21(1):73-82.

Many values can be set for MSY or TAC of a fishery resource, among them the greatest occurs only rarely. With poor comprehension of the statistical character of MSY, few attempts to manage fisheries with reference to it have been successful. That outcome has resulted partly from inadequacies of the general paradigm of stock assessment, but more from failure to appreciate the significance of the economic and social terms of the exploitation equation. A plea is made for a system of fishery resources law which, of local, national, and international effect, would restrain the economic drives and social impulses that so far have frustrated the efforts of fishery administrators, denied industrial stability, and threatened resource survival.

Khilnani, Arvind (1979). "Evaluation of the Data Availability and Data Needs of the Tortugas Shrimp Model (FISYS Version T)." Stanford University, Department of Engineering-Economic Systems, Stanford, California, November, 8 pp.

In this report a qualitative evaluation of the data availability and needs of the Tortugas Model is considered. The model is a quantitative tool for estimating and evaluating the effects of alternative management policy options prior to actual policy implementation. The combination of a quantitative methodology and a policy orientation provide a natural framework to evaluate present data availability. Furthermore, the model indicates areas of data paucity together with a list for future data gathering activities.

Khilnani, Arvind (1980). "Estimation of Price Elasticity and Flexibility of Demand with Respect to the Tortugas Shrimp Fishery." Memorandum for Edison Tse, John Poffenberger, and Jim Tom, Stanford University, Stanford, California.

The memorandum discusses the relationship between price elasticity of demand and price flexibility estimates using pink shrimp data from the Tortugas shrimp fishery to estimate statistical relationships. No preference vis a vis a choice of independent variables was found in the data or theoretically.

Khilnani, Arvind and Edison T.S. Tse (1980). "Integrated Approaches to Fishery Policy Analysis: A Case Study of the Tortugas Shrimp Fishery." Executive Summary of the Final report prepared for Southeast Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Virginia Key, Miami, Florida, by Stanford University, Department of Engineering-Economic Systems, Stanford, CA, January, pp. 14-20.

An executive summary of the management characteristics and adaptability of a Fisheries System Management Model (FISYS) as applied to the Tortugas shrimp fishery off the southwest coast of Florida.

Khilnani, Arvind and Edison T.S. Tse (1980). "Integrated Approaches to Fishery Policy Analysis: A Case Study of the Tortugas Shrimp Fishery." Final report prepared for Southeast Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Virginia Key, Miami, Florida, by Stanford University, Department of Engineering-Economic Systems, Stanford, CA, January, 281 pp.

This report discusses the application and implementation of the FISYS model. The FISYS model was developed at Stanford University as an analytical framework to address issues of policy choice mandated by the Fishery Conservation and Management Act of 1976. The model embodied a methodology to combine the diverse characteristics of a fishery into a single quantitative framework to best suit the needs of fishery analysts, fishery managers, and statistical experts. The model technology employed a computer to assemble and process the best available information as required by the law.

Khilnani, Arvind, Shu Dong He, and Edison T. S. Tse (1983). "The Gulf of Mexico Shrimp Fishery, An Integrated Approach." Report prepared for the Southeast Fisheries Center, National Marine Fisheries Service, Miami, Florida by the Department of Engineering-Economics Systems, Stanford University, Stanford, California, November, 76 pp.

This report discusses an application and implementation of the Fisheries System Management (FISYS) model. Three regional models for Texas, Florida, and the northern Gulf of Mexico have been integrated via the fleet mobility model to produce this integrated Gulf wide model. The report discusses the parameters used to represent the three regional fisheries and the integrated model with special emphasis on the northern Gulf component since that fishery has not been covered in earlier reports on the project.

Kildow, Judith (1997). A Proposal to Establish Economic Baselines to Quantify the Contribution of the Ocean Sector to the National Economy. Department of Ocean Engineering, Massachusetts Institute of Technology.

A proposal to develop a model of the effect oceans have on the U.S. economy. Two versions of the proposal are included with a summary of the presentation made at the meeting.

Kim, C.S., Michael R. Moore, John J. Hanchar, and Michael Nieswiadomy

(1989). "A Dynamic Model of Adaptation to Resource Depletion: Theory and an Application to Groundwater Mining." Journal of Environmental Economics and Management, 17:66-82.

This research develops an optimal control model that incorporates the opportunity for adaptation to resource depletion. In the context of groundwater mining for agricultural production, two traits supplement a conventional intertemporal depletion path: the relative allocation of groundwater among irrigated crops and endogenous switch times describing an intertemporal cropping pattern. Both planning and common property equilibria are derived. Results from an application to the Texas High Plains include: transition away from irrigation of sorghum occurs twice as fast when done optimally and benefit to groundwater management ranges between \$0.36 to \$4.16 million as the interest rate varies from five to two percent.

Kim, Dae K. (1983). "Energy Substitution in the Gulf of Mexico Shrimp Fishery." Southern Journal of Agricultural Economics, December:1-6.

The elasticities of substitution among fuel, capital, and labor are estimated for the Gulf of Mexico Shrimp fishery using a translog cost function fit to observed data.

Kim, Jae-On and Charles W. Mueller (1978). Introduction to Factor Analysis. Sage University Papers, Quantitative Applications in Social Sciences, Series/Number. 07-013, Sage Publications, Beverly Hills.

This is an elementary introduction that stresses the fundamental assumptions and logical foundations of factor analysis.

Kim, Jae-On and Charles W. Mueller (1978). Factor Analysis, Statistical Methods and Practical Issues. Sage University Papers, Quantitative Applications in Social Sciences, Series/Number. 07-014, Sage Publications, Beverly Hills.

The authors examine in greater detail the different types of factor analysis and the situations in which each is most useful. The distinction between confirmatory and exploratory factor analysis is discussed in greater depth than in the Introduction to Factor Analysis as are the various criteria for factor rotation.

King, Dennis M. (1989). "Economic Trends Affecting Commercial Billfish Fisheries." In Richard H. Stroud (ed.) Planning The Future of Billfish, National Coalition for Marine Conservation, Savannah, Georgia.

A discussion of the fundamental market factors that affect billfish demand, supply, and prices and how these factors have changed in recent years to create increased fishing pressure on billfish stocks.

King, Dennis M. (1991). "Costing Out Restoration." Restoration and Management Notes, 9(1):15-21.

The transition of restoration from a science, craft, and labor of love to a business raises questions about ecological values and economic costs. An environmental economist summarizes some problems and offers a framework for evaluating the costs and expected results of restoration projects.



King, Dennis M. (1991). "Wetland Creation and Restoration: An Integrated Framework for Evaluating Costs, Expected Results and Compensation Ratios." Report prepared by Chesapeake biological Laboratory, Center for Environmental and Estuarine Studies, University of Maryland System, Solomons, MD 20688-0038 for Kenneth Adler, Office of Policy Planning and Evaluation, U.S. Environmental Protection Agency, April, 79 pp.

The expected results of wetland restoration and creation projects, as characterized in the proposed analytical framework, can be based on the results of ongoing scientific and technical research. However, there has been very little directed research to determine the availability and cost of the resources required to carry out specific restoration tasks or reach certain restoration targets. Since the proposed framework, and the evaluation of wetland restoration and creation alternatives in general, require information about both costs and performance, some new research priorities are required to parallel ongoing scientific and technical research. These involve defining the individual tasks that constitute creation and restoration projects, determining the different ways of completing them, and estimating costs. Such research, when combined with the results of scientific and technical research, will contribute significantly to our understanding of both near term and long term problems associated with wetland mitigation.

King, Dennis M. (1992). "Avoiding Another Taxpayer Bailout." National Wetlands Newsletter, 14(1):11-12.

Wetland mitigation banking creates a competitive market for the development of wetlands.

King, Dennis M. (1992). "The Economics of Ecological Restoration." Chapter 19 in K.M. Ward and J.W. Duffield (eds.) Natural Resource Damages: Law and Economics, John Wiley and Sons, New York.

The analytical framework developed in this chapter is designed to show how much it costs to restore ecological functions; it is not intended to show how much should be spent on restoration. Nonetheless, the framework can be used to screen out clearly wasteful restoration efforts and to identify some important economic trade offs involving changes in restoration costs and resulting changes in lost ecosystem functions and values. It will become apparent that when the expected speed and level of ecosystem recovery, measured using indicators of structural or functional health, is used to measure the relative success of a restoration effort, the framework provides a reasonable basis for making decisions about appropriate, if not optimal, levels of restoration.

King, Dennis M. (1992). "Justifying Sustainability: Some Basics of Applied Ecological Economics." Paper presented at the Second Conference of the International Society for Ecological Economics (ISEE), Investing in Natural Capital, Sweden, August 3-6, 1992. Draft report, Maryland International Institute for Ecological Economics, University of Maryland, Center for Environmental and Estuarine Studies, Solomons, Maryland.

The important challenges facing ecological economics are becoming less ideological and more practical. Most world leaders are beginning to understand that investing in natural capital is a prerequisite for sustainability. What they need now is more information about ecological economic linkages so they can reconcile the long term goal of sustainability with near term economic needs.

In some circumstances the conventional method of evaluating production and investment decisions-benefit cost analysis (BCA)-can be expanded to include indirect measures of costs and benefits that result from ecological linkages; this may result in more sustainable near term resource management decisions. In other cases the use of benefit cost analysis is impractical, and sustainable near term production and investment decisions need to be justified on the basis of safe minimum standards.

In this paper, an expanded benefit cost framework is developed using six discrete pathways of potential project impacts. Two originate with withdrawals from and emissions to nature and generate measures of costs and benefits that are based on an expanded view of facts about ecological economic linkages. Two other pathways develop market based and nonmarket estimates of costs and benefits associated with ecological economic linkages and are responsible for assigning values. The last two pathways deal with distributional impacts and other socioeconomic considerations that reflect collective decisions about equity and balance.

Where there is too much uncertainty about facts, or too much disagreement about values, equity, or balance, decision making on the basis of benefit cost analysis may be impractical. In such cases the level of protection granted to a particular natural resource and the amount of public intervention to control market forces that could otherwise result in further degradation of that resource can be based on safe minimum standards. A framework is developed here that uses measures of ecological importance and reversibility to assign safe minimum standards and evaluate decisions about the level or types of natural resources.

King, Dennis M. and Harry A. Bateman (1985). "The Economic Impact of Recent Changes in the U.S. Tuna Industry." California Sea Grant College Program Working Paper No. P-T-47, August, 30 pp.

This report describes some of the difficult circumstances facing the U.S. tuna industry and summarizes the impacts that have resulted from changes in the industry during 1980-1984. Since the report focuses on impacts related to the domestic U.S. economy, the offshore operations of U.S. firms in American Samoa and Puerto Rico are not considered here to be "U.S.-based." Although some distinctions are made in the report between light meat tuna (caught primarily by distant water purse-seiners) and white meat tuna (caught primarily by locally based trollers) we have, for most purposes, aggregated figures for both types of tunas.

King, Timothy L., Anne Henderson-Arzapalo, and Anthony F. Maciorowski (1988). "A Comparison of Snook and Fat Snook Muscle Protein By Isoelectric Focusing." Management Data Series Number 141, Texas Parks and Wildlife Department, Coastal Fisheries Branch.

Sarcoplasmic protein extracts of snook and fat snook were compared by thin-layer polyacrylamide gel isoelectric focusing. A PH gradient from 3.0 (anodally) to 10.0 (cathodally) was used to distinguish protein phenotypes of the two species. The selected gradient conditions failed to differentiate between pond cultured snook derived from Florida broodstock and wild-caught snook from Texas.

Kinnucan, Henry W., Robert G. Nelson, and Johanis Hiariey (1993). "U.S. Preferences for Fish and Seafood: An Evoked Set Analysis." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

This study uses the concept of an "evoked set" to test hypotheses about the determinants of consumer preferences for seafood, especially catfish.

Conceptually, the evoked set includes those specific products (e.g., catfish, shrimp, or flounder) that are evoked by the consumer in the context of a decision to purchase from the general category (fish and seafood). In this study the evoked set is operationally defined as consisting of those seafood items named in answering the question: What are your three favorite types of fish and seafood?

Data from a national survey are used to estimate a four equation recursive model of preference formation and consumption behavior. Results indicate consumer preferences for the top seven fish types (shrimp, lobster, catfish, cod, flounder, scallops, and salmon) are mainly a function of the consumer's geographical location and ethnicity. Consumer beliefs about fish product attributes (e.g., quality, flavor, nutrition) and product category use experience (frequency of fish consumption) in general are not significant preference determinants, although important exceptions are noted. The composition of the evoked set may have different behavioral implications depending on whether fish consumption occurs in the home or in a restaurant setting.

Kinnucan, Henry W., Robert G. Nelson, and Johannis Hiariey (1993). "U.S. Preferences for Fish and Seafood: An Evoked Set Analysis." Marine Resource Economics, 8(3):273-291.

This study uses the concept of an "evoked set" to test hypotheses about the determinants of consumer preferences for seafood. Results indicate consumer preferences for seven major fish species (shrimp, lobster, catfish, cod, flounder, scallops, and salmon) are mainly a function of the consumer's geographical location and ethnicity. Consumer beliefs about fish product attributes (e.g., quality, flavor, nutrition) and product category use experience (frequency of fish consumption) in general are not significant preference determinants, although important exceptions are noted. The composition of the evoked set may have different behavioral implications depending on whether fish consumption occurs in the home or in a restaurant setting.

Kinnucan, Henry W., Robert G. Nelson, and Hui Xiao (1995). "Cooperative Advertising Rent Dissipation." Marine Resource Economics, 10(4):373-384.

Generic advertising is used by fish producers to accelerate demand growth or to alleviate temporary surpluses. Whether this cooperative promotional venture is profitable depends on a number of factors including industry supply response. A rent dissipation model applied to the U.S. catfish industry suggests the quasi-rents generated by increased advertising are more than sufficient to cover incremental costs over any reasonable time horizon.

Kinnucan, Henry, Scott Sindelar, David Wineholt, and Upton Hatch (1988). "Processor Demand and Price-Markup Functions for Catfish: A Disaggregated Analysis with Implications for the Off-Flavor Problem." Southern Journal of Agricultural Economics, 80(December):81-91.

Off-flavor in catfish restricts farm marketing 10 to 45% depending on the season. The economic impact on society of this imposed supply restriction depends, in part, on the elasticity of demand for catfish. Econometric estimates based on disaggregated processing plant data indicate an elastic demand at the processor level but an inelastic demand at the farm level. Short run social welfare gains from the elimination of off-flavor are estimated to equal 12.0% of farm revenues (\$10.0 million in 1983). The

inelastic demand for catfish at the farm level, however, means that most of the societal gains will accrue to individuals beyond the farm gate. Thus, an economic justification exists for public sector funding of off-flavor research.

Kirkley, James E. (1987). "Bridging the Gap Between Economic Theory and Fisheries Management: Can the MFCMA Produce Economically Rational Management? Discussion." Marine Fisheries Review, 49(3):25-28.

A discussion of Lee G. Anderson (1987). "Bridging the Gap Between Economic Theory and Fisheries Management: Can the MFCMA Produce Economically Rational Management?" Marine Fisheries Review, 49(3):13-25.

Kirkley, James E. (1996). Virginia's Net Fisheries: A Preliminary Economic Overview. Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, VA.

Summary tables and graphs that present the economic impacts of Virginia's seafood harvesting industry on the state's economy.

Kirkley, James E. (1997). Virginia's Commercial Fishing Industry: Its Economic Performance and Contributions. Special Report in Applied Marine Science and Ocean Engineering No. 337, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, VA.

An overview of Virginia's commercial fishing sector including wild harvest and aquaculture activities, the communities, processing and wholesale trade, international trade, and the economic importance of the fishing industry.

Kirkley, James E. (1998). Capacity, Capital, and Factor Utilization in Fisheries. Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, VA.

Various definitions of capacity, capitalization, and capacity utilization which are consistent with the prevalent economic theory and principles are presented. Two basic frameworks for defining capacity and capacity utilization are initially introduced: (1) a primal or physical based measure and (2) an economic based measure. Next, more practical measures of capacity and capacity utilization are introduced. These practical measures appear to be more consistent with the views on capacity held by resource managers and public administrators. The terms capital and capitalization are also defined consistent with economic principles, but later modified to indicate how resource managers typically view the terms.

Kirkley, James E. (1998). Concepts of Capacity, Capitalization. Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, VA.

Various definitions of capacity, capitalization, and capacity utilization which are consistent with the prevalent economic theory and principles are presented. Two basic frameworks for defining capacity and capacity utilization are initially introduced: (1) a primal or physical based measure and (2) an economic based measure. Next, more practical measures of capacity and capacity utilization are introduced. These practical measures appear to be more consistent with the views on capacity held by resource managers and public administrators. The terms capital and capitalization are also defined consistent with economic principles, but later modified to

indicate how resource managers typically view the terms.

Kirkley, James E. and William D. DuPaul (1994). Technical Efficiency, Biological Considerations, and Management and Regulation of the Sea Scallop, *Placopecten Magellanicus* (GMELIN, 1791), Fishery. Journal of Shellfish Research, 13(2):571-579.

Achieving social and economic efficiency in a fishery requires that production be technically efficient. Yet, technical efficiency (TE) is rarely examined for a fishery. By the use of detailed trip-level data and information about resource conditions obtained from routine sampling, a stochastic frontier production model relating landings to days at sea, crew size, and resource conditions is specified and estimated for 10 Mid-Atlantic sea scallop dredge vessels. TE is shown to depend partly on the mix of controllable inputs such as days at sea and crew size but possibly more on uncontrollable factors such as resource conditions and biological characteristics. Last, we illustrate that two regulations recently implemented by the management authorities should increase TE in the U.S. sea scallop fishery.

Kirkley, James E. and William D. DuPaul (1995). Standardizing Fishing Effort and Individual Transferable Effort Programs in the Sea Scallop, *Placopecten Magellanicus*, Fishery. Virginia Sea Grant, Virginia Institute of Marine Science, School of Marine Science, College of William & Mary, Gloucester Point, Virginia, 6 pp.

Consolidation and transferability of days at sea limits is explored in this report. If an effort consolidation or transferability effort program is to be allowed, there will be a need to standardize days at sea to ensure that desired levels of fishing mortality are not exceeded. Even though the optimum number of standardized days is unknown, it is possible to develop a framework for standardizing days for the purposes of effort consolidation or transferability. It is only necessary to consider the notion of fishing power or technical efficiency. Fishing power and technical efficiency both indicate some maximum level of potential harvesting or productivity.

Kirkley, James and David Kerstetter (1997). Saltwater Angling and Its Economic Importance To Virginia. Virginia Institute of Marine Science, School of Marine Science, College of William & Mary, Virginia 71 pp.

A review of recreational angling in Virginia with estimates on economic importance of saltwater angling.

Kirkley, James E. and Dale Squires (1988). A Limited Information Approach for Determining Capital Stock and Investment in a Fishery. Fisheries Bulletin, 88(2): 339-349.

There have been few empirical studies on the level of capitalization and investment in fisheries because the necessary data are often inadequate. Specifically, data on capital stock and investment in a fishery are not routinely collected and compiled or are limited in scope. In this study, a method is provided for estimating the aggregate capital stock and investment in a fishery utilizing the available information. Data on acquisition and list prices and vessel characteristics for a sample of New England vessels are obtained. The data are then used to estimate an hedonic cost function which specifies the acquisition price as a function of vessel characteristics. The resultant equations are subsequently used, with information on vessel characteristics for all New England vessels, to estimate aggregate capital stock and investment. The results indicate that substantial investment

occurred in the otter trawl and scallop dredge fisheries, particularly since the Magnuson Fisheries Conservation and Management Act. Moreover, the results demonstrate that the number and change in the number of vessels are inadequate indicators of the level of capital stock and investment in a fleet comprised of vessels with heterogeneous characteristics.

Kirkley, James and Dale Squires (1997). "Measuring Capacity and Capacity Utilization in Fisheries." Draft report, Food and Agriculture Organization of the United Nations, Rome, Italy.

This paper addresses the issues of (1) what is the maximum amount of output and fishing mortality a vessel, operating unit, or fleet can produce given available input stocks; (2) what is the technical efficiency and productivity of the fleet and vessels over time; (3) what portion of total fishing effort is redundant or unnecessary relative to present levels and biological and economic total allowable catches; and (4) what is the structure of industry and utilization of inputs given the frontier level of production and the elimination of technological externalities?

Kirkley, James and Dale Squires (1998). "Measuring Capacity and Capacity Utilization in Fisheries." Revised draft report, Food and Agriculture Organization of the United Nations, Rome, Italy.

In this report, the various concepts of capacity, capacity utilization, capital utilization, overcapitalization, fishing and harvesting capacity, and input utilization are examined. Numerous definitions and potential measurements are offered. The definitions and measurements are explored from primal or physical-based and economic orientations. Differences are articulated and further examined. In addition, numerous approaches for assessing capacity, capacity utilization, overcapitalization, capital utilization, and factor utilization are introduced.

Kirkley, James E. and Dale Squires (1999). Capacity and Capacity Utilization in Fishing Industries. Discussion Paper 99-16, Department of Economics, University of California, San Diego, July, 38 pp.

Excess capacity of fishing fleets is one of the most pressing problems facing the world's fisheries and the sustainable harvesting of resource stocks. Considerable confusion persists over the definition and measurement of capacity and capacity utilization in fishing. Fishing capacity and capacity utilization, rather than capital (or effort) utilization, provide the appropriate framework. This paper provides both technological-economic and economic definitions of capacity and excess capacity in fishing and illustrates the technological-economic approach through a case study using Data Envelopment Analysis.

Kirkley, James E. and Dale Squires (1999). Productivity Indexes in Fisheries, A Critical Review. Presentation at the Fisheries Productivity Workshop, Department of Agricultural and Resource Economics, University of Maryland, College Park, February 19-20.

An outline of a presentation on production theory state of the art as it is applied to fisheries problems.

Kirkley, J. and I. Strand, Jr. (1988). "The Technology and Management of Multispecies Fisheries." Applied Economics, 20:1279-1292.

This paper presents a dual based approach for determining forms of stock management in a multispecies or multiproduct fishery. A dual revenue function

is specified and estimated for the New England, Georges Bank, multiproduct, trawl fishery. Two forms of the technology, nonjointness in inputs and separability among outputs, often implicitly assumed by managers in formulating regulations are rejected. Important technical and economic interactions that are usually ignored in fisheries management are shown to characterize the fishery. Last, it is demonstrated that different types of management and regulations may be necessary if a fleet is comprised of heterogeneous fishing firms.

Kirkley, James E., William D. DuPaul, Michael Oesterling (1995). *Regulating the Blue Crab, Callinectes sapidus, Fishery of Virginia: Biological and Economic Concerns.* VSG-95-14, Virginia Sea Grant, Virginia Institute of Marine Science, School of Marine Science, College of William & Mary, Gloucester Point, Virginia, 15 pp.

This brief paper an overview of regulatory options for managing and regulating the blue crab fishery is provided. We initially focus on open access strategies and subsequently present a discussion of regulations that address the common property, open access fishery. Prior to discussing management options, we discuss goals and objectives of resource management.

Kirkley, J., Dale Squires, and Mohammad Ferdous Alam (1998). "Capacity and Capacity utilization in Fishing Industries." Draft report, Virginia Institute of Marine Sciences, College of William and Mary, Gloucester Point, Virginia, August, 22 pp.

This paper addresses the issue of defining and measuring capacity in fishing industries. Capacity can be defined and measured following either a technological-engineering approach or explicitly predicated on economic optimization from microeconomic theory. The former definition is the focus of this paper because of the paucity of cost data in most fisheries world-wide militates against estimation of cost or profit functions to derive economic measures of capacity and capacity utilization. An empirical illustration of capacity in the Malaysian purse seine fishery is provided as a case study.

Kirkley, J., Dale Squires, and Ivar E. Strand (1995). "Assessing Technical Efficiency in Commercial Fisheries: The Mid-Atlantic Sea Scallop Fishery." American Journal of Agricultural Economics, 77(2):686-697.

Despite the extensive effort to research issues of allocative efficiency in fisheries, little empirical analysis of technical efficiency (TE) in fisheries exists. This study examines vessel efficiency using a stochastic production frontier based on a sample of sea scallop vessels operating in the Mid-Atlantic between 1987 and 1990. Estimates of TE are computed and compared with input usage, resource conditions, economic performance, and recently imposed regulations. The analysis suggests that owners and captains only partially compensate for changes in resource conditions through the use of labor and fishing effort, and recent regulations may improve overall TE in the short run.

Kirkley, J., Dale Squires, and Ivar E. Strand (1998). "Characterizing Managerial Skill and Technical Efficiency in a Fishery." Journal of Productivity Analysis, 9:145-160.

Researchers have long recognized that entrepreneurial or managerial skill is a major determinant of productivity or reason why production among firms varies. Yet, except for a few studies, differences in productivity and output levels are usually attributed to plant configuration or scale. More

important, there appears to have been few attempts to relate technical efficiency to managerial skill. Utilizing a stochastic production frontier, we examine the relationship between technical efficiency and characteristics of skill such as experience and education in a fishery. Although we can not determine threshold or essential levels of experience and education, substitution possibilities are found to exist between years of experience and education levels. Additional analysis of efficiency for two captains of the same background and experience reveals that additional characteristics need to be considered in the examination of skipper skill or the good-captain hypothesis.

Kirkley, James E., Nancy Bockstael, Kenneth E. McConnell, and Ivar E. Strand (1999). The Economic Value of Saltwater Angling in Virginia. VSG-99-02, Virginia Sea Grant, Virginia Institute of Marine Science, School of Marine Science, College of William & Mary, Gloucester Point, Virginia, 16 pp.

This report provides results of an economic valuation study of saltwater recreational angling in Virginia. It is an extension of the Kirkley and Kerstetter (1997) study of recreational angling in Virginia.

Kirkley, James, Dale Squires, Mohammad Ferdous Alam, and Ishak Haji Omar (1999). Capacity and Offshore Fisheries Development: The Malaysian Purse Seine Fishery. Draft report, Virginia Institute of Marine Science, VA, April, 36 pp.

Many developing countries pursue offshore fisheries development to increase protein supply, expand employment, earn foreign exchange, and mitigate the conflict between large and small-scale fisheries over the inshore resource stocks. This study evaluates the economic success of Peninsular Malaysia's offshore fisheries development policy for the west coast purse seine fleet, finding it has largely succeeded on economic grounds.

Kirkley, James E., Dale Squires, John Walden, and John Ward (1999). Efficiency and Capacity in Fisheries, Theory, Methodology, and Applications. Report prepared for the National Marine Fisheries Service, Office of Science and Technology, Virginia Institute of Marine Science, School of Marine Science, College of William & Mary, Gloucester Point, Virginia, November, 100 pp.

This is a guide for estimating and assessing efficiency and capacity in fisheries using data envelopment analysis, peak to peak, and stochastic production frontiers techniques.

Kirkley, James E., Rolf Fare, Shawna Grosskopf, Kenneth McConnell, Dale E. Squires, and Ivar Strand (1999). Assessing Capacity and Capacity Utilization in Fisheries When Data are Limited. Draft report, College of William and Mary, School of Marine Science, Gloucester Point, VA, September, 37 pp.

Excess capacity is globally recognized by resource managers as a major problem for fisheries. Yet, the concept of capacity remains vague, ill-defined, and often ambiguous. Measuring capacity and capacity utilization in fisheries has become more important or of greater public concern than ever because of various national and international agreements or policies to reduce capacity in fisheries throughout the world. In this study, we offer definitions of capacity and propose a method to calculate capacity, capacity utilization, and optimum input utilization. We illustrate the method by estimating and assessing the capacity of ten U.S. northwest Atlantic sea



scallop, *Placopecten magellanicus*, vessels operating between 1987 and 1990. We conclude that the ten vessels had the capability to harvest considerably more than they actually did, and the fleet could be reduced by 68% or more if managers desire to match capacity to a recommended sustainable yield of 20 million pounds.

Kirkley, James E., Philippe Berry, Amy Buss, Douglas Lipton, Ivar E. Strand, Kurt Finsterbusch, and Diane Illig (1994). A Profile of the Oyster Industry. VSG-94-08, Virginia Sea Grant, Virginia Institute of Marine Science, School of Marine Science, College of William & Mary, Gloucester Point, Virginia, February, 68 pp.

This study describes the east coast oyster industry as it exists today. Oyster demand has decline substantially resulting in low prices despite low production levels. More oysters will not revitalize the oyster industry alone. Increased demand and a wider variety of products will be necessary components of a successful industry revitalization.

Kitner, Kathi R. (1987). "TEDS: A Study of the South Atlantic Shrimp Fishermen's Beliefs, Opinions and Perceptions Regarding the Use of Turtle Excluder Devices." Report to the South Atlantic Fishery Management Council, Charleston, South Carolina, September, pp. 47.

Determining the beliefs and perceptions that South Atlantic shrimpers hold relative to the federal regulations mandating TED usage prior to actual implementation is the objective of this study. It also addresses the more generic questions of how to successfully implement technology transfer, the role that class plays in structuring different behaviors and reactions to new fisheries policies, and why and how the goals of some regulations can foment conflict and dissent among and between various groups.

Kitts, Drew (1996). Cost-Earnings Variable Definitions. Draft, Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA.

A revised variable definition list based on work by Amy Gautum for use by economists wishing to develop cost and earnings surveys of various fisheries that retain comparability between surveys.

Kitts, Andrew and Eric Thunberg (1996). Economic Considerations in the Design of Northeast U.S. Fishing Vessel Buyout Programs. Draft, Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA, 43 pp.

Both the House and Senate bills re-authorizing the Magnuson Act contain language allowing for vessel buyout programs. A \$2 million pilot program was initiated to test aspects of a larger buyout program. Larger programs of up to \$75 million were proposed. This study used data from the pilot program to estimate functions that assess the probability of Northeast vessels submitting a bid to a vessel buyout program, and the expected total level of submitted bids. The level of effort removed, groundfish revenue removed, and gear types and multispecies categories removed at different levels of program cost are examined. Landings tax rates needed to fund a vessel buyout are calculated and issues such as the goals of a buyout program, consolidation of days at sea, and alternative uses of buyout dollars are discussed.

Kitts, Andrew and Eric Thunberg (1997). Report on Northeast Multispecies Harvest Capacity and Impact of New England Harvest Capacity Reduction. Report to Congress, Northeast Fisheries Science Center, National Marine

Fisheries Service, Woods Hole, MA, 14 pp.

This report to Congress responds to a request for information concerning (1) the total number of Northeast multispecies permits in each permit category and calculates the maximum potential fishing capacity of vessels holding such permits based on principal gear, gross registered tonnage, engine horsepower, length, age, and other relevant characteristics; (2) the total number of days at sea available to the permitted Northeast multispecies fishing fleet and the total days weighted by the maximum fishing capacity of the fleet; (3) an analysis of the extent to which the weighted days at sea are used by active participants in the fishery and of the reduction in such days as a result of the fishing capacity reduction program; and (4) an estimate of conservation benefits directly attributable to the fishing capacity reduction program.

Kitts, Andrew, Eric Thunberg, and John Robertson (1998). Modeling Participation and Bids in the Northeast U.S. Groundfish Fishing Vessel Buyout Program. Paper Presented at IIFET, Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA.

An experimental buyout program was initiated in 1995 to remove fishing vessels from the Northeast United States groundfish fishery. Implemented as a reverse auction, the purpose of the pilot program was to determine the level of interest in a vessel buyout and to gain insight on the prices owners would be willing to accept to surrender their vessel and all associated fishing permits. Of the 296 eligible vessels, the pilot program drew 114 applicants with average bids of \$455 thousand. This paper describes the pilot buyout program and the econometric procedures used to forecast probability of participation and bids, and to estimate the number and types of vessels that could be purchased at various levels of program spending. The decision of whether to participate in the program and the magnitude of bids were modeled in two stages via the specification of a participation function and a bid function. Alternative methods for modeling these functions, such as the Tobit model and the Heckman and Cragg two stage models, are discussed. Variables found to explain participation and bids include total and groundfish revenue history, allocated days-at-sea in the groundfish fishery, gear type, expected ranking, and vessel size characteristics. The expanded buyout program, completed in April 1998, provides a unique opportunity to evaluate the accuracy of the forecasts.

Klecka, William R. (1980). Discriminant Analysis. Sage University Papers, Quantitative Applications in the Social Sciences, Series/Number 07-019, Sage Publications, Beverly Hills.

The author introduces canonical discriminant functions, classification functions and procedures, and various selection criteria for the inclusion of variables in discriminant analysis. Then canonical discriminant function coefficients are derived, a spatial interpretation of them is provided, and an interpretation of canonical discriminant functions is provided. The paper concludes with a discussion of the violation of the assumptions that underlie discriminant analysis as a guide for the novice.

Kleiber, Pierre (1994). Modeling Effects of FADs and Islands on Movement of Skipjack Tuna (Katsuwonus pelamis): Estimating Parameters from Tagging Data. Canadian Journal of Fisheries and Aquatic Sciences, 51(12):2642-2653.

From an experiment with ordinary dart tags, we have found evidence of the effect of fish aggregating devices (FADs) and of islands on the movements of skipjack tuna (Katsuwonus pelamis) around the Solomon Islands. By fitting

a fish movement model to the tag data, we were able to estimate mortality and movement parameters (including diffusivity), parameters of a function that models FAD attraction, and a separate parameter of island attraction. Diffusivity was high enough to effectively distribute fish throughout the island archipelago (approximately 150,000 km<sup>2</sup>) within a few months. Estimates of FAD parameters indicate the presence of up to four or five FADs in an area approximately 50 X 50 km can reduce the propensity for skipjack to leave that area by approximately 50%, but that deploying additional FADs in such an area does not significantly increase their effectiveness in holding skipjack. Estimates of the island attraction parameter imply that the propensity of skipjack for movement away from the archipelago is less than half the propensity for movement within it.

Kleiber, Pierre (1995). Proposal for Coordinating an Integrated Research Program for Highly Migratory Species. Draft report, Highly Migratory Species Management Division, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 1315 East-West Highway, Silver Spring, MD, June, 4 pp.

Draft report outlining a contract proposal procedure to develop a research program for highly migratory species.

Kleiber, Pierre (1995). Research Plan for North Atlantic Bluefin Tuna. Draft report, Highly Migratory Species Management Division, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 1315 East-West Highway, Silver Spring, MD, June, 9 pp.

A proposed research plan to integrate economics, biology, and other sciences to support the management of Atlantic bluefin tuna.

Klima, Edward F. (1976). "Snapper and Grouper Resources of the Western Central Atlantic Ocean." Pages 5-40 in Harvey R. Bullis, Jr. and Albert C. Jones (eds.) (1976). "Proceedings: Colloquium on Snapper-Grouper Fishery Resources of the Western Central Atlantic Ocean. Report Number 17, Gulf States Marine Fisheries Commission, New Orleans, Louisiana, Texas A&M University Sea Grant College and Mississippi-Alabama Sea Grant Consortium, November, 333 pp.

Estimates of the standing stock and potential yields of snappers, groupers, and related species are provided for the Caribbean Sea and Campeche Bank area of the Gulf of Mexico. Handline fishing explorations by the United Nations Food and Agriculture Organization (FAO) Caribbean Project provided the basic data for assessment of the resources in the Caribbean Sea. Exploratory trawl surveys by the Pascagoula Laboratory of the National Marine Fisheries Service (NMFS), NOAA and catch and effort data from the Cuban and Mexican snapper fisheries provided the basis for the Campeche Bank assessments. Present production of snappers and groupers can probably be significantly increased in many areas of the Caribbean, notably along the continental shelf of northeast South America off the Guianas and the Central American shelf. One problem hampering increased production in some island communities is the occurrence of ciguatera in fish in the northern Leeward Islands. Production for both snappers and groupers can be increased in the Campeche Bank area. Increased red grouper production can be realized by altering the age at entry into the fishery from 3 to about 5 years of age and increasing fishing effort.

Klima, Edward F. (1986). "Review of Ecuadorean Shrimp Fisheries and Suggestions for Management and Research." National Marine Fisheries Service, Southeast Fisheries Center, Galveston

Laboratory, 4700 Avenue U, Galveston, Texas, June, 18 pp.

At the request of the University of Rhode Island that is under contract to USAID, an evaluation is made of the offshore shrimp fisheries of Ecuador and recommendations are made concerning their management and research. This paper reviews, in a general sense, the information available for the offshore shrimp fishery of Ecuador, synthesizes some of the major findings and makes recommendations concerning their management and research.

Klima, Edward F. (1989). "Approaches to Research and Management of U.S. Fisheries for Penaeid Shrimp in the Gulf of Mexico." Chapter 4 in John F. Caddy (ed.) Marine Invertebrate Fisheries: Their Assessment and Management. John Wiley & Sons, New York.

This paper summarizes the results of current shrimp management and research programs, including estuarine research programs in the U.S. Gulf of Mexico.

Klima, Edward F., K. Neal Baxter, and Frank J. Patella (1982). "A Review of the Offshore Shrimp Fishery and the 1981 Texas Closure." Marine Fisheries Review, 44(9-10):16-30.

Prohibition of shrimp fishing within 200 miles of the Texas coast on 22 May 1981 resulted in large brown shrimp catches off Texas when the season reopened on 15 July. Catch per unit effort off Texas in late July and August 1981 ranged from 1,349 to 2,250 pounds per fishing day, compared with only 820 to 858 pounds per fishing day for the Louisiana offshore brown shrimp fishery. The July-August 1981 relative abundance (CPUE) off Texas was greater than during similar time periods for any other year. Shrimp caught and landed off Louisiana were also predominantly smaller than those caught and landed off Texas.

Recruitment from Texas bays to the offshore fishery appeared average to good, but was not sufficient to account for the outstanding abundance levels found offshore. The closure of Texas waters to fishing appears to have been a major reason for the large catches and high catch rates in July and August off Texas in 1981.

Klima, Edward F., Terrell W. Roberts, and Albert C. Jones (1986). "Overview of the Tortugas Sanctuary Studies." North American Journal of Fisheries Management, 6(3):297-300.

A summary of the Tortugas pink shrimp sanctuary studies that found that the area should remain closed to protect undersized pink shrimp from being harvested by shrimp fishermen.

Klima, Edward F., Gregg R. Gitschlag, and Maurice L. Renaud (1988). "Impacts of the Explosive Removal of Offshore Petroleum Platforms on Sea Turtles and Dolphins." Marine Fisheries Review, 50(3):33-42.

Comparisons of turtle strandings during periods characterized by high and low numbers of offshore explosions, March-April 1985-88, suggest a positive relationship between the frequency of explosions and the stranding of turtles. Although dolphins may be impacted by explosions, the relationship between the stranding of dolphins and offshore explosions was not as conspicuous.

Klima, Edward F., K. Neal Baxter, Frank J. Patella, and Geoffrey A. Matthews (1984). "Review of the 1983 Texas Closure for the Shrimp

Fishery off Texas and Louisiana." NOAA Technical Memorandum NMFS-SEFC-136, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Galveston Laboratory, Galveston, Texas, March, 28 pp.

The objectives of whether the Texas Closure regulation increased shrimp yield and reduced discarding of undersized shrimp were determined for 1982 and 1983. This report reviews and analyzes the characteristics of the Texas and Louisiana fisheries west of the Mississippi River and describes the catch, fishing effort, relative abundance and recruitment to the offshore fishery from June 1982-August 1983.

Klima, Edward F., James M. Nance, Eduardo X. Martinez, and Terrance Leary (1990). "Workshop on Definition of Shrimp Recruitment Overfishing." NOAA Technical Memorandum, NMFS-SEFC-264, 21 p.

This report summarizes the findings of a two day workshop undertaken to (1) draft scientific definitions of overfishing for each of the shrimp species in the management unit of the Fishery Management Plan and (2) to recommend action that might be taken if overfishing occurred in any of these stocks.

Kling, Catherine L. (1987). "A Simulation Approach to Comparing Multiple Site Recreation Demand Models Using Chesapeake Bay Survey Data." Marine Resource Economics, 4:95-109.

This paper's purpose is to implement a methodology that can be used to suggest a model (or models) appropriate for valuing quality improvements in the Chesapeake Bay. To compare these approaches, a series of outdoor recreation user populations is constructed by choosing a utility function, its parameter values and an error distribution. This information is combined with the characteristics of individuals and recreation sites from a Chesapeake Bay recreation demand survey to solve the individual's maximization problem. Each of the models is estimated using these data, and the compensating variation of a quality change is calculated. Benefit estimates are compared with simulated welfare change to evaluate the models.

Kling, Catherine L. (1988). "The Reliability of Estimates of Environmental Benefits from Recreation Demand Models." Journal of Agricultural Economics, 70(4):892-901.

Recreation demand models are commonly employed tools of economists interested in valuing improvements in environmental amenities. Despite their importance, little comparative work has been undertaken to examine the ability of the models to accurately estimate welfare changes. A simulation study designed to compare the reliability of estimated welfare measures (compensating variation and consumer surplus) from several commonly employed recreation demand models is presented. Results of the study indicate that choice of functional form and model specification are important determinants of the resulting estimates of benefits.

Kling, Catherine L. (1988). "Comparing Welfare Estimates of Environmental Quality Changes from Recreation Demand Models." Journal of Environmental Economics and Management, 15:331-340.

This paper presents a procedure for examining the reliability of welfare estimates resulting from the estimation of multiple site recreation demand models. A simulation approach is suggested where a utility function is combined with observations of individual and site characteristics to generate simulated data sets. Welfare measures associated with an improvement in site

quality are calculated. Recreation demand models are estimated using the simulated data sets. Estimated welfare measures resulting from the recreation demand models are then compared to the true welfare measures calculated from the simulated data. The procedure is demonstrated using two commonly employed recreation demand models.

Kling, Catherine L. and Joseph A. Herriges (1995). "An Empirical Investigation of the Consistency of Nested Logit Models with Utility Maximization." American Journal of Agricultural Economics, 77(4):875-884.

Global conditions under which nested logit models are consistent with utility maximization are provided by Daly and Zachary and by McFadden. Recently, Borsch-Supan and Herriges and Kling have provided conditions under which a nested logit model is locally consistent. However, previous work has not discussed implementation of these conditions. Here, three alternative approaches to checking and formally testing for the consistency conditions using classical statistics are investigated. In addition, a Bayesian approach to interpreting and imposing the local consistency conditions is provided. The application is based on anglers' choices regarding sportfishing alternatives in southern California.

Kmenta, Jan (1967). "On Estimation of the CES Production Function." International Economic Review, 8(2):180-189.

The original specification of the constant elasticity of substitution (CES) production function was restricted to the case of constant returns to scale. If the CES production function is generalized to allow for the possibility of nonconstant returns to scale require nonlinear regression techniques or linear estimation using a Taylor series expansion around  $p=0$ . The latter technique is essentially a Cobb-Douglas production function with a correction factor. This technique is then applied to U.S. nonfarm data for 1947 to 1960.

Kmenta, Jan (1986). Elements of Econometrics, Second Edition. Macmillan Publishing Company, New York.

An econometrics textbook that starts with basic statistics and then develops econometric theory advancements since 1971.

Knapp, Gunnar (1996). Alaska Halibut Captains Attitudes Towards IFQs. Marine Resource Economics, 11(1):43-55.

In 1994, prior to the introduction of the individual fishing quota (IFQ) management system, the University of Alaska conducted a detailed survey of vessel captains who had fished for halibut between 1987 and 1993. The survey included five questions about captains' expectations for and attitudes towards the planned IFQ management system. This paper reports on captains' responses to these questions.

Knapp, Gunnar (1998). Initial Effects of the Alaska Halibut IFQ Program: Survey Comments of Alaska Fishermen. Thalassorama, Marine Resource Economics, 12(3):239-248.

An open ended survey of halibut fishermen in the Alaskan fishery confirm the positive effects of ITQ management and also indicates that attitudes toward the program are inversely proportional to holdings of ITQ shares. These results remind us that management policies that may increase net benefits of fisheries do not necessarily make all fishermen, or even a

majority of fishermen, better off. This can contribute to strikingly different perceptions of the same management policies among different fishermen.

Knapp, Gunnar, Jeff Hartman, and Mike Mills (1999). Basic Issues in Economic Comparisons of Commercial and Sport Fisheries: A Study of Allocation Alternatives for Alaska's Kenai River Sockeye Salmon Fisheries. Prepared for presentation at The Role of Economics in Fisheries Management at the 1998 Annual Meeting of the American Fisheries Society, Hartford, Connecticut, August, 18 pp.

Allocation between commercial and sport fisheries is becoming an increasingly difficult and divisive issue in fisheries management. As conflicts over allocation have increased, so has interest in the relative economic contributions of commercial and sport fisheries. This paper describes eight basic issues in economic comparisons of commercial and sport fisheries. These basic issues should be considered in evaluating or planning any economic comparison of commercial and sport fisheries - from a back-of-the-envelope comparison to a formal study. We illustrate these issues by describing how they arose in an economic comparison of commercial and sport fisheries for Alaska's Kenai river sockeye salmon.

Kneese, Allen V. and James L. Sweeney (ed.) (1985). Handbook of Natural Resource and Energy Economics, Vol. II, Elsevier Science Publishers B.V.

The three volumes comprising this book examine the current theory and sample current application methods for natural resource and energy economics. Volume II deal with the economics of renewable resources.

Knight, H. Gary and James P. Lambert (1975). "Legal Aspects of Limited Entry for Commercial Marine Fisheries." Final report, National Marine Fisheries Service Contract No. 03-4-042-23, Center for Wetland Resources, Louisiana State University.

A discussion of the legal aspects of establishing a limited entry fishery management program in domestic fisheries. The report begins with an introduction to the concept of limited entry. Then, a legal analysis of the limited entry concept and related problems. Problems concerning interstate and state federal fisheries management such as federal preemption are discussed. The report concludes with specific recommendations concerning how limited entry programs should be instituted since a single legal framework to base legislation on is not possible to develop.

Knowlton, Clifford J. (1971). "Preliminary Studies of a Potential finfish Industry from Commercial Shrimp Landings." Report for the Commercial Fisheries Research and Development Act (PL 88-309), U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, St. Petersburg, FL, October.

A study was conducted to determine species composition and weights of fish taken during trawling for shrimp by the commercial fishery in Georgia's close inshore waters. For all species combined and considering the state as a unit, the average pounds per hour of trawling had a large seasonal variation. The months of January, March, April, October, and December all averaged less than 100 pounds per hour of trawling with December the low month at about 29 pounds followed by March at about 52 pounds. In all remaining months the catches averaged over 120 pounds per hour of trawling with peaks in May at 245

pounds and in November at 192 pounds. Four families of fish each represented 3 percent or more of the yearly average catch over the state. These are Sciaenidae 73.8 percent, Clupeidae 8.5 percent, Dasyatidae 3.6 percent, and Ariidae 3.3 percent -- a combined total of 89.2 percent of the yearly average catch. The Sciaenidae contributed 95.0 pounds per hour of trawling, Clupeidae 10.9 pounds, Dasyatidae 4.7 pounds, and Ariidae 4.3 pounds or a combined total of 114.9 pounds of the yearly average of 128.8 pounds per hour of trawling. Nine species of fish were captured in greatest abundance over the state and together contributed 111.6 of the 128.7 pounds per hour of trawling and represented 86.4 percent of the yearly average catch.

Koenig, Evan F. (1984). "Controlling Stock Externalities in a Common Property Fishery Subject to Uncertainty." Journal of Environmental Economics and Management, 11:124-138.

Two methods are examined for regulating stock externalities under uncertainty; quotas and taxes. Dynamic programming is used to characterize the externalities precisely. The accuracy with which the current size of the resource stock can be monitored is found to be of crucial importance in the choice between tax and quota regulation. If the current stock is observed without error, taxes are capable of outperforming any quota.

Koenig, Evan F. (1984). "Fisheries Regulation Under Uncertainty: A Dynamic Analysis." Marine Resource Economics, 1(2):193-208.

This paper considers alternative methods for regulating the stock externality in a common property fishery. The methods considered are fiat price controls, a quota on the fish catch, and taxes on the size or value of the fish catch. When regulations must be formulated on the basis of incomplete information, these methods are not equivalent. It is shown that taxes are the preferred regulatory instrument whenever the regulatory authority is able to accurately monitor the size of the fish stock.

Koenig, Evan F. (1996). Capacity Utilization As a Real-Time Predictor of Manufacturing Output. Economic Review, Third Quarter: 16-23, Federal Reserve Bank of Dallas, P.O. Box 655906, Dallas, Texas.

The Federal Reserve Board's initial estimate of manufacturing capacity utilization is helpful in predicting subsequent growth in manufacturing output. Together with lagged real-time output growth and growth in composite index of leading indicators, capacity utilization explains more than 50 percent of the variation in output growth at a four quarter horizon. Based on data available at the beginning of the year, the forecasting equation predicts little or no growth in manufacturing output during 1996.

Korson, Charles S. and Wesley Silverthorne (1987). "Economic Status of the Washington, Oregon, and California Groundfish Fishery in 1986." NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWR-018, August, 39 pp.

This is the third in a series of annual reports describing the economic status of the Washington, Oregon, and California (West Coast) groundfish fishery. This fishery consists of business firms and recreationists that harvest fish stocks regulated under the Pacific Coast Groundfish Fishery Management Plan. The focus of this report is on factors affecting the economic performance of domestic commercial firms in the West Coast groundfish fishery.

Kortbech-Olesen, R. (1984). "World Shrimp Trade Continues to Expand."



The Fish Boat, August: 22-98 (7 pages).

A review of the world trade in shrimp, the effect of aquaculture, and the International Trade Center study "Shrimps: A Survey of the World Market."

Kotis, Richard J. (1984). "Strategies For A Strengthened Industry." Chapter 9 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

The author (1) defines the fishing tackle industry as manufacturers define it, (2) defines the marine recreational fisheries as the fishing tackle industry perceives them, and (3) outlines how he believes marine recreational fisheries can be improved, expanded, and strengthened. Hopefully, this will provide the basis for a stronger total industry.

Kouka, Pierre-Justin (1995). An Empirical Model of Pricing in the Catfish Industry. Marine Resource Economics, 10(2):161-169.

The adoption of aquacultural products has created an imbalance of market power between catfish producers and a processing sector that exerts a monopsonistic power in certain regions of the U.S. such as west Alabama. However, because of the recent changes caused by vertical integration of the catfish industry, the existence of an oligopolistic power has been identified in the catfish industry. An empirical model of pricing in the catfish industry was developed using a theoretical model proposed by Appelbaum. An analysis of the market structure was conducted to provide estimates of conjectural elasticities over time. Conjectural elasticities were used to construct the oligopoly power index. Results show some evidence of the existence of oligopolistic power in the catfish industry that further suggests some degree of price enhancement.

Kraniotis, Patricia (1993). "The Fisheries Enforcement Agreement Between the United States and Canada." Paper presented at the Workshop on Enforcement Measures, Organization for Economic Co-Operation and Development, Directorate for Food, Agriculture, and Fisheries, Committee for Fisheries, Paris, September.

This paper discusses the history of the agreement between the United States and Canada on fisheries enforcement. It discusses the Agreement itself and the implementing domestic laws and regulations. The paper explores how the agreement has functioned in operation, evaluating both its strengths, weaknesses, and potential applications of this approach in other fisheries contexts.

Krapf, David (1995). From TEDs to BRDs, Gulf and South Atlantic Shrimp fishermen Shift Bycatch Focus. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

The paper presents a discussion of the marine turtle and finfish bycatch problem in the Gulf of Mexico and south Atlantic shrimp fishery whose solution is expected to be a gear modification using TED and BRD devices. Views on the issue by both commercial fishermen associations and conservation groups are presented and discussed in the report.

Krauthamer, Judith T., William E. Grant, and Wade L. Griffin (1984). "Characteristics of the Texas Shrimp Fleet, 1979-82." Marine

Sound management of the Texas shrimp fishery requires an understanding of the composition of the shrimp fleet and its response to changing economic conditions and regulations. This study utilized Texas Parks and Wildlife Department licensing data to quantitatively describe and evaluate the commercial fleet from 1979 to 1982. Tables representing the number of vessels in the fleet, the license (bay, bait, Gulf) or license combinations that they maintain, the home ports of vessels, and the counties of residence of vessel owners, are presented. Despite yearly fluctuations, the shrimp fleet has been increasing, as have been the purchases of single and multiple licenses. Decreases in the number of vessels in the fleet for any given year resulted primarily from vessels less than 25 feet in length and vessels 55-70 feet in length leaving the fishery. The expansion of the fleet in 1981 and its relationship to 1981 fisheries legislation is discussed.

Krauthamer, Judith T., William E. Grant, and Wade L. Griffin (1987). "A Sociobioeconomic Model : The Texas Inshore Shrimp Fishery." Ecological Modelling, 35:275-307.

A sociobioeconomic model (SBM) of the Texas inshore shrimp fishery is developed as an extension of a General Bioeconomic Fisheries Simulation Model (GBFSM) for annual crop fisheries. The SBM is a heuristic model which redefines the traditional concept of a vessel class to include social and cultural variables that describe the vessel operators. Sociocultural variables that are hypothesized to affect harvesting capability of fishermen, or relative fishing power (RFP) of vessels that they operate, are identified and referred to as Fishing Advantage variables. Fishing Advantage variables, age of operator, years of experience, and innovativeness, are quantified and incorporated into the GBFSM through modification of an equation that calculates RFP for different SBM vessel classes. Sociocultural variables hypothesized to affect decisions of vessel operators to exert fishing effort, or nominal days fished (NDF) are identified and referred to as Motivational variables. These include deferred gratification orientation, work orientation, and vessel ownership status of the vessel operator. A method using decision trees to direct decision making based on Motivational variables and economic feedback is incorporated into the GBFSM to adjust NDF for different vessel classes. Five idealized inshore vessel classes representing different types of Texas inshore shrimp vessels, whose operators differ in Fishing Advantage and Motivation, are included in the SBM. Examination of the performance of individual inshore vessel classes indicated that policy changes have different economic impacts on different groups of fishermen, with revenue and rent of the lowest producers being most sensitive to policy changes.

Krautkraemer, Jeffrey A. (1990). "Taxation, Ore Quality Selection, and the Depletion of a Heterogeneous Deposit of a Nonrenewable Resource." Journal of Environmental Economics and Management, 18:120-135.

The effect of taxation on depletion is examined when ore quality varies within a deposit and the firm's selection of the sequence of exploitation is constrained. Tax policies in this setting are less conserving of the resource than if ore quality is homogeneous and can be less conserving of the resource than in other models of ore quality selection. For example, a constant severance tax can induce faster depletion, decrease the life of the mine, reduce total recovery, and increase metal output in periods when extraction is positive.

Kronman, Mick (1995). Dolphin Protection. In Brad Warren, Win-Win Bycatch

Solutions. National Fisheries Conservation Center, Seattle WA.

A discussion of technical solutions to the dolphin bycatch problem in purse seine tuna fishery of the eastern tropical Pacific. Including back down techniques, the Medina panel, and their inventor Harold Medina.

Krupnick, Alan J., Wallace E. Oates, and Eric Van De Verg (1983). "On Marketable Air-Pollution Permits: The Case for a System of Pollution Offsets." Journal of Environmental Economics and Management, 10:233-247.

After examining the properties of several alternative forms of marketable permit systems for the control of air pollution, this paper proposes a system of pollution offsets as the most promising approach. Under the pollution offset scheme, sources of emissions are free to trade emission permits subject to the constraint of no violations of the predetermined air quality standard at any receptor point. The paper shows that the pollution offset system has the capacity to achieve the predetermined standards of air quality at the minimum aggregate abatement cost, while making comparatively modest demands both on the sources and on the administering agency.

Krutilla, John V. (1981). "Reflections of an Applied Welfare Economist." Journal of Environmental Economics and Management, 8:1-10.

Presidential address presented at the annual meeting of the Association of Environmental and Resource Economists.

Kumbhakar, Subal C. and Mickael Lothgren (1998). A Monte Carlo Analysis of Technical Inefficiency Predictors. Working Paper Series in Economics and Finance, No. 229, Stockholm School of Economics.

This paper studies performance of both point and interval predictors of technical inefficiency in the stochastic production frontier model using a Monte Carlo experiment. In point prediction we use the Jondrow et al. (1980) results, while for interval prediction the Horrace and Schmidt (1996) and Hjalmarsson et al. (1996) results are used. When ML estimators are used we find negative bias in point predictions. MSEs are found to decline as the sample size increases. The mean empirical coverage accuracy of the confidence intervals are found to be significantly below the corresponding theoretical confidence levels for all values of the variance ratio.

Kurien, John (1998). A Few Thoughts From the Perspective of Small-Scale Fisheries in Asia. Associate Professor, Centre for Development Studies, Trivandrum, Technical Working Group on the Management of Fishing Capacity, La Jolla California, U.S.A., April 15-18, 3 pp.

Overcapitalization and excess/over capacity are issues that engage the minds of fishery managers the world over. In the artisanal, small-scale fisheries of tropical water developing countries, overcapitalization is a new phenomenon, overcapacity is not.

Kurien, John (1998). Does International Trade in Fisheries Products Contribute to Food Security? Discussion note prepared for the FAO E-Mail Conference on Fisheries Trade and Food Security, Associate Professor, Centre for Development Studies, Ulloor, Thiruvananthapuram, Kerala State, India, 8 pp.

The new globalization initiatives place increased faith in the role

played by market forces. They have created euphoria about the ability of a regime of vigorous and free international trade in food products to solve problems of food security. Achieving food security depends crucially on the level of both physical and economic access to food by the needy. Trade is therefore only one facilitating factor, and fish composes only a small part of the food basket. Both enhanced trade and food security depend substantially on the content, the quantum and the distribution of economic growth within and across countries. The role of trade and fish in food security must therefore not be overrated, and when examined in isolation, done so with caution. What contribution can fishery products make in moving humanity from the reality of widespread food insecurity to the vision of a world free from hunger? Does international trade in fishery products, in the manner in which it is organized today, play a role in alleviating food insecurity directly or indirectly? If not, under what conditions can it do so in the future? We need to ponder over these issues.

Kurkul, Patricia A. and Stanley D.H. Wang (1988). "Profitability of the U.S. Northeast Fisheries, 1976-1986." Draft report, Analytical Services Branch, Northeast Region, National Marine Fisheries Service, Gloucester, MA, March, 25 pp.

The methodology used to generate profit data and a discussion of profit trends are presented. Some important factors are discussed in relation to profit trends and tentative conclusions are drawn about fleet financial viability over this time period.

Kuronuma, Yoshihiro and Clement A. Tisdell (1996). Economics of Antarctic Minke Whale Catches: Sustainability and Welfare Considerations. Marine Resource Economics, 9(2):141-158.

Clark's bioeconomic model is applied to Antarctic minke whales (AMW), the backbone of the commercial whaling in 1982 when the International Whaling Commission (IWC) opted for a ban on whaling commencing 1985/86. The moratorium appears not to be justified from the point of view of saving AMW from extinction or for maximizing the net present value of returns to whalers. Catch quotas before the moratorium are found to be lower than needed for survival of the species and for sustainability of the harvests and returns. It seems that the IWC catch quotas and the moratorium were determined not by conventional bioeconomics, but by other factors such as political pressure from conservationists who suffered adverse externalities from whaling. Nevertheless, even taking such externalities into account, the present moratorium seems not to be Kaldor-Hicks optimal.

Kuruc, Michele (1993). "The Lacey Act." Paper presented at the Workshop on Enforcement Measures, Organization for Economic Co-Operation and Development, Directorate for Food, Agriculture, and Fisheries, Committee for Fisheries, Paris, September 21-22.

The legislative changes made to the Lacey Act during the past 93 years are chronicled. A survey is conducted of some case law under the Act involving fish and wildlife. The intent is to show how the Act has protected endangered species since its passage in 1900.

Kusumastanto, Tridoyo and Curtis M. Jolly (1997). Demand Analysis for Fish in Indonesian. Applied Economics, 29:95-100.

The purpose of this study was to determine an aggregate demand function and the factors influencing the demand for fish in Indonesia during the period 1967-88. Using a Box-Cox transformation methodology, the double-log model was

found to be appropriate for explaining the demand for fish. Results of static analysis showed an own-price of -0.102, a cross-price elasticity for eggs of 0.271, and an income elasticity of 0.506. A dynamic analysis using a Houthakker-Taylor model indicated that fish consumption depended on psychological food buying habits of consumers. Short run and long run elasticities, resulting from a partial adjustment model, implied that per capita consumption of fish is growing at a slow rate.

Kusumastanto, Tridoyo, Curtis M. Jolly, and Chairul Muluk (1996). Investment Analysis for Indonesian Shrimp Aquaculture. Journal of Applied Aquaculture, 6(4):1-15.

Investment strategies for Indonesian shrimp aquaculture were evaluated. Three strategies: intensive, semi-intensive, and extensive production systems, and four scales of operation: small scale (2 ha), medium scale (5 ha), large scale (10 ha), and extra large scale (30 ha) were examined. Capital budgeting techniques were used to determine the system and scale that were most cost effective for the industry. All systems showed positive net present values and had acceptable internal rates of return. The 2 ha and 5 ha semi-intensive were the most cost effective with or without financing. The intensive strategy is less attractive for 10 ha production programs compared to the 10 ha and 30 ha semi-intensive. The results showed that net present values and benefit to cost ratios increased with farm sizes, but internal rates of returns (IRR) were the highest for 2 ha and 5 ha semi-intensive farms.

Kutkuhn, Joseph H. (1984). "A New Fisheries Emphasis in the U.S. Fish and Wildlife Service." Chapter 3 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

An explanation of the U.S. Fish and Wildlife Service's new fisheries resources emphasis. The objectives are to rebuild native fisheries resources, mitigating damage to fisheries resources, manage fishery resources on federal lands, enhance endangered and threatened fishes, scientifically based fisheries resources management, and promote public awareness of the Nation's fisheries resources.

Le Cren, E.D. and M.W. Holdgate (eds.) (1962). The Exploitation of Natural Animal Populations. John Wiley and Sons, Inc., New York, N.Y.

This is the report of the Second Symposium of the British Ecological Society on the exploitation of natural animal populations.

LaFrance, Jeffrey T. and W. Michael Hanemann (1989). "The Dual Structure of Incomplete Demand Systems." American Journal of Agricultural Economics, May:262-274.

Integrability of incomplete demand systems is discussed. The concepts of weak integrability, quasi-expenditure function, quasi-indirect utility function, and quasi-utility function are defined. Their relationships to the expenditure function, indirect utility function, and utility function are developed. The dual structure of the quasi-functions permits exact welfare analysis and reveals the conditional preference structure for the commodities of interest. New results relating the uniqueness and exactness of consumer's surplus to the structure of the expenditure and indirect utility functions are obtained.

Labisky, Ronald F., Douglas R. Gregory, Jr., and Joseph A. Conti (1980).  
"Florida's Spiny Lobster Fishery: An Historical Perspective."  
Fisheries, 5(4):28-37.

The Florida based fishery accounts for 98 percent of the spiny lobster landed commercially in the United States; this catch is comprised almost exclusively of the Florida spiny lobster, Panulirus argus. The commercial lobster industry began in the lower Florida Keys during the early 1800's principally as a bait fishery that supported the local finfish industry. Subsequent developments in the lobster fishery have essentially mirrored the prosperity of Key West. In 1908, landings totaled about 53,000 pounds that were valued at \$3,600. The fishery began to exhibit progressive expansion in the 1940's, a trend that continued through the 1970's. A sport (diver) fishery for lobsters that began in the 1950's has also gained prominence. Commercial landings in Florida, including catches from international waters, peaked in 1972 at 11.4 million pounds. The peak in ex-vessel landings value, \$13.4 million, was attained in 1974. The strong international fishery that developed during the 1960's was severely curtailed in 1975 by the closure of Bahamian fishing grounds to foreign fishing. Domestic catches from Florida waters declined slightly during the 1970's, despite a substantial increase in fishing effort. Retrospectively, the spiny lobster has not only strongly impacted the culture, sociology, and economics of south Florida, but has also emerged to rank second only to shrimp as Florida's leading fishing industry.

Lacewell, Ronald D., Wade L. Griffin, James E. Smith, Wayne A. Hayenga (1974). "Estimated Costs and Returns for Gulf of Mexico Shrimp Vessels: 1971." Departmental Technical Report No. 74-1, The Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, January, 36 pp.

This study is an analysis of expected vessel costs, returns, and economic implications of alternative shrimp price situations. Costs and return estimates were based on 1971 data taken from 29 vessels separated into two classifications: (1) 53 to 65 foot and (2) 66 to 72 foot. Annual landings of shrimp were 41,551 and 56,933 heads-off pounds for small and large vessels, respectively. Total annual variable cost was \$30,031 for small vessels and \$51,632 for large vessels. Based on an expected 20 year life and 1971 vessel costs, annual fixed cost was \$8,144 and \$10,421 for small and large vessels, respectively. Gross revenue was \$46,800 for smaller vessels based on a price of \$1.13 per pound and \$69,869 for large vessels based on a price of \$1.23 per pound. The resulting net per vessel was \$8,625 and \$7,816 for small and large vessels, respectively. The investment analysis indicated that the internal rate of return for a small vessel was 24 percent without external financing and 50 percent with normal financing arrangements of an 80 percent loan at 8 percent interest for 6 years. This compares to an internal rate of return for large vessels of 7 percent without financing and 32 percent with the financing arrangement described above.

Lackey, Robert T. and Wayne A. Hubert (1976). Analysis of Exploited Fish Populations, VPI-SG-76-04, Sea Grant, Extension Division, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

The purpose of this text is to provide students and practicing fisheries scientists with a basic understanding of the analysis of exploited fish populations. Methods for evaluating the state of a population and techniques that lead to management options and decisions are presented. Population dynamics is approached from a broad, principle oriented direction.

Ladner, Rosamund, Leah J. Smith, Susan Peterson, and James Wilson (1981). "Bibliography of Socio-Economic Studies: Fisheries of the Northeast U.S." Woods Hole Oceanographic Institution, Technical Report WHOI-81-99, Woods Hole, Massachusetts 02543.

This bibliography of social and economic studies of the fisheries of the Northeast United States includes annotated listings for each entry and an index of key works for cross referencing. We have attempted to include all studies published since 1970, and a selected group of particularly significant studies done earlier. The major focus has been on commercial fisheries, but recreational fishing studies have also been included when possible. In addition to studies of the Northeast United States fisheries, studies of Canadian fishing subsidies, European and other markets, have been included because of their relevance to the regional industry. All stages of the fishing industry's operation - harvesting, processing, distribution, marketing - are included, along with management and policy oriented material.

Lallemant, Philippe, J.M. Gates, Joel Dirlam, and Jung Hee Cho (1998). The Costs of Small Trawlers. Final report, Department of Environmental & Natural Resource Economics, University of Rhode Island, Kingston, RI, March, 54 pp.

The results of an economic survey of small northeast fishing vessels using otter trawl gear is described. The population consisted of 572 persons who were holders of groundfish permits, had fishing vessels of 65 feet or less, and who reported catches in New England using trawl gear in 1996. A 10 percent response rate was achieved from a mail survey of a questionnaire that generated 35 usable responses from a probable population of 420 fishermen. The results of our mail survey of small trawlers are presented in eleven sets of tables and 4 sets of figures. Each table summarizes quantitative data responses by providing two or more measures of central tendency (the mean or average, the median, and the mode), and two measures of variability (the standard deviation, the standard error of the mean, the skewness, and the range). The Count on total respondents for each question is also provided as an indication of the reliability of the results.

Lam, C.F., J.D. Whitaker, and F.S. Lee (1989). "Model for White Shrimp Landings for the Central Coast of South Carolina." North American Journal of Fisheries Management, 9:12-22.

A stock recruitment relationship (SRR) was developed for white shrimp Penaeus setiferus in the central coastal area of South Carolina. The SRR is a Beverton-Holt type curve for which May and June commercial fishery landings represent stock and August-January landings represent recruitment. A variable, August salinity in Charleston Harbor, was selected by the stepwise regression process, and it was combined with the Beverton-Holt equation to produce a model that explained 86.8% of the variation in August-January landings. The final model was used to develop a family of SRR curves in which each curve corresponded to a different salinity. This model was sufficiently robust to forecast below average, average, and above average fall landings from readily obtainable data collected in spring and summer. These findings support South Carolina's existing management strategy of protecting spring spawners as much as possible after severe winter weather when the brood stock has suffered heavy mortality.

Lambert, David K. and J.S. Shonkwiler (1995). Factor Bias Under Stochastic Technical Change. American Journal of Agricultural Economics, 77(3):578-590.

Time series procedures are employed to determine the influence of technological change in inducing factor bias in U.S. agricultural production between 1948 and 1983. A dynamic measurement error model is used to link research expenditures to the unobserved technological change variable. Biasedness in labor and material factor shares is established.

Lambert, David K. and Amin Ussif (1997). A Distance Function Approach to Multifactor Productivity Measurement in U.S. Agriculture. Presentation for the Western Agricultural Economics Association, Reno Nevada, July 13-16, 17 pp.

A new procedure is developed to derive estimates of productivity. Distance function values are calculated between observed netputs and a reference technology constructed by augmenting observed netputs for quality changes. MFP growth rates average around 2% over the postwar period. Discrepancies occur between the distance function estimates and traditional measures.

Lambregts, Johannes A.D., Sayra G. Thacker, and Wade L. Griffin (1993). "Economic Evaluation of Different Densities for Various Sized Shrimp Farms in Texas." Journal of the World Aquaculture Society, 24(1):12-22.

There has been a trend toward intensification of shrimp farming in the U.S. Fifteen simulated farms were used to evaluate economies of scale and to compare three Penaeus vannamei commercial production strategies: semi-intensive, intensive, and very intensive. Large economies of scale were associated with each production strategy. Over the range of farm sizes considered, investment cost per hectare decreased approximately 50% and production cost decreased approximately 25%. Farms' returns were measured with Internal Rate of return (IRR). When investment was greater than \$0.75 million, the intensive strategy provided slightly better returns to the investor than semi-intensive or very intensive strategies. At investment levels less than \$0.75 million, the semi-intensive strategy provided the highest IRR.

Lambregts, J.A.D., W.L. Griffin, R.D. Lacewell, J.T. Davis, and G.M. Clary (1993). "Estimated Costs and Returns for Catfish Farms With Recirculating Ponds Along the Upper Texas Coast." Journal of Agriculture and Applied Economics, 25(2):1-12.

Costs, returns, and economies of scale for small, medium, and large catfish farms with recirculating ponds are presented for the upper Texas coast. Internal rates of return are 0.150, 0.183, 0.219, respectively. Total investment is higher than farms with static ponds but investment per unit production capacity is 7 percent to 16 percent lower. Average total cost per pound is between \$0.565 and \$0.541 (11 percent - 20 percent lower than farms using current technology). These results have implications for regional comparative advantage of catfish production as well as incentive for adoption of new technology in conventional ponds.

Lamkin, John Tillman (1984). A Study of the Galveston Bay Bait-Shrimp Fishery. Thesis, Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas, December, 79 pp.

A study of the bait fish fishery in Galveston Bay, Texas and its impact on finfish bycatch. Monthly shrimp:finfish abundance ratios ranged from 6.4:1 to 1.5:1 with bait shrimp catch of brown and white shrimp. A total of 348,585 kg of finfish were caught in the Galveston Bay bait-shrimp fishery



during this study. However, bycatch mortality appears to be negligible and impact upon juvenile fish stocks minimal.

Lampe, H.C., B.J. Bates, and I.E. Strand (19??). "Fish, A Dynamic Bio-Economic Simulator." Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island.

Fish is a Fortran IV level G program designed for simulating the growth, capture and sale of any two species of fish. It can be executed from a terminal or from a source deck. The biological model follows closely the models designed by Beverton and Holt. The economic behavior is based on J.F. Farrell and H.C. Lampe's model.

Lane, Daniel E. (1986). "A Partially Observable Model of Decision Making by Fishermen." Working Paper 86-46, University of Ottawa.

This paper presents an application of a partially observable Markov decision process for the intraseasonal decisions of fishing vessel operators. Throughout each fishing season independent vessel operators must decide in which zone or fishing ground of the fishery to fish during each period to catch the most fish with the highest return to fishing effort. Fishermen's decisions are assumed to be made to maximize net operating income. The decision model incorporates the potential catch of fish, the cost of fishing effort, and the unit price of fish. Catch potential is modeled by considering the abundance of the fish stock and the catchability of the fishing technique. Abundance dynamics not directly observed are modeled as a Markov chain with a parsimonious state space representation that renders the problem practicable. Dynamic decision policies are computed by the method of optimal control of the process over a finite horizon. The resultant policies are used to simulate distributions of fishermen's net operating income, fishing effort dynamics, and catch statistics. The model may be used as a decision aid in the regulation of the common property fisheries resource.

Lane, Daniel E. (1987). "Investment Decision Making by Fishermen." Working Paper 87-20, University of Ottawa, March.

This paper develops and applies a model of investment decision making by fishermen. The results of the model present an accurate picture of actual investment decisions and provide valuable insights into the behavioral basis of investment decision making by fishermen. Understanding the investment decisions of fishermen has implications for planning and regulation in fisheries. Insights gained into the key factors behind fishermen's investment decisions provide the basis for the development of strategic long term policies that anticipate fishermen's behavior. The consequences will be a movement away from reactive, short term policies that have characterized fisheries regulation to date. Individual fishermen make investment decisions in an environment that is competitive and highly variable from season to season. Extensive variability means that economic survival must be a primary consideration in the investment decision process. In this paper fishermen's investment decisions are modeled as a probabilistic dynamic programming problem in discrete time. Fishermen are assumed to make rational decisions based on income expectations and subject to survivability conditions to maximize the net worth of fishing enterprise at the end of a finite planning horizon. The formal analysis of the investment model is presented and the model is applied to troller fishermen of the British Columbia commercial fishing fleet.

Lane, Daniel E. (1996). "Report by Correspondence of the Study Group on the Management Performance of Individual Transferable Quota (ITQ)

Systems." ICES CM1996/Assess:19, Advisory Committee on Fishery Management, International Council for the Exploration of the Sea, Palaegade 2-4, DK-1261, Copenhagen K Denmark, September, 30 pp.

A bibliography of studies on individual transferable quotas. The purpose of the Study Group is to examine and assess current work on ITQs and the experience compiled from those systems already in place. The purpose of this report is to examine what significant work has been done to date on ITQs, what work is currently in progress, and to consider initiatives within ICES toward developing a better understanding of all implications of rights based systems in fisheries management in general, and ITQS in particular. The intention is to have ICES use the information from this report and that provided by the Study Group in considering the need for future meetings and an expanded mandate.

Lane, Daniel E. (1997). "ICES Study Group on the Management Performance of Individual Transferable Quota (ITQ) Systems." Study Group Meeting, Northeast Fisheries Science Center, 166 Waters Street, Woods Hole, Mass., USA, April, 18 pp.

An agenda for a meeting on individual transferable quotas with an extensive bibliography.

Lane, Daniel E. (1997). "Evaluation of Potential Gains and Costs of the Transition to Responsible Fisheries: Model For Analysis." AGR/FI(97)10, Directorate for Food, Agriculture, and Fisheries, Fisheries Committee, Organization for Economic Co-operation and Development, Sept., 34 pp.

A model framework is applied to a Canadian fisheries case study for tracking the dynamic transition of the fishery to a position of responsible fisheries. It is envisaged that the model will be used by the Secretariat to analyze national case study submissions.

Lange, Anne M., Morgan L. McCosh, Rita Curtis, Terry Smith, Rob Hicks, Doug Lipton, and Peter Fricke (1998). Atlantic Striped Bass Study: Socio-Economic Benefits of the Striped Bass Resource. Report to Congress, Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service and Department of the Interior, U.S. Fish and Wildlife Service, Fishery Management Division, September, 65 pp.

This report constitutes the socio-economic analysis of the benefits of the Atlantic Striped Bass resource mandated by Congress in its reauthorization of the Striped Bass Act in 1977. Existing economic data and analyses are used to provide a characterization of the fisheries that outlines the possible benefits to the nation from successful fisheries management, but does not quantify those benefits. Limited resources and time preclude an in-depth examination of striped bass angling and commercial harvest and their resulting social and economic value and impacts. Further study and data are needed if Congress wants to quantify the economic importance of the striped bass fishery.

Langley, Lynne (1997). Big Haul Forecast for Shrimpers. The Post and Courier, Charleston, SC, May 18, 2 pp.

A newspaper announcement of the opening of the south Atlantic white shrimp fishing season, promising an above average fishing season, with fishermen's comments.

Langmo, R Donald, Christopher N. Carter, and Ronald O. Bailey (1975).  
"Marketing Characteristics of Oregon's Fresh Frozen Shrimp  
Industry." Oregon State University, Sea Grant College Program,  
Publication No. ORESU-T-75-002, Agricultural Experiment Station,  
Special Report No. 440, August, 23 pp.

This work consolidates from many sources features of the fresh frozen shrimp industry in terms of its product volume, growth trends, and position relative to other Oregon seafood commodities. Market structure and functions are described as the product moves from the fisherman through the processor, broker, wholesaler, and retailer to the consumer. There is brief speculation on needs for future studies of marketing.

Larkin, P.A. (1963). "Interspecific Competition and Exploitation." J. Fish. Res. Board Can., 20(3):647-678.

The consequences of exploitation of either or both of a pair of competing species are examined using the Lotka-Volterra equations. The removal of a fixed proportion of a population on an instantaneous basis shifts the equilibrium population sizes for both the exploited species and its competitor. Similar shifts occur when both species are exploited. The maximum sustained yield of a species can be estimated under various degrees of exploitation of its competitor. The maximum combined sustained yield can be estimated for various relative values of the two species. From this analysis it is observed (1) harvesting only one species may provide a mistaken underestimate of capacity for sustained yield, (2) harvesting two species but relating yield to the fishing mortality rate of only one of the two may give a misleading overestimate of further capacity for sustained yield. Similar conclusions can be drawn if exploitation rate is proportional to abundance.

Larkin, P.A. (1966). "Exploitation in a Type of Predator-Prey Relationship." Journal Fisheries Research Board of Canada, 23(3):349-356.

The response of a predator-prey system to exploitation are explored. This type of equation system is perhaps a suitable representation of the type of natural situation in which a predator is wholly dependent on one species of prey for food, and in which factors other than predators may regulate prey abundance. Yield and value isopleths are presented for sample values of the above parameters and for various rates of fishing.

Larkin, P.A. (1978). "Fisheries Management - An Essay for Ecologists." Ann. Rev. Ecol. Syst., 9:57-73.

The paper attempts to expose for ecologists who are not fisheries biologists what fisheries biology and management are all about. The population dynamics of fish and fishermen are woven together in an attempt to project the present state of our understanding of the population ecology of fisheries and the state of the art of fisheries management. It concludes with some guesses about some of the developments in the future.

Larkin, Peter A. (1984). "The Problem with George or the Role of Development in Fisheries Management." Chapter 13 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

A tongue in cheek discussion of the role of development in fisheries

management using an alleged letter from a former student as the vehicle.

Larkin, Sherry L. and J. Walter Milon (1997). Florida's Spiny Lobster Fishery: Preliminary Analysis Using Catch-Effort Data. Draft Report, P.O. Box 110240, Food and Resource Economics Department, University of Florida, Gainesville, Florida, August, 22 pp.

Several surplus production models are estimated for Florida's commercial spiny lobster (Panulirus argus) fishery. Results are used to derive and compare selected biological parameters including the intrinsic growth rate, catchability coefficient, and maximum stock level. The model developed by Clarke, Yoshimoto, and Pooley best explained the dynamics; this model had the highest explanatory power largest number of statistically significant independent variables, and reasonable estimates of the biological parameters. Using this model, a statistical difference was found during years of fishing in international waters. This result did not, however, appreciably alter the biological parameter estimates.

Larkin, Sherry L. and Gilbert Sylvia (1995). Intrinsic Product Characteristics and Fisheries Management: An Intraseason Bioeconomic Analysis of the Pacific Whiting Fishery. Draft Report, Department of Agriculture and Resource Economics, Ballard Extension Hall 322, Oregon State University, Corvallis, Oregon and the Coastal Oregon Marine Experiment Station, Hatfield Marine Science Center, Oregon State University, Newport, Oregon, August.

An empirical bioeconomic model of the Pacific whiting fishery is developed to illustrate the inefficiency of calendar independent policies for managing stocks that display physical variation within seasons. The model uses the characteristics of the harvested product to link biological information with the economics of production. The socially optimal short run management plan jointly regulates the intra season harvest pattern and quasi-property rights allocation. The distinct effects of these regulations are examined using sensitivity analysis. Results indicate that society benefits from harvest plans that consider intrinsic characteristics by regulating the timing of harvest within each season. Moving from an early to a later season fishery increased 3-year net present value from U.S. \$36.5 million to \$66.4 million due to greater biological growth and higher product recovery rates associated with improved intrinsic quality of the fish. Results also show a conservation effect for both the resource stock and the ecosystem. In addition, the magnitude of benefits are robust to the allocations held by onshore and offshore sectors. This analysis offers insights for improving fisheries management.

Larkin, Sherry L. and Gilbert Sylvia (1995). Intrinsic Product Characteristics and Intraseason Production Efficiency. Draft Report, Food and Resource Economics Department, University of Florida, Gainesville, FL and the Coastal Oregon Marine Experiment Station, Hatfield Marine Science Center, Oregon State University, Newport, Oregon.

Aside from the determination of harvest levels, contemporary management of many species is dominated by concerns for the economic well-being of the harvesters, especially when there are several competing heterogeneous harvest groups. Fisheries managers, therefore, often overlook the biological and economic effects of seasonal physiological changes in individual fish cohorts. For many marine species, these changes can affect harvest yields, processor recovery rates, and quality characteristics of processed products. Ignoring these factors can lead to smaller stocks and harvests, increased costs, lower

valued products and significant losses in regional and national welfare. The Pacific whiting (Merluccius productus) fishery serves as a case study to understand the importance of pre-harvest fish quality and fisheries management including the determination of annual, seasonal, and user group quotas. A bioeconomic programming model is used to evaluate the relationship between the various quota strategies and management goals of stock conservation, economic value, and maximum utilization.

Larkin, Sherry L., Donna Lee, and Charles Adams (1997). Atlantic Pelagic Fisheries: Analysis of 1996 Trip Summary Statistics. Draft Report, Food and Resource Economics Department, University of Florida, Gainesville, FL, August, 19 pp.

Logbook trip summary data was analyzed for commercial U.S. vessels that participated in Atlantic pelagic fisheries in 1996. The economics were compared between alternative vessel and trip groupings. These comparisons revealed an appropriate means to disaggregate the industry for use in future bioeconomic modeling of the North Atlantic swordfish (Xiphias gladius) fishery.

Larkin, Sherry L., Donna Lee, and Charles Adams (1998). Costs, Earnings, and Returns to the U.S. Atlantic Pelagic Longline Fleet in 1996. SP98-9, Staff Paper Series, Food and Resource Economics Department, University of Florida, Gainesville, FL, June, 44 pp.

Logbook trip and set summary data collected by the NMFS are analyzed for commercial U.S. pelagic longline vessels that participated in Atlantic pelagic fisheries in 1996. These data are augmented with the U.S. Coast Guard vessel database to incorporate vessel characteristics. Average fish weights and prices from NMFS observers, licenced seafood dealers, and the Fisheries Statistics and Economics Division, respectively, are used to estimate gross revenues. This revenue is compared to average reported cost and earnings information. Comparisons by vessel and trip types are also made. The Atlantic pelagic longline fleet consisted of 259 vessels that landed (e.g., offloaded for sale) approximately 240,000 fish (more than 30 species) in 1996. Each vessel average 12 trips during which they placed five sets (each with, on average, 632 hooks over 25 miles). The average trip lasted 10 days and grossed \$10,270. Supply costs averaged \$4,708 for fuel, bait, light sticks, ice, and groceries, and \$2,623 for miscellaneous expenses. The total crew payment averaged \$3,903 (\$1,055 per crew member). In addition, vessel owners and captains (if not the owners) received \$4,422 and \$1,521, respectively. This analysis suggests considering the fleet as heterogeneous by vessel length and the number of sets per trip based on cost and revenue calculations. Disaggregating the fleet by vessel size (e.g., length) and fishing behavior (i.e., number of sets per trip) may be necessary to account for significant differences in reported landings and estimated financial returns. It may be especially important to incorporate these differences into management decisions when considering proposed changes in fleet and fisheries regulations.

Larson, Douglas M. (1993). Joint Recreation Choices and Implied Values of Time. Land Economics, 69(3):270-286.

A model of joint recreation quantity choices is developed. Individuals choose both total time spent at distant sites and the number of trips taken, implicitly choosing average on-site time. The model permits nonzero marginal utility of travel, makes on-site time endogenous, and is linear in the constraints. The scarcity value of time is analyzed without assuming the marginal utility of work time is zero. A partially testable assumption about relative marginal values of travel and on-site time yields nonparametric

calculations of the scarcity value of time and marginal values of trips and days on-site from people's observed optimal quantity choices.

Larson, Douglas M. (1993). On Measuring Existence Value. Land Economics, 69(4):377-388.

The prevailing consensus that existence value can only be measured by contingent valuation is questioned. The concern is over pure existence value, a change in welfare when a public good changes that leaves no trace in behavior. Pure existence value may well be more a consequence of the simple models used to characterize nonuse value than a reflection of how people value public goods. If so, nonuse value can in principle be obtained from observing behavior as well as from asking questions, which offers a prospect for cross-checks and corroboration using both approaches. Some possibilities for empirical measurement are suggested.

Larson, Douglas M., Brett W. House, and Joseph M. Terry (1996). Towards Efficient Bycatch Management in Multispecies Fisheries: A Nonparametric Approach. Marine Resource Economics, 11(3):181-201.

Linear programming based models of individual multispecies groundfish operations in the Bering Sea/Aleutian Islands area are developed and applied to the question of determining efficient bycatches. The policy tool is halibut quotas, which restrict the bycatch of halibut and also induce changes in the target species catch composition and bycatch of other prohibited species. Efficient quotas can be interpolated from the locus of shadow values for discrete halibut quotas relative to the opportunity cost of prohibited species bycatch induced by the policy set quotas on halibut bycatch. Because of information limitations intrinsic to fisheries management, the efficient halibut quotas are considered in the context of ranges of marginal value and marginal opportunity cost developed using short and long run groundfish fishery models and standard error estimates of opportunity cost.

Larson, Douglas M., Brett W. House, and Joseph M. Terry (1998). Bycatch Control in Multispecies Fisheries: A Quasi-Rent Share Approach to the Bering Sea/Aleutian Islands Midwater Trawl Pollock Fishery. American Journal of Agricultural Economics, 80(4):778-792.

Optimal bycatch rules and quota share price estimates are derived from a multispecies production technology model of the factory trawler fleet targeting on midwater pollock in the Bering Sea/Aleutian Islands region of the North Pacific Ocean. Data routinely collected by federal and state fisheries officials on catch and revenue by species, week, and operation are used to identify the aggregate restricted quasi-rent function for the fishery by estimating the associated system of inverse demands for species quotas. The model is estimated using data for the 1991 and 1992 seasons, and separability and nonjointness of the technology are tested for and rejected.

Lave, Charles A. (1970). "The Demand for Urban Mass Transportation." The Review of Economics and Statistics, 52:320-324.

This paper explores some of the factors which influence the commuter's choice of mode. It attempts to provide quantitative estimates of the degree of transit improvement that will be necessary to attract commuters.

Lea, J.D. and J.S. Shonkwiler (1988). "Misspecification in Simultaneous Systems: An Alternative Test and Its Application to a Model of the Shrimp Market." Southern Journal of Agricultural Economics, 20(2):65-72.

Concern over the effects of public policies based on misspecified econometric models motivates interest in a procedure to test, diagnose, and improve the specification of models that have been estimated with three stage least squares. A test of system wide specification based on Hausman's specification test is employed in a test of the a priori restrictions placed on the parameters of a structural model of the U.S. shrimp market. The null hypothesis of proper specification is rejected. After diagnosis via a comparison of unrestricted and restricted reduced forms and respecification, the null hypothesis cannot be rejected.

Lean, Judith and David Rind (1996). "The Sun and Climate." Consequences, 2(1):27-36.

The Sun is almost certainly implicated in some of the climate changes of the past, and may today affect, to some degree, the weather from year to year. Yet, were it the only agent of climatic change, we would live in a world where the mean global surface temperature varied, in any century, through limits of at most about 0.5° C. We are not yet able to predict those changes, beyond what is now known of the Sun's much smaller, eleven year variation. Over longer scales of time, possible changes in solar radiation could modify the warming that has been projected in mid range, consensus IPCC models for the end of the next century by at most about 25 percent. Our understanding of solar variations needs to be extended if we are to refine these estimates to the level of most of the other climatic variables on which current projections are based.

Leard, Richard, John Merriner, Vincent Guillory, Borden Wallace, and Dalton Berry (1995). "The Menhaden Fishery of the Gulf of Mexico, United States: A Regional Management Plan." Draft Report Number 32, Gulf States Marine Fisheries Commission, P.O. Box 726, Ocean Springs, Mississippi, February.

A fishery management plan for the Gulf of Mexico menhaden fishery that describes the management objectives, problems in the fishery, and the existing economic, social, and biological information for the fishery.

Leard, Richard, John Merriner, Vincent Guillory, Borden Wallace, and Dalton Berry (1995). "The Menhaden Fishery of the Gulf of Mexico, United States: A Regional Management Plan." Report Number 32, Gulf States Marine Fisheries Commission, P.O. Box 726, Ocean Springs, Mississippi, April.

A fishery management plan for the Gulf of Mexico menhaden fishery that describes the management objectives, problems in the fishery, and the existing economic, social, and biological information for the fishery.

Leard, Richard, Behzad Mahmoudi, Harry Blanchet, Henry Lazauski, Kyle Spiller, Mike Buchanan, Christopher Dyer, and Walter Keithly (1995). The Striped Mullet Fishery of the Gulf of Mexico, United States: A Regional Management Plan. No. 33, Gulf States Marine Fisheries Commission, P.O. Box 726, Ocean Springs, Mississippi, December.

A fishery management plan for the Gulf of Mexico striped mullet fishery that describes the management objectives, problems in the fishery, and the existing economic, social, and biological information for the fishery.

Leard, Richard, Richard Matheson, Karen Meador, Walter Keithly, Clarence Luquet, Mark Van Hoose, Christopher Dyer, Scott Gordon, James Robertson, Doug Horn, and Rita Scheffler (1993). The Black Drum Fishery of the

Gulf of Mexico, United States: A Regional Management Plan. No. 28, Gulf States Marine Fisheries Commission, P.O. Box 726, Ocean Springs, Mississippi, May.

The present stock assessment concludes that the black drum population in the gulf is healthy; however, states should continue to monitor their fisheries to maintain a conservation standard that is at least equivalent to a 20% SSB/R ratio. States should adopt gear restrictions, size limits, bag limits, seasonal quotas or other restrictions as needed, and they should work cooperatively to enact regulations that are consistent among states to the maximum extent possible. All fish should be landed whole, with heads, tails and flesh naturally attached, and only licensed commercial fishermen should be allowed to sell drum. State should also evaluate the impacts of regulations and their effects on solving problems and accomplishing management objectives. This evaluation should include effects on black drum from restrictions used to protect other fisheries.

Leary, Terrance R. (1983). "Review of the Gulf of Mexico Management Plan for Shrimp." Second Australian National Prawn Seminar.

Seasonal closures in the western gulf are estimated to have increased gulf wide yield of *Penaeus aztecus* by 9% in 1981 and 6% in 1982. Monitoring spring water temperatures and salinities allows some degree of accuracy in predicting annual abundance of this species. Salinities about 10 parts per hundred and temperatures above 20 degrees C are favorable. Benefits of management of *P. duorarum* in the eastern Gulf are less clearly defined, and relationships to environmental factors are not clearly understood. Restriction on U.S. vessels access to former foreign fishing grounds and increased imports from mariculture may require a reassessment of the management program.

Leatherman, Stephen P. and Robert J. Nicholls (1991). "Difficulties in Measuring and Predicting Sea-Level Rise." Proceedings of the Conference on Oceans, Climate, Man, Turin, Italy, April.

Relative sea level change at a particular location is primarily the sum of global change and local change in land elevation. Published values for sea level rise vary from 0.5 to 3 mm per year reflecting active local uplift or subsidence. Screening these data, it can be shown that long term tide gauge records measure the same underlying trend of sea level change. For planning and engineering purposes, government officials and decision makers should utilize the one meter benchmark because this estimate is well within the probable range of change.

Ledyard, John and Leon N. Moses (1976). "Dynamics and Land Use: The Case of Forestry." In Ronald E. Grieson (ed.) Public and Urban Economics, Lexington Books, D.C. Heath and Company, Lexington, Massachusetts.

This chapter develops a model that combines (1) Thunen's conception of rent as it varies with distance and transport costs from a center and (2) Samuelson's capital theory reasoning of the impact of the interest rate and other costs on the steady state solution for any given parcel of forest land without regard to location and transport costs.

Lee, Dennis (1990). "Tabulation of Recent Data on Swordfish Sex Ratio at Size Collected From the U.S. Fishery." ICCAT Working Document, SCRS/90/, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service,



Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida.

Recently, more intensive sampling of swordfish sex ratio at size has been implemented in the U.S. swordfish fleet. The purpose of this paper is to document the data available from these efforts.

Lee, Dennis (1991). "Update of the 1990 and 1991 Data Available on Swordfish Sex Ratio at Size Collected From the U.S. Fishery." ICCAT Working Document, SCRS/91/44, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida.

Efforts were continued in 1990 and 1991 to sample the U.S. swordfish fleet for sex ratio at size data. Morphometric measurements, sex determination, and biological data were collected through various sampling activities. These data may prove useful for stratifying swordfish landings by sex. The purpose of this paper is to document the current data available from these efforts.

Lee, Dennis W. and Gerald P. Scott (1991). "Development of Length and Weight Regression Parameters for Atlantic Swordfish (Xiphias gladius)." ICCAT Working Document SCRS/91/43, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL.

Availability of a common unit of measurement, such as lower jaw fork length (LJFL), is often used for partitioning the catch into age groups for age based stock assessments. In the U.S. fleet, swordfish (Xiphias gladius) are processed for the commercial market at sea. The processing used involves the removal of the head, viscera, gills, and caudal fin of the carcasses. In addition, whole weights cannot be measured on landed fish. Because the recent ICCAT agreement for a minimum size swordfish of 25 kg, whole weight, predictive relationships between the commonly available measurements for the U.S. landings were needed. For these reasons, length-weight and length-length relationships were derived from data collected by at sea observers and volunteer crew members aboard cooperating swordfish vessels to allow conversion from carcass length (CK) to LJFL and CK to dressed (DWT) and whole weights.

Lee, Dennis W., Cheryl J. Brown, Albert J. Catalano, Justin R. Grubich, Thomas W. Greig, Robert J. Miller, and Michael T. Judge (1994). SEFSC Pelagic Longline Observer Program Data Summary for 1992-1993. NMFS-SEFSC-347, NOAA Technical Memorandum, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida, April, 19 pp.

This document provides an overview of the pelagic longline observer program and summary of those data collected in the southeast region from May, 1992 through December, 1993.

Lee, Donna and Charles Adams (1996). A Bioeconomic Model of the North Atlantic Swordfish Fishery. Proposal to the National Marine Fisheries Service, Highly Migratory Species Management Division, Silver Spring, MD, September, 10 pp.

The objectives of this study are to (1) determine the effectiveness of

current management policy in sustaining swordfish stocks and improving long run net economic returns to the fishery, (2) provide comparisons of current policy (i.e. TAC direct and bycatch quotas) to proposed policies in terms of sustainability of the fishery and long run economic returns, and (3) compute the optimal 6 month harvest quota and bycatch limit under the following alternate goals: maximize long run economic returns, maximize annual yields, and maximize likelihood of sustaining the fishery beyond a specified target date.

Lee, Donna, Sherry L. Larkin, and Charles Adams (1996). A Bioeconomic Analysis of Proposed Regulations in the U.S. North Atlantic Swordfish Fishery. Staff Paper SP 98-10, Institute of Food and Agricultural Sciences, Food and Resource Economics Department, University of Florida, Gainesville, Fl, June, 56 pp.

A bioeconomic programming model was developed for the North Atlantic swordfish (*Xiphias gladius*) fishery to examine the effect of alternative management schemes. The model uses population dynamic equations obtained from the International Commission for the Conservation of Atlantic Tunas (ICCAT) and characteristics of the domestic fleet as reported to National Marine Fisheries Service (NMFS) in 1996. The model chooses the annual harvest level and domestic fleet size that maximize the net present value of returns to the U.S. commercial fishery across a five-year time horizon ( which corresponds with the ICCAT management time line). The model explicitly includes conservation measures.

Results indicate that five-year economic returns to the U.S. Atlantic longline fishery (discounted at ten percent annually) can be increased by reducing fleet size or by lowering the mortality of incidentally caught juveniles. Domestic policies aimed at reducing juvenile mortality may increase biomass in subsequent years and benefit the entire industry. Regulators need, however, to jointly consider such policies since an increase in stock size may be able to support a larger domestic fleet (which would contrast with proposed limited entry policies.).

Lee, John, Jr. (1994). Transparency, Empowerment, and the Public Interest: A View on the Role of Publicly-Employed Agricultural Economists. American Journal of Agricultural Economics, 76(5):1010-1021.

What should publicly supported institutions that employ agricultural economists expect of them.

Lee, Lung Fei and Robert P. Trost (1978). "Estimation of some Limited Dependent Variable Models with Application to Housing Demand." Journal of Econometrics, 8:357-382.

A model that extends the switching regression models and combines several different limited dependent variable models into a general framework is introduced. Methods to get consistent estimates and asymptotic efficient estimates are derived. Our estimation procedures are then used to study a housing expenditure model that takes into account the simultaneous determination of whether or not to own and how much to spend.

Lee, S. Todd and Daniel Holland (1999). The Impact of Noisy Catch Data on Estimates of Fishing Capacity Derived From DEA and Stochastic Frontier Models: A Monte Carlo Comparison. Draft report, Alaska Fisheries Science Center, NMFS, 7600 Sand Point Way NE, Seattle, WA, 23 pp.

There is currently much national and international interest in measuring commercial fishing capacity. Two quantitative methods that will likely be

used for this purpose are data envelopment analysis (DEA) and stochastic frontier (SF) production functions. Although both methods can be used to estimate a production frontier, their underlying assumptions and method of solving for the frontier are quite different. Once substantial difference is how each model handles noisy data. An understanding of the implications of this difference is important because random variation is likely to exist in commercial fishery catch data. This research uses Monte Carlo simulations to investigate possible finite sample biases attributable to this type of noise. The results suggest that the mean bias associated with noisy data is often substantially larger for DEA than SF. However, the frequency distributions of the biases from each method show a wide variation in some cases.

Lee, T.C., G.G. Judge, and A. Zellner (1968). "Maximum Likelihood and Bayesian Estimation of Transition Probabilities." American Statistical Association Journal, December:1162-1179.

In this paper, maximum likelihood and bayesian methods are presented for estimating transition probabilities when data in the form of aggregated proportions are available. The probability function for the observed proportions is assumed to have a multinomial distribution under the Lexis scheme. The multivariate beta distribution is used as the prior probability density function in formulating the Bayesian estimator. The results of some Monte Carlo experiments provide some evidence on the sampling properties of several alternative estimators.

Lee, T.C., G.G. Judge, and A. Zellner (1970). Estimating the Parameters of the Markov Probability Model from Aggregate Time Series Data. North-Holland Publishing Company, Amsterdam.

This book (1) summarizes and evaluates the initial results of markov chain models as appropriate probability model for time series data when the observation at any point in time is the state or category into which the unit being observed falls, (2) develops alternative macro transition probability estimators and the corresponding computer routines, and (3) evaluates the finite sample properties of these various estimators by a limited sampling experiment. Although the results reported apply primarily to aggregate data generated from a stationary first order Markov process, the extension of the results to areas concerned with the estimation of transition probabilities that are not time constant and the general problem of estimation when proportion data are used are considered in appendices.

Leeworthy, Vernon R. (1990). "An Economic Allocation of Fishery Stocks Between Recreational and Commercial Fishermen: The Case of King Mackerel." Ph.D. Dissertation, Department of Economics, Florida State University.

The economic value and the economic impact were estimated for Florida's east and west coast recreational and commercial king mackerel fisheries using 1986 data. In 1986, king mackerel fisheries in Florida were economically more important to both the nation and to the state of Florida's economy than the commercial king mackerel fisheries in Florida. These conclusions held even assuming large errors in estimation. Separate reviews are included that contest the authors conclusions of theoretical and empirical grounds.

Leeworthy, Vernon R. and Peter C. Wiley (1996). Importance and Satisfaction Ratings By Recreating Visitors to the Florida Keys/Key West. Linking the Economy and Environment of Florida Keys/Florida Bay, Strategic Environmental Assessments Division, Office of Ocean Resources Conservation and Assessment, National Ocean Service, National Oceanic

and Atmospheric Administration, U.S. Department of Commerce, November, 23 pp.

This report includes ratings given by visitors on the importance of, and satisfaction derived from 25 natural resource attributes, facilities and services using importance-performance or importance-satisfaction techniques.

Leeworthy, Vernon R. and Peter C. Wiley (1996). Visitor Profiles: Florida Keys/Key West. Linking the Economy and Environment of Florida Keys/Florida Bay, Strategic Environmental Assessments Division, Office of Ocean Resources Conservation and Assessment, National Ocean Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, November, 159 pp.

A survey was conducted of visitors in Monroe County Florida during two seasons: July - August 1995 and January - April 1996. Over 8,100 visitors were interviewed and over 11,000 questionnaires were completed which gathered information on visitors characteristics, activities, spending habits, and importance and satisfaction ratings on 25 selected facilities, services and natural resource attributes. The sample design also allowed for the estimation of total visitation. Estimates are provided for June - November 1995 and December 1995 - May, 1996. Annual totals or weighted annual averages were also estimated for the June 1996 - May 1996 period. Estimates were also made by geographic region (Upper Keys, Middle Keys, Lower Keys, and Key West).

Leeworthy, Vernon R. (1997). Draft Goals, Objectives and Assessment Efforts Required for Socioeconomic Monitoring in the Florida Keys National Marine Sanctuary. Linking the Economy and Environment of Florida Keys/Florida Bay, Strategic Environmental Assessments Division, Office of Ocean Resources Conservation and Assessment, National Ocean Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, October, 3 pp.

The primary goal of socioeconomic monitoring is to detect and document resultant changes in Sanctuary resource utilization patterns and their impact on market and nonmarket economic values of Sanctuary resources.

Leeworthy, Vernon R. and J.M. Bowker (1997). Nonmarket Economic User Values of the Florida Keys/Key West. Linking the Economy and Environment of Florida Keys/Florida Bay, Strategic Environmental Assessments Division, Office of Ocean Resources Conservation and Assessment, National Ocean Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, October, 41 pp.

This report presents a simple conceptual model that illustrates the link between the economy and the environment. Environmental and natural resource economic theory is used to show how sustainable use is related to environmental quality, and environmental quality's relationship to market and nonmarket economic values.

Leeworthy, Vernon R. and Peter C. Wiley (1997). A Socioeconomic Analysis of the Recreation Activities of Monroe County Residents in the Florida Keys/Key West. Linking the Economy and Environment of Florida Keys/Florida Bay, Strategic Environmental Assessments Division, Office of Ocean Resources Conservation and Assessment, National Ocean Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, August, 49 pp.

The results of a study to establish the recreational use of the Florida

Keys/Key West by residents of Monroe County, residents ratings on the importance and satisfaction with 25 selected natural resource attributes, facilities, and services, and the economic contribution that resident recreation activity makes to Monroe County.

Leeworthy, Vernon R. and Peter C. Wiley (1997). Technical Appendix: Sampling Methodologies and Estimation Methods Applied to the Survey of Monroe County Residents. Linking the Economy and Environment of Florida Keys/Florida Bay, Strategic Environmental Assessments Division, Office of Ocean Resources Conservation and Assessment, National Ocean Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, October, 58 pp.

This technical appendix to A Socioeconomic Analysis of the Recreation Activities of Monroe County Residents in the Florida Keys/Key West provides detailed documentation on how various measurements were derived.

Legault, Christopher and Mauricio Ortiz (1998). Delta Lognormal Estimates of Bycatch for Gulf of Mexico King and Spanish Mackerel and Their Impact on Stock Assessment and Allowable Biological Catch. MSAP/98/12, National Marine Fisheries Service, Southeast Fisheries Science Center, Sustainable Fisheries Division, 75 Virginia Beach Drive, Miami, FL, March.

An alternative approach to a generalized linear model is used to estimate bycatch levels for king and Spanish Mackerel in the shrimp fishery. The delta method treats values as a two part process, the probability of encountering a positive value and the expected value given that a positive value is encountered. Estimating each part separately and multiplying the results within each strata produces an alternative estimate of CPUE and thus annual bycatch.

Leigh, Peter (1997). Benefits and Costs of the Ruffe Control Program for the Great Lakes Fishery. Draft report. Habitat Conservation Office, National Oceanic and Atmospheric Administration, Silver Spring, Maryland.

Although data on Great Lake fish stocks and values are uncertain estimates, reasonable approximations can be made concerning economic losses for the United States from various types of management practices. Based on biometric changes that are projected to occur, it appears that early control of a nonindigenous fish species, specifically ruffe (Gymnocephalus cernuus), can result in significant investment returns. By instituting a ruffe control program, benefits to the public will exceed costs by 44 to 1 over the next five decades. Under a moderate case projection of benefits this will yield an estimated net public savings of \$513 million for the United States. Since sportfishing values are much greater than commercial fishing values, anglers will benefit the most from this program.

Leman, Christopher K. and Robert H. Nelson (19??). "Ten Commandments for Policy Economists."

The incorporation of economic approaches into policy making requires special skills on the part of the economist. This article examines the use of economics in government as illustrated by the experience of the natural resources agencies. It presents ten guiding rules for the practicing policy economist: (1) be economical about the use of economics; (2) discount for political demand; (3) dare to be "quick-and-dirty", (4) think like a manager; (5) analyze equity as well as efficiency; (6) know your market; (7) pay your

organizational dues; (8) profit form action-forcing events; (9) do not oversell economic analysis; and (10) learn policy economics by doing it.

Lence, Sergio H., Dermot J. Hayes, and William H. Meyers (1995). The Behavior of Forward-Looking Firms in the Very Short Run. American Journal of Agricultural Economics, 77(4):922-934.

The study develops a theory of very short run forward looking behavior allowing for forward trading and storage of final good and material input. Production and storage are separable from hedging decisions and depend only upon current forward and cash prices. Comparative statics are derived regarding production, purchases, and sales. The hypotheses advanced are tested with monthly data pertaining to the U.S. soybean processing industry. Results suggest that in short run equilibrium futures prices of the soybean complex have had little influence on crushings or production, but they have been important determinants of inventory levels.

Lent, Rebecca (1993). "Welfare Assessment of Recreational Demand Using Count Data." Draft report, National Marine Fisheries Service, Silver Spring, MD.

Count data from the recreational bluefin tuna fishery are used to estimate a truncated Poisson travel cost model. Angler consumer surplus (ACS) approximated from model parameters is compared to OLS and previous studies' estimates. ACS helps determine a rational quota allocation in the absence of property rights based fishery management.

Lent, Rebecca (1994). "Recreational Fisheries and Limited Access." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. Highly Migratory Species Division, National Marine Fisheries Service, Silver Springs, Maryland.

Limited access and individual transferable quota management programs for recreational fisheries are discussed. The existing limited literature is presented and major points presented from each study that pertain to this topic. Future research in the area is outlined.

Lent, Rebecca (1997). "1977 Shark Evaluation Workshop Annual Report, 1998 Atlantic Shark Regulations, and Magnuson-Stevens Fishery Conservation and Management Act Implementation." SAFE Report, Memorandum for Shark Operations Teams Members, Highly Migratory Species Division, National Marine Fisheries Service, Silver Springs, Maryland, Oct. 22, 4 pp.

The 1997 Stock Assessment and Fishery Evaluation Report(SAFE) has been assembled from (1) the 1997 Shark Evaluation Workshop (SEW) Annual Report with attached memo; and (2) Chapter 4 of the Draft Amendment 1 to the Fishery Management Plan for Sharks of the Atlantic Ocean (FMP) entitled Affected Environment , which describes the social and economic aspects of the fishery. Additionally, the section describing the functions and composition of the Highly Migratory Species (HMS) Advisory Panel (AP); Federal Register notices announcing NMFS s intent to prepare two Environmental Impact Statements and hold Scoping Meetings; the HMS Scoping Document; a memo describing the NMFS s interpretation of the precautionary approach; and the NOAA fisheries Strategic Plan are also attached.

Lery, J.M., J. Prado, and U. Tietze (1999). Economic Viability of Marine Capture Fisheries. FAO Fisheries Technical Paper 377, Food and Agriculture Organization of the United Nations, Rome, Italy, 130 pp.

Findings of a global study and an interregional workshop on the economic and financial viability of the most common fishing craft and gear combinations. In spite of fully and sometimes over-exploited fishery resources, marine capture fisheries in most cases are an economically and financially viable undertaking which generates sufficient revenue to cover the cost of depreciation as well as the opportunity cost of capital to generate funds for reinvestment in addition to employment, income, and foreign exchange earnings.

Levhari, David and Nissan Liviatan (1977). "Notes on Hotelling's Economics of Exhaustible Resources." Canadian Journal of Economics, 10(2):177-192.

The paper provides some extensions of Hotelling's fundamental paper on the economic theory of exhaustible resources. One of the main modifications introduced in the paper concerns the assumption of complete versus incomplete exhaustion of the resource. Under complete exhaustion the concept of full marginal cost must include a term that reflects the alternative cost of producing an extra unit at the terminal time. Under incomplete exhaustion this term vanishes. To derive these results, we present a novel formula for the full marginal cost of extracting exhaustible resources. Also, the principle that marginal profit has to increase over time exponentially at a rate equal to the interest rate ( $r$  percent rule) is shown to be valid only under special conditions. The modifications to this rule are discussed.

Levhari, David and Leonard J. Mirman (1980). "The Great Fish War: An Example Using a Dynamic Cournot-Nash Solution." The Bell Journal of Economics, 11:649-661.

In recent years there have been numerous international conflicts about fishing rights. These conflicts are wider in scope than those captured by the model presented in this paper. Yet the model sheds light on the economic implications of these conflicts as well as on the implications of other duopolistic situations in which the decisions of the participants affect the evolution of an underlying population of interest. Our model has two basic features: the underlying population changes as a result of the actions of both participants, and each participant takes account of the other's actions. This strategic aspect is studied, for an example, by using the concept of a Cournot-Nash equilibrium in which each participant's reaction depends on the stock of fish and not on previous behavior. Thus, the model is a discrete-time analog of a differential game. The paper examines the dynamic and steady state properties of the fish population that results from the interactions of the participants.

Levhari, David, Ron Michener, and Leonard J. Mirman (1981). "Dynamic Programming Models of Fishing: Competition." The American Economic Review, 71(4):649-661.

In this paper a simple framework will be provided in which many important results new to the literature can be derived. One bonus of this approach is that much of the previous literature can be organized and rationalized. The simplicity of the mathematics has the effect of revealing the underlying economic intuition of the subject. Throughout the paper the self renewing resource will be referred to as fish. However, it should be clear that the analysis is perfectly general in that it can be applied to any self renewing resource. In fact, by specializing the production function, and elementary exposition of the theory of exhaustible resources is implicit.

Lewis, Earl J., Frederick G. Kern, Aaron Rosenfield, Stuart A. Stevens,

Randal L. Walker, and Peter B. Heffernan (1992). "Lethal Parasites in Oysters from Coastal Georgia with Discussion of Disease and Management Implications." Marine Fisheries Review, 54(2):1-6.

Extensive mortalities of oysters, Crassostrea virginica, occurred from 1985 through 1987 in coastal waters of Georgia. Fluid thioglycolate cultures of oysters collected from 16 of 17 locations revealed infections by the apicomplexan parasite Perkinsus marinus. An ascetosporan parasite, Haplosporidium nelsoni, was also observed in histopathological examination of oysters from 4 of the locations. While the range of H. nelsoni currently is recognized as the east coast of the United States from Maine to Florida, this is the first report of the parasite in Georgia waters. This paper documents the occurrence of these two lethal parasites in oysters from coastal waters of Georgia, along with potential disease and management implications. Results of an earlier independent and previously unpublished survey are also discussed which document the presence of P. marinus in Georgia as early as 1966.

Lewis, Tracy R. (1977). "Attitudes Toward Risk and the Optimal Exploitation of an Exhaustible Resource." Journal of Environmental Economics and Management, 4:111-119.

The exploitation of a nonrenewable natural resource, such as petroleum or mineral ores, is analyzed in a stochastic framework with price uncertainty. The market setting may be either monopolistic or competitive. We demonstrate that the rate of extraction varies directly with the resource owner's willingness to accept risk. Risk preferring owners use the resource more rapidly than risk neutral owners, who in turn deplete the resource more rapidly than risk averse owners. It is also seen that the usual practice of increasing the discount rate to account for risk induces a more rapid rate of resource use when in fact a slower rate of depletion is desired.

Lewis, Tracy R. and James Cowens (1982). "The Great Fish War: A Cooperative Solution." Resources Paper No. 84, University of British Columbia, Department of Economics, Room 997B, 1873 East Mall, Vancouver, Canada, B6T 1Y2.

This note investigates a model that bases a firm's harvesting decision on the current stock as well as on the previous behavior of its competitors for its predictions on the sustainability of cooperative resource use, in which agreements are enforced by threat of retaliation. We use the Levhari-Mirman example to relate the prospects for maintaining cooperative arrangements to (a) the number of users and their ability to monitor each other, (b) the time rate of discount, and (c) the growth potential of the resource.

Lewis-Beck, Michael S. (1980). Applied Regression, An Introduction. Sage University Papers Series on Quantitative Applications in the Social Sciences, 07-022, Sage Publications, London.

An introduction to applied regression analysis with examples.

Liao, David S. (1979). "An Economic Analysis of Mobility of Shrimp Vessels in the South Atlantic States." South Carolina Marine Resources Center, Technical Report Number 35, May, 38 pp.

The study develops economic information concerning mobility of shrimp trawlers in the south Atlantic states. The study examined the mobility patterns of trawlers, factors associated with the trawler mobility, and the economic performance of various types of shrimping operations. It was hoped



that the study would provide benchmarks for decision-making to improve the shrimping industry and to utilize the resources more efficiently. In addition, the study analyzed some existing and alternative management programs that were related to the mobility of trawlers in the region. However, the general objective is to provide information and analysis to policy makers, not to make policies.

Liao, David S. (1993). "Economic Analysis of the 1991 South Carolina Shrimp Baiting Fishery." South Carolina Marine Resources Center, Technical Report Number 81, April, 25 pp.

This study's purpose was to develop some basic economic information concerning the recreational shrimp baiting fishery. Specific objectives include determining the socio-economic characteristics of licensed recreational shrimpers, analyzing factors affecting recreational shrimping trips, and estimating the economic values of shrimp baiting trips by the direct questioning method. Total gross economic values of shrimping trips in 1991 were estimated at \$1.9 million, while total net economic values were only \$236 thousand. The analysis of commercial and recreational shrimping relationships indicated that the commercial shrimp landings were independent of the level of recreational shrimping harvest. Therefore, commercial and recreational shrimping activities can coexist even if the gross economic value per pound was lower from recreational shrimping.

Liao, David S. and Theodore I.J. Smith (1981). "Test Marketing of Freshwater Shrimp, Macrobrachium Rosenbergii, in South Carolina." Aquaculture, 23:373-379.

A market testing study was conducted to examine the consumer and retailer acceptance for locally produced freshwater shrimp in South Carolina. The majority of consumers evaluated freshwater shrimp as similar to saltwater shrimp and about 89% were willing to purchase these shrimp from seafood stores. All retailers indicated that freshwater shrimp demonstrated high salability in their outlets and that they would add this aquafood to existing product lines.

Libby, Lawrence W. (1994). "Conflict on the Commons: Natural Resource Entitlements, the Public Interest, and Agricultural Economics." American Journal of Agricultural Economics, 76(5):997-1009.

This paper is about property rights, the public interest, and our particular piece of agricultural economics real estate in the path of economic and social change. I will examine selected natural resource institutional issues for insight about our discipline and profession. The parallels lead to certain recommendations essential to our professional survival, an important part of any presidential address. My examples are the current property rights debate, two cases where good intentions for resource development produced major environmental damage (irrigating the desert and draining the Everglades), and cases where changing human values have created resource issues (use of public lands and wetland protection). Then I will briefly mention farm policy in this context of changing values.

Libecap, Gary D. (1989). Contracting for Property Rights. Cambridge University Press, Cambridge.

This study is of the way property rights (the basic incentive system that shapes resource allocation) institutions are formed. Property rights are formed and enforced by political entities and reflect the conflicting interests and bargaining strength of those affected. Four common pool case

studies are used to illustrate that losses occurred even though in each case large aggregate gains could be achieved from reaching agreement.

Libecap, Gary D. and Ronald N. Johnson (1980). "Legislating Commons: The Navajo Tribal Council and the Navajo Range." Economic Inquiry, 18:69-86.

The article argues that chronic overgrazing on the Navajo Reservation is the result of policies of the BIA and the Tribal Council. In support of that hypothesis the paper outlines the nature of property rights to grazing land on the Reservation. It shows that BIA and Tribal Council actions have led to the proliferation of small herds since 1933. Small herds increase the resource costs of establishing and enforcing property rights, and they increase the political costs of requiring compliance with grazing rules. Statistical tests reveal a close relationship between herd size and overstocking of the range. The paper concludes that in the absence of the constraints of a private property system, it may be necessary for an outside agency to regulate grazing to avoid the problem of the Commons.

Libecap, Gary D. and Steven N. Wiggins (1984). "Contractual Responses to the Common Pool: Prorating of Crude Oil Production." American Economic Review, 74(1):87-98.

This paper addresses the impact of the number and heterogeneity of parties on contracting success by isolating firm differences that lead to differing bargaining positions and by showing the high degree of concentration necessary to complete contracts. We analyze firm bargaining to mitigate rent dissipation from competitive production on five common oil pools where contracting success varied sharply. On some fields, agreements were quickly reached and effectively enforced, while on others compliance was never achieved. We show the firm heterogeneities that led to different bargaining positions, and calculate the level of concentration necessary for private contracting success.

Lichtenberg, Erik and David Zilberman (1987). "Regulation of Marine Contamination under Environmental Uncertainty: Shellfish Contamination in California." Marine Resource Economics, 4:211-225.

We develop a model of regulation of environmental risks in a heterogeneous industry when policy makers are sensitive to uncertainties about the processes generating the risks. Optimal source reduction capacity is shown to vary according to site suitability. Optimal source reduction capacity and the implicit value of risk reduction increase as risk standards become more stringent and as aversion to uncertainty grows. Taxes are more equitable than standards whenever the emissions generating the risks are all-or-nothing.

Lin, Biing-Hwan, Richard S. Johnston, and R. Bruce Rettig (1986). "U.S. Demand for Selected Groundfish Products, 1967-80: Comment." American Journal of Agricultural Economics, 68(4):1021-1024.

Criticism of the Tsoa, Schrank, and Roy (1982) demand for groundfish article.

Lin, Biing-Hwan, Hugh S. Richards, and Joseph M. Terry (1988). "An Analysis of the Ex-vessel Demand for Pacific Halibut." Marine Resource Economics, 4:305-314.

Throughout its history the North Pacific halibut fishery has experienced dramatic changes in season length-most recently a greater than tenfold decrease during the last fifteen years. This analysis estimates the effect on ex-vessel halibut demand of season length by incorporating it with other more traditional explanatory variables such as landings, cold storage holdings, and prices of substitutes in a price dependent demand analysis.

Ex-vessel demand is found to be price elastic; thus management programs that increase catch will also increase gross fishing revenues. Cold storage holdings have an inverse relationship to ex-vessel price. Since the level of cold storage holdings decreases as the fishing season approaches, the date of the first opening will affect the ex-vessel price. Finally the length of the halibut season does have a positive relationship with ex-vessel price; management strategies, such as limited entry, that increase season length will increase ex-vessel demand.

Lind, Kent (1995). Using Economic Incentives in Environmental Management: the Case of Marketable Permits for Pollution Control. Resource Ecology and Fisheries Management Division, Alaska Fisheries Science Center, National Marine Fisheries Service, 7600 Sand Point Way NE, BIN C15700, Seattle, Washington, May, 24 pp.

The use of individual transferable quotas for bycatch (IBQ) or target species (ITQ) has been proposed as a potential solution to the bycatch, discard, and underutilization problem in the Gulf of Alaska and Bering Sea/Aleutian Islands groundfish fisheries. The objective of this report is to provide information that can be used to design and evaluate such programs by summarizing the nature and effectiveness of environmental protection programs that include the use of marketable rights. As policy makers begin to examine the use of marketable permits as a solution to other environmental management problems such as fisheries bycatch regulation, these results underscore the importance of assuring that unnecessary constraints are not imposed in future trading applications.

Lind, Kent and Joe Terry (1995). Community Development Quota (CDQ) and Open Access Pollock Fisheries in the Eastern Bering Sea: A Comparison of Groundfish Utilization and Prohibited Species Bycatch. AFSC Processed Report 95-07, Alaska Fisheries Science Center, National Marine Fisheries Service, 7600 Sand Point Way NE, BIN C15700, Seattle, Washington, November, 59 pp.

The different economic incentives presented in the open access and community development quota (CDQ) pollock fisheries is examined. Several hypotheses are tested as to the expected differences in vessel performance under both types of systems. Among the measures of performance were groundfish discard rates, prohibited species bycatch rates, product value per unit of catch, pollock catch per unit of fishing effort (CPUE), dollars per metric ton of pollock catch, and pollock catch per hour of fishing. Overall, conditions in a CDQ fishery support a more efficient utilization of resources in the pollock fishery and could be effective in addressing the problems of discards and bycatch in the groundfish fisheries off Alaska.

Lindall, Bill (1995). "Gulf of Mexico Fishery Management Council Actions." Memorandum for distribution, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL.

A list of actions, by fishery, approved by the Gulf of Mexico Fishery Management Council at their January 16-19, 1995 meeting.

Linder, Ernst, G.P. Patil, and Douglas S. Vaughan (1986). "Application of Event Tree Risk Analysis to Fisheries Management." Technical Report Number 86-1205, Technical Reports and Reprints Series, Center for Statistical Ecology and Environmental Statistics, Department of Statistics, Pennsylvania State University, University Park, PA, December, 27 pp.

Risk analysis can be defined as the evaluation of the probability of end events interpreted in terms of sequences of earlier events. In fisheries science, stock assessment provides future projections on which management decisions can be based. Uncertainties in estimating input parameters for such projections are considerable.

For the assessment problem, we propose an event tree analysis that couches the uncertainty of projections in terms of relative risk associated with various management options. As an illustration, we rephrase the stock assessment advice given in 1980 for the Georges Bank haddock stock (Melanogrammus aiglefinus L.) in the framework of event tree analysis. This method is also examined for a second species: the Gulf of Mexico menhaden (Brevoortia patronus). We also evaluate the results and their sensitivity relative to choices of end events.

Lipton, Douglas W. (198?). "U.S. Shrimp Market for Domestic Production and Imports." Chapter III of a draft report.

A review of trends in commercial landings, imports, and aquaculture affecting the domestic market for shrimp.

Lipton, Douglas W. (1986). "The Resurgence of the U.S. Swordfish Market." National Economics Program, Office of Data and Information Management, National Marine Fisheries Service, Washington, D.C., August, 12 pp.

This study is an attempt to explain the large increase in U.S. swordfish imports in 1985 and 1986, and to project changes in the swordfish market to 1995. An historical review of the swordfish markets shows that prior to 1971, the swordfish market depended mainly on imports. In 1971, high concentrations of mercury were discovered in swordfish. This led to Food and Drug Administration (FDA) inspection and potential seizure of swordfish that is imported or transported across state lines. FDA inspection requirements and the negative consumer response resulted in a almost complete collapse of the swordfish market. However, enough swordfish demand remained so that the price of swordfish landed and marketed in the same state rose substantially after 1971. The high ex-vessel price stimulated the expansion of the domestic swordfish fishery, as imports remained minimal until 1980. From 1981 to present, swordfish demand has continued to grow from increased consumer incomes and also from the fact that consumers have appeared to forget about the high mercury concentrations discovered in 1971. In 1985, imports surged to a level slightly higher than the level in 1970 and appear to be even higher in 1986. This recent increase in imports and the continued high level of U.S. landings is being sustained by a new surge in consumer demand for high value fishery products. Projections to the year 1995 indicate that the U.S. swordfish market will continue to grow as consumer incomes and the population increase. As U.S. landings level out, the continued growth in the market will be met by increased imports.

Lipton, Douglas W. (1986). "The Resurgence of the U.S. Swordfish Market." Marine Fisheries Review, 48(3):24-27.

This paper will attempt to explain the current trends in the U.S.

swordfish market and to project changes to 1995. To understand how the discovery of mercury contamination affected the swordfish market, historical trends are examined from 1965 to 1985. Using this time period, a regression model is used to estimate the demand for swordfish. The model incorporates a feature that allows the mercury discovery to affect the demand for swordfish in the year that it was discovered and subsequent years. However, as time progresses, the model allows the impact of the mercury discovery to lessen as consumers forget. Thus, the model is used to make projections in a period where mercury levels are no longer perceived as a factor in swordfish demand.

Lipton, Douglas W. (1987). "Interdependencies Among Fisheries Management, Fisheries Trade, and Fisheries Development: Experiences with Extended Jurisdiction." Marine fisheries Review, 49(3):55-56.

A discussion of Richard S. Johnston and James R. Wilson (1987). "Interdependencies Among Fisheries Management, Fisheries Trade, and Fisheries Development: Experiences with Extended Jurisdiction." Marine fisheries Review, 49(3):45-55.

Lipton, Douglas (1997). Development of NOAA Coastal Environmental Economics Extension Network. Draft Proposal, University of Maryland, College Park, Maryland, 7 pp.

This project seeks to create a national network of Sea Grant, NOAA, and other economists to strengthen and improve the use of environmental economics information in coastal resource management decisions at the regional and local level, ensuring that management actions result in the greatest net benefit to society from its coastal resources.

Lipton, Douglas W. and Robert A. Siegel (1989). "Toward a Rational Seafood Trade Policy." Marine Fisheries Review, 51(1):11-14.

This paper explores the practicality and desirability of the NMFS trade objective to increase exports and domestic consumption of U.S. fishery products that would lead to a reduction in the \$6.3 billion fishery trade deficit that existed in 1986.

Lipton, Douglas W. and Ivar E. Strand (1989). "The Effect of Common Property on the Optimal Structure of the Fishing Industry." Journal of Environmental Economics and Management, 16:45-51.

This paper extends previous fisheries models by generalizing the necessary and sufficient conditions under which coexistence of specialized and generalized vessels occurs in a multispecies fishery. Economies of scope and demand conditions are argued to dictate coexistence. Inefficiency in market structure is also shown to arise with an inappropriate property rights regime.

Lipton, Douglas W. and Ivar E. Strand (1992). "Effect of Stock Size and Regulations on Fishing Industry Cost and Structure: The Surf Clam Industry." American Agricultural Economics Association, (February):197-208.

Fishing costs are dependent on the size of the fish stock and regulations. Changes in these factors alter the equilibrium industry structure. In a multiproduct fishery, it is not possible to generalize how a reduction in industry catch will be accomplished, through a reduction in catch per vessel or in the number of vessels. Multiproduct cost functions are estimated for the Atlantic clam fishery. Simulations reveal that optimal

harvest would be achieved with an increase in the number of vessels and a decrease in the catch per vessel of surf clams and an increase in the catch of ocean quahogs.

Lipton, Douglas W., Katherine Wellman, Isobel C. Sheifer, and Rodney F. Weiher (1995). Economic Valuation of Natural Resources--A Handbook for Coastal Resource Policymakers. NOAA Coastal Oceans Program Decision Analysis Series No. 5, NOAA Coastal Ocean Office, Silver Spring, MD, 131 pp.

The focus of this handbook is to introduce and illustrate concepts of environmental valuation, among them travel cost models and contingent valuation for noneconomists. These concepts, combined with advances in natural sciences that allow us to better understand how changes in the natural environment influence human behavior, aim to address some of the more serious shortcomings in the application of economic analysis to natural resource and environmental management and policy analysis.

LiPuma, Edward and Sarah Keene Meltzoff (1985). "The Social Economy of Shrimp Mariculture in Ecuador." Draft report, Department of Anthropology and the Rosenstiel School of Marine and Atmospheric Science, University of Miami, May, pp. 35.

This report provides an initial account of the social economy of the Ecuadorian shrimp industry and lays the foundation for more comprehensive analyses to complement existing biological studies to strengthen the management of the shrimp resources.

Lisman, J.H. and J. Sandee (1964). "Derivation of Quarterly Figures from Annual Data." Applied Statistics, 13:87-90.

Quarterly figures may be required when only a series of annual data are available. If no assumption about the pattern of the quarterly figures can be made, so that merely a smooth trend must be obtained, a very simple procedure can be employed to obtain a fairly good adaptation of the quarterly figures to the annual totals. For each year  $t$ , the value of a quarterly figure is considered as a weighted average of the totals of the years  $t-1$  and  $t+1$ . After introduction of some quite natural conditions a system of equations is obtained, from which the weighting coefficients can be calculated. To a certain extent the solution contains some arbitrary aspects, but it has the advantage of simplicity, plausibility and practical usefulness.

Liu, Pan-Tai (ed.) (1980). Dynamic Optimization and Mathematical Economics. Plenum Press, New York.

The papers appearing in this book are contributions from control theorists and economists covering the application of control theory to economic planning, exploration, exploitation, and pricing of extractive natural resources, and some recent advances in large scale systems and decentralized control.

Liu, P.T. and J.G. Sutinen (1982). "On the Behavior of Optimal Exploration and Extraction Rates for Non-Renewable Resource Stocks." Resources and Energy, 4:145-162.

Models are developed to examine the behavior of optimal exploration and production policies over time. The principal model is singular in the exploration control and possesses four phases of the exploitation cycle. Explicit sets of conditions are established that (i) give rise to a U-shaped price path, and (ii) determine when additions to reserves from exploration are

greater than or less than extraction, and when exploration ceases. Three alternative specifications of the principal model are considered, and with a separable benefit function it is shown that a higher discount rate leads to a lower level of cumulative exploration.

Livingston, P.A. (1994). "Overview of Multispecies Interactions Involving Walleye Pollock in the Eastern Bering Sea and Gulf of Alaska." C.M. 1994/P:1, Theme Session on Multispecies Interactions of Importance to the Groundfish Abundance Fluctuations, International Council for the Exploration of the Sea, St. John's, Newfoundland, Canada, September, 7 pp.

The walleye pollock (*Theragra chalcogramma*) is a semi-pelagic gadid species that dominates the directed groundfish catches in the eastern Bering Sea and Gulf of Alaska. Two approaches have been taken to evaluate the impact of other predators on the walleye pollock population in each area; an integrated catch at age model and major predator food habits information. Both methods show the dominance of groundfish predation as a source of mortality for young walleye pollock. Cannibalism is most important in the eastern Bering Sea while predation by arrowtooth flounder is highest in the Gulf of Alaska. In both areas, explicitly including predation mortality in our assessment of walleye pollock stock size tends to increase our estimates of number at age for prefishery juvenile pollock. Further insights into predator feeding responses and factors affecting pollock recruitment into the fishery are gained through examination of predation data.

Livingston, Bob and Ted Stevens (1995). Letter to Rollie Schmitt, Assistant Administrator, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, Maryland, from Chairman House Committee on Appropriations and the Senate Committee on Appropriations, December 22.

No individual transferable quota programs for red snapper specifically or any new ITQ programs in general or no future funding for NMFS.

Loch, John S., Mikio Moriyasu, and James B. Jones (1994). "An Improved Link Between Industry, Management and Science: A Case History - The Southern Gulf of St. Lawrence Snow Crab Fishery." C.M. 1994/T:46, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 22 pp.

This paper traces the evolution of snow crab fisheries science and its impact on the management of the southern Gulf of St. Lawrence snow crab (*Chionoecetes opilio*) fishery. This currently lucrative fishery (estimated landed value of more than 100 million Canadian dollars in 1994) has experienced the traditional rises and falls of most fisheries and the resulting socioeconomic consequences and sometimes strained relations between the industry and the fisheries management agency, in this case the Canada Department of Fisheries and Oceans (DFO). Of note at this time is the remarkable degree of cooperation that has developed between the industry and DFO since the stock last drastically decreased (1987-1989). Since then the stock has been recovering steadily and is also better managed. The reasons for this are four-fold: 1) a recruitment pulse of small sized crab occurred in 1988-89; 2) substantial advances in the understanding of the complex biology of snow crab and the development of an accurate, reliable stock assessment methodology together have provided consistent, reliable, and credible advice for forecasting the amount and geographic distribution of exploitable biomass

for the upcoming fishing season; 3) the industry leaders worked very hard with their associations to convince fishers that their fishery was in peril and that close cooperation with DFO was the key for the future; 4) the industry and DFO worked as partners to develop a management approach based upon scientific advice to climb out of the trough. The paper also outlines the conundrum that fisheries managers currently face resulting from a combination of a moratorium of the entire Gulf of St. Lawrence groundfishery, the consequent pressure from displaced groundfish fishermen to enter the lucrative snow crab fishery and an optimistic short term but pessimistic longer term forecast regarding snow crab abundance; do we redistribute the wealth; if so among whom, how, and for how long?

Logan, Phil (1994). "Some Issues Concerning Rents and User Fees." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA, January.

Publicly owned natural resources under certain management regimes can generate rents that could be captured by taxes or user fees for the resource. Under an ITQ program, those who are initially allocated the ITQ receive a windfall when they sell their market shares. Those who enter the fishery by buying shares receive a windfall when they sell out equivalent to the difference between their purchase price and their selling price (a capital gain inequity). The royalty payments under this example are based upon the generation of rents.

Long, Ngo Van (1975). "Resource Extraction under the Uncertainty about Possible Nationalization." Journal of Economic Theory, 10:42-53.

This paper looks at the problem of resource exploitations under anticipated nationalization. A model where the probability of nationalization is a function of time is evaluated for (i) no nationalization, (ii) nationalization at a known date, and (iii) no nationalization, but with a rising trend of effective profit tax rate.

Longley, W.L., (ed.) (1994). Freshwater Inflows to Texas Bays and Estuaries: Ecological Relationships and Methods for Determination of Needs. Texas Water Development Board and Texas Parks and Wildlife Department, Austin, TX, 386 pp.

This document reports the effects of freshwater inflows on the biological productivity of bays and estuaries, and effects on the distribution and abundance of economically important and ecologically characteristic fish and shellfish species, and the estuarine life on which they depend. The reports two main themes are demonstrating the effects of freshwater inflows on living and nonliving components of estuarine ecosystems and presenting a methodology for assessing the freshwater inflow needs of Texas bays and estuaries that satisfies the requirement of maintaining an ecologically sound environment and the productivity of fish, shellfish, and other estuarine life.

Loomis, John B. (1988). "The Bioeconomic Effects of Timber Harvesting on Recreational and Commercial Salmon and Steelhead Fishing: A Case Study of the Siuslaw National Forest." Marine Resource Economics, 5:43-60.

The economic effects of changes in timber harvest levels on recreational and commercial salmon and steelhead fisheries are estimated by combining a series of simple watershed, habitat, population, and economic models. The economic loss in fishery benefits from future timber harvests on 86,700 acres



is estimated to be \$1.7 million over a 30 year period. The approach employed in this paper overcomes previous shortcomings in valuing marginal changes in recreational fishing by use of a regional multi-site travel cost demand model that contains fish catch as a site characteristic. Site specific marginal values per salmon and steelhead caught are derived using this technique.

Loomis, John B. and Douglas M. Larson (1994). "Total Economic Values of Increasing Gray Whale Populations: Results from a Contingent Valuation Survey of Visitors and Households." Marine Resource Economics, 9(3):275-286.

The consistency of an individual's willingness to pay (WTP) responses for increases in the quantity of an environmental public good (whale populations) is tested along three lines. First, we test whether WTP for 50% and 100% increases in whale populations are statistically different from zero. Second, we ask whether the incremental WTP from a 50% increase to a 100% increase is statistically significant. Finally, we test whether there is diminishing marginal valuation of the second 50% increment in gray whale populations. The paired t-tests on open ended WTP responses supported all three sets of hypotheses. Both visitors and households provided WTP responses that were statistically different from zero and increased (but in a diminishing fashion) for the second increment in WTP. In this survey both visitors and households provided estimates of total economic value (including nonuse or existence values) for large changes in wildlife/fishery resources that were consistent with consumer theory.

Loose, Verne W. (1979). "A Bioeconomic Commercial Pacific Salmon Fishery Model." Resources Paper No. 44, University of British Columbia, Department of Economics, 2075 Wesbrook Place, Vancouver, Canada, V6T 1W5, September, pp. 23.

A bioeconomic model of a commercial Pacific salmon fishery is constructed. The economic sector focuses upon the seasonal harvesting process in a gauntlet fishery while the biological sector deals with the long term reproductive and growth processes of the fish population. The sectors are linked by the biotechnical harvesting process (unharvested fish escape to spawn) and by the specification of an intertemporal objective function. It is shown that a fishery constrained only by the economic incentives of its sole owner is unlikely to lead to stock extinction; that substantial excess capacity exists in the fishery; and that successful economic exploitation requires that attention be paid to species makeup.

Lopes, Rui Junqueira-, Philippe Michel, and Gilles Rotillon (1996). Bioeconomic Management of Red Swamp Crayfish (Procambarus clarkii) in the Presence of Environmental Externalities. Marine Resource Economics, 11(1):1-9.

Red swamp crayfish (Procambarus clarkii) is a valuable renewable resource which creates significant negative externalities to its environment. Crayfish can cause severe crop damage by burrowing in fields and using irrigation systems to spread. These crayfish are resistant to normal dosages of pesticides which are harmful to fish and birds, can endure months of dryness, and live in a low oxygen environment. This paper presents a simple bioeconomic model for optimal use of the red swamp crayfish accounting for its value in consumption, adapting Plourde's (1970) model to include the negative externalities.

Lord, Gary E. (1973). "Characterization of the Optimum Data Acquisition and Management of a Salmon Fishery as a Stochastic Dynamic

Program." Fishery Bulletin, 71(4):1029-1037.

The optimum data acquisition and management of a typical Bristol Bay sockeye salmon fishery have been expressed as a problem in statistical decision theory. Optimality has been defined as that set of sequential decision rules that minimizes the Bayes risk over the duration of the run. Economic losses or costs are ascribed to acquisition of catch and escapement data in such a manner that an optimal data acquisition scheme can be defined in addition to defining the set of optimal management strategies.

Lord, Gary E. (1976). "Decision Theory Applied to the Simulated Data Acquisition and Management of a Salmon Fishery." Fishery Bulletin, 74(4):837-846.

A salmon fishery management model utilizing statistical decision theory has been constructed. The model provides for the successive acquisition of data that can be used to formulate and maintain an optimum management strategy. The Bayes risk is defined as the expected economic loss resulting from a set of fishery management decisions and the criterion of optimality is taken to be the strategy that minimizes the Bayes risk. Specific functional forms are assumed where necessary to obtain a closed form expression for the Bayes risk. The Bayes risk, in units of numbers of fish, can then be computed for any particular sequence of fishery management decisions.

Lothgren, Mickael (1997). A Multiple Output Stochastic Ray Frontier Production Model. Working Paper Series in Economics and Finance No. 158, Stockholm School of Economics, February, 15 pp.

This paper proposes an approach to specify and estimate multiple input, multiple output production frontiers and technical efficiency using a stochastic ray frontier production model. A possible model extension is to incorporate a technical efficiency effects model to allow estimation of the effects of various explanatory variables on technical efficiency. An empirical application using Swedish health care data reveals a significant positive effect on technical efficiency of an internal market reform while the effect on the production frontier is negative. Technical change is found to be positive while technical efficiency has decreased over time.

Lott, John R., Jr. (1987). "Licensing and Nontransferable Rents." The American Economic Review, 77(3):453-455.

Traditionally, restrictive licensing is assumed to create monopoly profits by restricting output and therefore to produce two kinds of social costs: the deadweight loss due to reduced output and the resources devoted to rent seeking. However, the fact that nonsalvagable resources spent on rent seeking create their own barriers to entry has not been recognized. By increasing nontransferable rents, licensing prevents the least costly producers from entering and thus produces a third kind of social cost. While Harold Demsetz (1982) dismissal of the traditional notion of entry barriers is correct when assets are transferable, the idea of entry barriers is still useful when assets are nontransferable as this note shows in the case of professional licensing.

Louisiana Department of Wildlife and Fisheries (1994). "Enhancing the Benefits Derived from Shrimp in the Gulf of Mexico Through Optimizing Shrimp Management in Louisiana." A Fisheries Management Plan for Louisiana's Penaeid Shrimp Fishery, MARFIN Project NA90AA-H-MF726 Final Report, December, 231 pp.

This management plan addresses the problems and potentials of Louisiana's penaeid shrimp fishery. The plan was developed by a project jointly funded by the U.S. Department of Commerce, Louisiana State University (LSU), and the Louisiana Department of Wildlife and Fisheries. LSU experts including a biologist, an economist, and an attorney provided the scientific information necessary to evaluate the management options suggested by the Department of Wildlife and Fisheries. The early development of the plan was guided by the goal of maximizing the economic benefits of the fishery to Louisiana and the region. Subsequent review of the draft plan by the Louisiana Wildlife and Fisheries Commission's Shrimp Management Committee resulted in refining the set of feasible management actions and an elaboration of the management goals. After review by the committee, public comment was solicited. The final product of this process is a set of proposed actions to be addressed by the Louisiana Wildlife and Fisheries Commission and the Louisiana Legislature in the future management of the fishery.

Low, R.A., D. Theiling, and E.B. Joseph (1987). "South Carolina Marine Fisheries, 1977-1986." South Carolina Marine Resources Center, Technical Report Number 67, November, 78 pp.

This report is an information summary of important developments in South Carolina's marine fisheries since 1977. Economic consideration has been confined to trends in landed value.

Low, R.A., W. Waltz, R. Martore, and C.J. Moore (1986). "South Carolina Marine Recreational Fishery Surveys, 1985 and 1986." South Carolina Marine Resources Center Technical Report Number 65, December, pp. 65.

Three surveys of marine recreational fishermen were conducted during June 1985 - June 1986. These were: 1) a coastal tackle shop questionnaire survey (June-December 1985), 2) a public launching ramp creel census (June 1985 - May 1986), and 3) a public launching ramp drop-box survey (November 1985 - 1986). Results from the tackle shop questionnaire provided information on fishing modes and activities, boat and access site utilization, reactions to licensing of marine recreational fishermen, and constituency perceptions of problems associated with marine sport fishing. Results from the on-site surveys furnished data on species preference, catch, catch rates (CPUE), length composition of red drum and spotted seatrout catches, and site utilization.

Low, R., R. Rhodes, E.R. Hens, D. Theiling, E. Wenner, and D. Whitaker (1987). "A Profile of the Blue Crab and Its Fishery in South Carolina." South Carolina Marine Resources Center, Technical Report Number 66, November, pp. 37.

A review of the landings, value, and biology of the blue crab in South Carolina so that recommendations can be made to expand the information base for fishery management regulations.

Lucas, Robert E.B. (1975). "Hedonic Price Functions." Economic Inquiry, 13(June): 157-178.

Three feasible interpretations of cross sectional hedonic price regression equations are derived from consumer choice, profit maximization by competitive firms, and market clearing, each conceptual experiment deploying a Lancasterian "new approach" to micro theory. Lancaster's theory is compared with those consumer theories of Houthakker heritage, and some limitations of each are indicated. The assertion that Adelman and Griliches' quality

adjusted hedonic price index is a constant satisfaction index is shown to necessitate interpersonal comparisons of utility, and the possibility of identifying demand and supply functions for commodities by exclusion restrictions on characteristics is rejected.

Ludwig, Donald, Ray Hilborn, and Carl Walters (1993). Uncertainty, Resource Exploitation, and Conservation: Lessons from History. Science, 260(2):17 and 36.

Our lack of understanding and inability to predict mandate a much more cautious approach to resource exploitation than is the norm. Political leaders at levels ranging from world summits to local communities base their policies upon a misguided view of the dynamics of resource exploitation. Scientists have been active in pointing out environmental degradation and consequent hazards to human life, and possibly to life as we know it on Earth. But by and large the scientific community has helped to perpetuate the illusion of sustainable development through scientific and technological progress. Resource problems are not really environmental problems: They are human problems that we have created at many times and in many places, under a variety of political, social, and economic systems.

Lyles, Charles H. (1967). "Historical Statistics (Shrimp Fishery)." Division of Economics, Bureau of Commercial Fisheries, U.S. Department of the Interior, Washington, D.C., May, 63 pp.

A compendium of shrimp fishery statistics for the United States from 1887 to 1965 covering domestic landings, foreign trade, prices, processed products, and frozen trade.

Lyles, Charles H. (1969). "The Spanish Mackerel and King Mackerel Fisheries." C.F.S. No. 4936, Division of Statistics, Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C., May, 21 pp.

A description of the fishery from the late 1880's to 1967 with landings and values for king and Spanish mackerel.

Lynne, Gary D., Patricia Conroy, and Frederick J. Prochaska (1981). "Economic Valuation of Marsh Areas for Marine Production Processes." Journal of Environmental Economics and Management, 8:175-186.

The relationship of natural marsh-estuarine systems to the economic productivity of marine systems is not well understood, at least in any quantitative sense. An approach is developed for relating blue crab economic productivity on Florida's Gulf Coast to marsh availability in the area. Previous efforts have not always applied economic concepts appropriately in attempts at such quantification. The marginal value productivity of marsh is shown to vary with alternative levels of marsh and effort in the fishery. The interaction and subsequent interdependence is shown to be statistically significant. Data availability on marginal response to marsh changes poses a severe obstacle to further progress.

Lynne, Gary D. and Phyllis Park Saarinen (1993). "Water Markets: What Role Can They Play in Florida." Staff Paper Services, SP93-9, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL, 20 pp.

Water is a difficult resource to allocate because of its common pool characteristics that lead to co-interference. As a result, a wide variety of decision forums - judicial, legislative, executive/administrative, special purpose districts, and markets - are used in various mixes in the U.S. In Florida, only the market forum is not used. The reasonable beneficial use standard in Florida suggests the necessity for economic and efficient utilization while still reducing interference and satisfying the public interest. Markets facilitate pursuit of mutual gain (i.e., economic efficiency) in trades. Markets are valuing processes that create incentives to save water (e.g. to reuse) and to avoid degrading water quality so that more can be sold. Proportional shares in the safe yield could be marketed. The water districts would specify the water quantity associated with each share. Districts and governing boards would still be charged with defining tolerable interference and ensuring the public interest considerations are satisfied by administered markets. Such markets will be helpful in determining what is a reasonable beneficial use.

Lyons, William G. (1980). "The Postlarval Stage of Scyllaridean Lobsters." Fisheries, 5(4):47-49.

A biological description of the postlarval development of spiny lobsters that lasts between 8 and 11 months.

MacCall, Alec D. (1990). Dynamic Geography of Marine Fish Populations. Washington Sea Grant Program, University of Washington Press, Seattle.

The author borrows an established concept from academic ecology the theory of density dependent habitat selection and applies it to a major problem in fisheries; anchovy.

MacKenzie, W.C. (1979). "Rational Fishery Management in a Depressed Region: The Atlantic Groundfishery." J. Fish. Res. Board Can., 36:811-826.

The economic and social milieu of the commercial fisheries in the Atlantic provinces of Canada is described, followed by an analysis of the structure of the major sector, the fishery based on the demersal stocks of the region. Existence of the classic features of mature fisheries, i.e. congestion and economic distress, is established for this fishery and the causes considered. Extended national jurisdiction over the use of fishery resources, it is argued, while it improves opportunity for development, does not affect those causes. Possible approaches to rational management of the fishery are reviewed, in particular the institution of inducements for fishing enterprises to minimize production costs. A discussion in this respect of quasi property rights for resource users and associated problems concludes the paper.

McAvoy, Henry R. (19??). "The Potential for Expanding East and West Coast Markets for Gulf and South Atlantic Swordfish." National Marine Fisheries Service, Fisheries Service, Fisheries Development Division, St. Petersburg, FL.

This report presents the results of a informal survey conducted during April 21-25 of selected seafood wholesalers in Boston, New York, Atlanta, Chicago, San Diego, Los Angeles, San Pedro, and Seattle. Our objective was to obtain comments on their present use of Gulf and south Atlantic swordfish and ascertain potential for increased shipments to selected markets. Their comments are presented for each market area.

McCarthy, Maurice (199?). The Evolution of the Irish Seafood Export Sector to Continental Europe 1985-1995. Draft report, 9 pp.

This summarizes the changes that have occurred in the Irish Seafood Sector over the last ten years. The main thrust deals with the changes brought about by logistical changes in distribution, communication, and retail in destination markets. Also dealt with are infra structural changes that have occurred as part of EU mandates and local demand changes in Ireland over the same period.

McCarty, Gene (1995). "Biological Benefits of the 200 Mile Closure for Red Snapper and Brown Shrimp." Texas Parks and Wildlife Department, January.

For the years when the 200 mile closure was in effect there were significant increases in the number of juvenile red snapper found in the Texas Territorial Sea and in the number of juvenile brown shrimp found in the estuaries during April following the year of the closure. Increases in red snapper may be attributed to increased spawning due to protection in the spawning grounds or to the reduction of bycatch associated with juvenile red snapper.

McCay, Bonnie J. (1991). "A 'Privatized' Ocean?" Commentary, Asbury Park Press, Tuesday, May 21, page A 13.

A discussion of the impact of ITQs on the fishing community and resource conservation. It raises the question of whether or not privatization is the appropriate thing to do.

McCay, Bonnie J. (1994). ITQ Case Study: Atlantic Surf Clam and Ocean Quahog Fishery. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Implemented in October 1990, Amendment #5 of the Atlantic Surf Clam and Ocean Quahog Fishery Management Plan was the first in U.S. jurisdiction to incorporate ITQs, or individual transferable quotas. Transaction costs in this fishery are low because (1) it is a relatively small fishery, (2) landings occur in few ports, and (3) very little bycatch is involved in the fishery. The economic and social outcome was predictable. Fleet size and crew positions declined sharply and returns to the remaining crew have declined.

McCay, Bonnie J. (1995). "Social and Ecological Implications of ITQs: An Overview." Ocean and Coastal Management, 28(1-3):3-22.

After a brief review of some of the economic dimensions of ITQs, which indicate the importance of combining social and economic considerations, the three major issues surrounding privatization of fishing rights are discussed; social equity, stewardship, and what this means for public ownership or stewardship.

McCay, Bonnie J. and Adesoji Adelaja (1998). "Rutgers University Work on Surf Clam/Ocean Quahog Economics." Report to the Mid-Atlantic Fishery Management Council, Department of Human Ecology, Cook College, The State University of New Jersey, Rutgers, N.J., March, 3 pp.

A report on the work at the Ecopolicy Center at Rutgers University on

the economics of the surf clam and ocean quahog fisheries under ITQ s.

McCay, Bonnie J. and Carolyn F. Creed (1987). "Crews and Labor in the Surf Clam and Ocean Quahog Fleet of the Mid-Atlantic Region." A Report to the Mid-Atlantic Fisheries Management Council, Department of Human Ecology, Cook College, Rutgers University, P.O. Box 231, New Brunswick, NJ, October.

The purpose of this study is to examine the recent history of employment in the harvesting sector of the surf clam and ocean quahog industry to improve the basis for predicting how future regulatory measures may affect labor.

McCay, Bonnie J. and Carolyn F. Creed (1990). "Social and Cultural Aspects of Regulation in the Surf Clam and Ocean Quahog Fisheries." New Jersey Sea Grant Technical Report, RSE-1.

The Mid-Atlantic surf clam fishery is the only example on the east coast of the United States of a "limited entry" marine fishery. Since 1977, it has been managed with a moratorium on the number of vessels plus quotas and effort limitations. This study investigated the socio-economic impacts of limited entry and related management measures (including restricted fishing time) in the surf clam fishery and the closely related ocean quahog fishery. It also investigated the social and cultural dimensions of the management process leading, at the end of this study period, to a decision to change from limited entry to quasi-privatization through individual transferable quotas (ITQs).

McCay, Bonnie J. and Carolyn F. Creed (1990). "Social Structure and Debates on Fisheries Management in the Atlantic Surf Clam Fishery." Ocean and Shoreline Management, 13:199-229.

The surf clam fishery of the mid-Atlantic experienced a sharp decline in resources in the mid-1970's and impressive increase in clam populations by the mid-1980's. Public response to the former, triggered by a severe anoxic condition and near disaster in 1976, was to impose strict regulations on the fishing fleet and create limits on the number of vessels. Response to the latter has been to impose even stricter regulations and to move toward a privatized limited access regime. We show how social structure within the fishing industry affects the management process.

McCay, Bonnie J., and Carolyn F. Creed (1994). "Individual Transferable Quotas in Clams and Fish: A Comparative Analysis." C.M. 1994/T:20, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 9 pp.

Individual transferable quotas (ITQs) are widely advocated as ways to rationalize overcapitalized and over exploited fisheries. Research on ITQs in the U.S. federal surf clam and ocean quahog fishery and the Canadian groundfish fishery for mobile gear under 65 feet in length in the Scotia-Fundy region suggests a series of lessons about the introduction, acceptance, and consequences of ITQs for fisheries management. Research is also underway on the Western Newfoundland mobile gear ITQ fishery and on the Eastern Newfoundland crab fishery, among the many that have not been converted to ITQs. This paper reports solely on the comparison between the U.S. clam fishery and the Scotia-Fundy groundfish fishery.

McCay, Bonnie J. and Jonathan S. O Neil (1998). Social and Economic

Characteristics of the Maine Party and Charter Boat Industry. The Ecopolicy Center for Agriculture, the Environment, and Resource Issues, New Jersey Agricultural Experiment Station, Cook College, Rutgers, The State University of New Jersey.

The Marine Recreational Fisheries Statistics Survey (MRFSS) has collected information on angler trip costs. Arguably though, this cost information shows only a portion of the economic mechanisms at work. The economic contribution of charter and party boat businesses is an area which is little understood and there exists something of an information gap where data on costs and profits is greatly lacking. For example, in addition to the gross sales from boat trips, additional revenues and employment are generated from repair services, bait and tackle shops, lodging, restaurants, and other support industries.

McCay, Bonnie J. and Svein Jentoft (1998). "Market or Community Failure? Critical Perspectives on Common Property Research." Human Organization, 57(1): 21-29.

The best known revisionist perspective on the so-called tragedy of the commons underscores important conceptual and hence policy errors and has been important in contributing to understanding of conditions in which collective action for common benefits, with respect to common pool resources, can take place. Characterizing this perspective as a thin or abstract, generalizing explanatory model, with strengths and weaknesses thereby, we discuss a thicker or more ethnographic perspective that emphasizes the importance of specifying property rights and their embeddedness within discrete and changing historical moments, social and political relations. We argue that this perspective leads to a focus on community failure rather than market failure as the presumed cause of environmental problems, and hence, to questions about how markets, states, and other external and internal factors affect the capacities of communities and user-groups to respond adequately to environmental change.

McCay, Bonnie J., John B. Gatewood, and Carolyn F. Creed (1989). "Labor and the Labor Process in a Limited Entry Fishery." Marine Resource Economics, 6: 311-330.

We examine aspects of labor in the harvesting sector of the surf clam/ocean quahog industry of the mid-Atlantic region of the United States in the context of limited entry. Vessel owners are both diversifying and cutting back on labor costs through crew consolidation in response to difficulties in the sea clam industry. A survey of crew-members on job satisfaction reveals more about the preferences and experiences of labor. We make predictions about the fate of labor under a new management regime based on individual transferable quotas. The analysis is intended to bring the interests of crew-members in to the decision making process and to improve the basis for predicting how future regulatory measures may affect crewing.

McCay, Bonnie J., Richard Apostle, Carolyn Creed, Alan Finlayson, and Knut Mikalsen (1994). "Privatization in Fisheries: Lessons from Experiences in the U.S., Canada, and Norway." Draft, Symposium of the Ocean Governance Study Group; "Moving Ahead on Ocean Governance: Practical Applications Guided by Long-Range Vision," April 9-13, Lewes, Delaware, March, 18 pp.

The politics of conservation is dealt with in several ways. The first concerns the politics of deciding for or against major institutional change. In the U.S., Canada, and Norway, attempts to create so called ITQs, or



individual transferable quotas, in major commercial fisheries have been fraught with delay and controversy, largely because of the distributional issues raised by privatization and recourse to market based regulation. The second concerns the structure of decision making, and in particular how user groups and their interests and concerns are and are not brought into the decision making process. The third concerns the distributional effects of changes in fisheries property rights and how people respond to them. In this paper, we touch upon aspects of these topics with particular emphasis on the hypothetical intersection of privatization and comanagement.

McConnell, Kenneth E. (1979). "Values of Marine Recreational Fishing: Measurement and Impact of Measurement." American Journal of Agricultural Economics, 61(5):921-925.

Economists can help improve resource allocation by applying their evaluation techniques to marine recreational fishing. In this paper, two approaches to evaluation are reported: the travel cost method and the hedonic price method. The two approaches are similar in that they rely on observed behavior rather than responses to hypothetical questions. They differ in the extent to which they assume an individual can control his environment.

McConnell, Kenneth E. (1985). "The Economics of Outdoor Recreation." Chapter 15 in Handbook of Natural Resource and Energy Economics, Allen V. Kneese and James L. Sweeney (eds.), North-Holland, New York.

The survey is divided into three parts; (1) the extent of and rationale for government involvement in the provision of outdoor recreation services is explored; (2) conceptual and empirical issues are investigated in estimating the demand for benefits of outdoor recreation; (3) some issues relating to the quality of outdoor recreation are explored. The greatest proportion of the chapter is devoted to empirical and conceptual demand issues.

McConnell, Kenneth E. (1988). "Heterogeneous Preferences for Congestion." Journal of Environmental Economics and Management, 15:251-258.

The paper studies the problem of congested recreation facilities when the users differ with regard to their willingness to pay for access to the site and their aversion to congestion. The simple model of the paper shows that some user groups may actually increase their use of a site if they are less price responsive and more averse to congestion than the central tendencies of all users. These results help explain many administrators' reluctance to use fees to ration entrance to congested sites. Under plausible assumptions about the effects of income on price and congestion responsiveness, the use of a fee would tend to ration sites toward people with higher incomes.

McConnell, K.E. (1997). Does Altruism Undermine Existence Value? Journal of Environmental Economics and Management, 32(1):22-37.

The debate over the use of contingent valuation for existence values or passive-use values has failed to explore the validity of motives for such values. One potential motive, altruism, has conflicting implications for benefit-cost analysis, depending on whether the altruist is paternalistic. This paper constructs models of three types of altruism and shows how benefit-cost analysis responds to each type of altruism, how damage assessment and restoration depend on each type, and the implications of heterogeneous altruists.

McConnell, Kenneth E. and N.E. Bockstael (1984). "Aggregation in Recreation Economics: Issues of Estimation and Benefit Measurement." Northeastern Journal of Agricultural and Resource Economics, 13(2):181-186.

This paper addresses the aggregation issue for estimating the demand for outdoor recreation. The basic theme is that regardless of how they are estimated, individual behavioral parameters should be used for welfare measurement. The first part of the paper treats appropriate estimation techniques for data sets that are aggregated over individuals; the zonal travel cost model. The second part explores and reviews models of individual behavior that incorporate changes in participation as well as changes in the number of visits that may confound welfare estimates. The plausibility of benefit estimates could be substantially improved if greater care were given to the extrapolation of benefits calculated from a sample to aggregate benefit estimates for the population.

McConnell, Kenneth E. and Virginia A. Duff (1976). "Estimating Net Benefits of Recreation Under Conditions of Excess Demand." Journal of Environmental Economics and Management, 2:224-230.

The public provision of outdoor recreation necessitates the development of nonmarket measures of the value of resources in recreational use. Such values can be used as surrogates for market values in the decision-making process. Another aspect of recreation as a publicly provided good is the absence of a mechanism to eliminate automatically excess demand. The absence of such a mechanism has resulted in conditions of excess demand at many recreation sites. This paper deduces the implications of excess demand for the travel cost method of benefit estimation. We show that when excess demand results in rationing at a particular site, the travel cost method will underestimate the true benefits of the site. The results are important because they help identify the direction of bias of one measure of the benefits from the use of a natural resource.

McConnell, Kenneth E. and Virgil J. Norton (1976). "An Economic Evaluation of Marine Recreational Fishing." In Marine Recreational Fisheries, Henry Clepper (ed.), Sport Fishing Institute, Washington, D.C.

This chapter deals with conceptual methods of measuring the economic benefits of marine and recreational fishing. It is intended to serve several purposes: to present a review of the state of the art of economic evaluation of marine recreational fishing; to expand certain of the conceptual aspects of the subject; and to suggest high priority steps that should be taken to develop appropriate marine recreational fishing values that can be used in policy decisions. A simple, but concise demand model is developed from utility theory with theoretical implications of the mathematical model clearly discussed. The use and to a limited extent abuse of travel cost, willingness to pay, and input-output analysis as measures of net benefits are discussed.

McConnell, Kenneth E. and Ivar Strand, Jr. (1981). "Some Economic Aspects of Managing Marine Recreational Fishing." In Lee G. Anderson (ed.) Economic Analysis for Fisheries Management Plans. Ann Arbor Science, Ann Arbor, Michigan.

This chapter elucidates some basic relationships important to the long run management of sport fisheries. First, the relationships required by optimal management are developed. Second, the economic costs of various approaches to regulating sportfishing catch are demonstrated. Third, an

example of the costs of regulating a recreational fishery is given.

McConnell, Kenneth E. and Ivar E. Strand (1989). "Benefits from Commercial Fisheries When Demand and Supply Depend on Water Quality." Journal of Environmental Economics and Management, 17:284-292.

This paper investigates the social returns to commercial fisheries when water quality influences the demand for and the supply of commercial fish products under open access conditions and when stocks are effectively private property. We use this model to show that an efficient allocation of property rights to the fishery is necessary to realize potential benefits from cleaner water and healthier fish stocks. In fact, we show that cleaner water can reduce the social returns from the production of fish products if common fish stocks exist.

McConnell, Kenneth E. and Ivar E. Strand (1994). "The Economic Value of Mid and South Atlantic Sportfishing." Volume 2, Cooperative Agreement #CR-811043-01-0, University of Maryland, Environmental Protection Agency, and the National Marine Fisheries Service, University of Maryland, College Park, September.

This report is a study of the economic value of marine recreational fishing on the east coast of the U.S., from Long Island, New York to Key Biscayne, Florida. It is the second in a series on the economics of recreational fishing in this region. This study is concerned with the value of recreational fishing opportunities to anglers, not individuals and firms providing services to those anglers. It contains an analysis of responses to questions concerning individuals preferences, both stated and revealed, for sportfishing sites.

McConnell, Kenneth E. and Jon G. Sutinen (1979). "Bioeconomic Models of Marine Recreational Fishing." Journal of Environmental Economics and Management, 6:127-139.

The theory of recreational fishing is developed and conditions are derived for optimal management policy, with special attention given to functional relationships that must be empirically verified. Determinants of the optimal allocation between commercial and recreational fishing effort are derived. The theory is extended to include selected peculiar features of recreational fishing: Some anglers sell their catch; a small proportion of the fishing population accounts for a large proportion of the catch; and anglers throw back a fraction of what they catch. Optimal policies are derived under these more realistic conditions.

McConnell, Kenneth E., J.N. Daberkow, and I.W. Hardie (1983). "Planning Timber Production with Evolving Prices and Costs." Land Economics, 59(3):292-304.

This paper develops a model for determining the approximately optimal age at harvest from a single site when prices and costs vary exogenously. When discounted stumpage price is constant, the optimal harvest length increases over time if establishment costs increase more rapidly than the discount rate. Second, when discounted stumpage prices are constant, the optimal harvest length decreases over time if establishment costs increase less than the discount rate. Third, whether the optimal harvest length increases or decreases depends on the type of yield function.

McConnell, Kenneth E., Ivar E. Strand, and Lynne Blake-Hedges (1995). Random

Utility Models of Recreational Fishing: Catching Fish Using A Poisson Process. Marine Resource Economics, 10(3):247-261.

This paper presents a Poisson model of expected angler catch during a sportfishing trip and employs the expected catch in a random utility model of site choice. The approach permits greater heterogeneity in expected catch and individual welfare estimates from policies such as creel limits.

McConnell, Kenneth E., Ivar E. Strand, S.K. Valdes, and Q.R. Weninger (1992). "The Economic Value of Mid and South Atlantic Sportfishing." Volume 2 of a report on Cooperative Agreement #CR-811043-01-0 between the University of Maryland, the Environmental Protection Agency, the National Marine Fisheries Service, and the National Oceanic and Atmospheric Administration.

This projects goal is to document the value of marine resources derived from recreational fishing from New York to Florida. Sportfishing has economic value in that anglers would be willing to pay more for their opportunities than they actually have to pay. The value of opportunities for recreational fishing will depend on many aspects of the opportunities-the quality of fishing, the weather, the skill of the angler, and so forth. There are two kinds of economic values of interest: a) the access value, what anglers would pay rather than do without access to the resource; and b) the value of a change in the quality of fishing, what anglers would pay for increments in fishing characteristics, such as the catch rate.

McConnell, Virginia D. and Robert M. Schwab (1988). "The Impact of Environmental Regulation on Industry Location Decisions: The Motor Vehicle Industry." Draft Report, University of Maryland, Baltimore County.

The paper examines the impact of regional variation in environmental regulations on industry location decisions for one industry; automobile production. The focus is on location decisions in the 1970's, that was a time when there was some regional variation in environmental regulations in this industry, at both the county and state level, and when the costs of complying were sufficiently large that they might affect location decisions. Using a conditional logit model, we determine the regional factors important in firm location decisions for this industry, including various county and state measures reflecting the stringency of environmental regulations. We find no evidence that environmental regulations deter firm location in this industry when regulations are measured by a simple distinction between areas in attainment of ambient ozone standards and those not in attainment. There is some indication, though that the degree to which an area is out of attainment matters. Urban areas that are severely out of compliance with standards are less likely to be chosen.

McDonald, A. David, Anthony D.M. Smith, Andre E. Punt, Geoffrey N. Tuck, and Adam J. Davidson (1997). Empirical Evaluation of Expected Returns from Research on Stock Structure for Determination of Total Allowable Catch. Natural Resource Modeling, 10(1):3-29.

An approach to incorporating new information using Bayes theorem is applied to obtain estimates of expected returns from research on stock structure for determination of total allowable catch (TAC). Expected returns are measured relative to quantitative performance criteria that are outlined and a detailed case study of Tasmanian orange roughy is reported.

McDonald, J.F. (1980). "Uses of Tobit Analysis." Rev. of Econ. and

Stat., 62:318-21.

McEachron, L.W. and A.W. Green (1985). "Trends in Relative Abundance of Selected Finfishes Along the Texas Coast: November 1975-June 1984." Management Data Series Number 79, Coastal Fisheries Branch, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744.

Trends in relative abundance and size of red drum, spotted seatrout, black drum, sheepshead, southern flounder, Atlantic croaker, and sand seatrout were monitored using a standardized fishery independent gill net and bag seine sampling program in eight Texas bay systems. The impacts of management decisions based on optimum sustained yield, effects of catastrophic events and stock recruitment relationships can be measured by using estimates of relative abundance based on the fishery independent monitoring program. Fall and spring gill net catch rates indicate that declines in red drum and spotted seatrout populations have slowed or stopped since the prohibition of sale of these species in September 1981. However, the full effect of the regulations may not be evident for 3-5 years because spotted seatrout and red drum do not spawn until they are 3-5 years old. In addition, the effect of these regulations has been hampered by the coast wide fish kill documented in December 1983 and January 1984. Reduced population levels of red drum, spotted seatrout and black drum due to this freeze were observed in the 1984 spring gill net catch rates.

McHugh, Richard (1993). Creation of a Real-Time and Historical Shark Fishery Data Series. Center For Economic and Management Research, College of Business Administration, University of South Florida, 4202 East Fowler Ave, BSN 3403, Tampa, Florida, November, 33 pp.

This report summarizes a vessel level data base which can be used to better understand the economic operations of those working in the shark fisheries, as well as the implications of shark management plans. This data is drawn from the vessel trip tickets. Among the information included on these tickets are catch by species, cost by category (ice, fuel, etc.), price received, and vessel characteristics. Summarized is the historical data base, but an ongoing data collection effort is underway to continuously update the data base.

McFadden, Daniel (1974). "Conditional Logit Analysis of Qualitative Choice Behavior." In Zarembka, Paul (ed.) (1974). Frontiers in Econometrics. Academic Press, New York.

This paper outlines a general procedure for formulating econometric models of population choice behavior from distributions of individual decision rules. A concrete case with useful empirical properties, conditional logit analysis, is developed in detail. The relevance of these methods to economic analysis can be indicated by a list of the consumer choice problems to which conditional logit analysis has been applied: choice of college attended, choice of occupation, labor force participation, choice of geographical location and migration, choice of number of children, housing choice, choice of number and brand of automobiles owned, choice of shopping travel model and destination.

McFadden, Daniel (1974). "The Measurement of Urban Travel Demand." Working Paper No. 227, Institute of Urban & Regional Development, University of California, Berkeley.

This paper suggests approaches to advancing the behavioral theory of

travel demand and sheds light on some currently unresolved empirical questions on the determinants of travel behavior.

McFadden, Daniel (1976). "Quantal Choice Analysis: A Survey." Annals of Economic and Social Measurement, 5(4):363-390.

This article surveys quantal choice analysis, focusing on derived selection probabilities, revealed choice models, and the Luce Model. Statistical analysis of selection probabilities is examined from the standpoint of functional forms, methods for estimation and inference, and extensions of the statistical choice problem. Particular attention is given to multivariate choice, separability, and independence, and unsolved problems are discussed. The survey concludes with some economic applications of these choice models.

McFadden, D. (1978). "Modeling the choice of residential location." in Spatial interaction theory and planning models. Edited by A. Karlqvist, et al. Amsterdam: North-Holland, pp. 75-96.

A person chooses a community to live in and a type of dwelling to live in creating a two step estimation process; i.e. the probability of choosing a dwelling type given the choice of community. The independence from irrelevant alternatives problem is treated by McFadden's standard Generalized Extreme Value model by setting the correlations among the utilities associated with similar alternatives ( $\rho_{ij}$ ) to a constant. A fewer number of parameters can be estimated more efficiently, but the true correlation structure may be more complex than is represented by this simple solution.

McFadden, Daniel (1987). "Regression-Based Specification Tests for the Multinomial Logit Model." Journal of Econometrics, 34:63-82.

Diagnostic tests for omitted variables or functional misspecification in the multinomial logit (MNL) model can be performed conveniently by testing the significance of auxiliary regressions of residuals on included and excluded variables. In particular, Lagrange Multiplier (LM) and Hausman-McFadden (HM) tests of the Independence from Irrelevant Alternatives (IIA) Property on the MNL model can be carried out by the regression method using suitably defined excluded variables. Using this method, it is straightforward to test jointly against several sources of misspecification and to diagnose the structure of deviations from the MNL model.

McFadden, Daniel (1994). "Contingent Valuation and Social Choice." American Journal of Agricultural Economics, 76(4):689-708.

The contingent valuation method for estimating the existence value of natural resources is examined for psychophysical robustness, statistical reliability, and economic sensibility. Extensions of standard models for willingness to pay, and suitable econometric techniques for analyzing these models, are developed. The analysis is applied to a series of experiments on the value of preserving wilderness areas in the western United States. The results call into question the reliability of the CV method for estimating existence values.

McFadden, Daniel and Fred Reid (1974). "Aggregate Travel Demand Forecasting From Disaggregated Behavioral Models." Working Paper No. 228, Institute of Urban & Regional Development, University of California, Berkeley.

Aggregate and disaggregate travel demand models have a common foundation

and it may be possible to use a synthesis of the models to facilitate calibration and improve forecasting accuracy.

McGaw, Richard L. (1981). "The Supply of Effort in a Fishery." Applied Economics, 13:245-253.

The empirical literature on fisheries economics has largely ignored the concept of supply, concentrating instead on the specification of production functions. While it has been recognized that overexploitation of a fishery is an economic problem, the supply behavior of the industry has not been seriously examined. It is intended here to develop a model where effort, the index of inputs used in most production models, is determined endogenously rather than assumed to be exogenous. The consequence of this is that landings will be determined by economic rather than purely physical factors.

McGillivray, Robert G. (1970). "Demand and Choice Models of Modal Split." Journal of Transport Economics and Policy, May:192-207.

A review of the existing literature on travel by mode and an empirical analysis of San Francisco Bay area. Of interest is the appendix that derives both a utility interpretation of a binary choice model of the decision whether or not to take a trip and a demand interpretation of the estimated function.

McIlwain, T., K. Austin, B. Bastian, J. Erbacher, R. Fite, F. Kern, R. Orr, T. Siewicki, B. van der Schalie, Z. Zein-Eldin (1997). An Evaluation of Potential Shrimp Virus Impacts on Cultured Shrimp and Wild Shrimp Populations in the Gulf of Mexico and Southeastern U.S. Atlantic Coastal Waters. A Report to the Joint Subcommittee on Aquaculture prepared by the JSA Shrimp Virus Work Group, National Marine Fisheries Service, Animal and Plant Health Inspection Service, National Center for Environmental Assessment, and the Fish and Wildlife Service, June, 65 pp.

This report evaluates four major pathogenic shrimp viruses: Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV), Taura Syndrome Virus (TSV), White Spot Syndrome Virus (WSSV), and Yellow head Virus (YHV). In response to their findings the shrimp virus work group recommends that an ecological risk assessment be conducted.

McInerney, John (1976). "The Simple Analytics of Natural Resource Economics." Journal of Agricultural Economics, 27(1):31-52.

An attempt is made in this paper to identify the prime issues in natural resource economics and analyze them within a framework of simple economic principles. A socially optimal resource utilization policy is seen as basically a matter of the intertemporal allocation of resource stocks, and the appropriate analytical procedures for determining this are explored in the context of a proposed four way classification of natural resources. The renewable resource discussion contains an error corrected in a note by McInerney (1978).

McInerney, John (1978). "On the Optimal Policy for Exploiting Renewable Resource Stocks." Journal of Agricultural Economics, 29(2):183-188.

Corrects the error found in McInerney (1976).

McQuaid, John, Mark Schleifstein, and Bob Marshall (1996). Oceans of Trouble. The Times-Picayune, March 24-31.

The impact of fisheries exploitation, development, and pollution on the Gulf of Mexico. An entire section is devoted to the shrimp fishery and another to aquaculture. Emphasis is also placed on the people who earn their living from harvesting living marine resources and the prospects for their future. A most insightful assessment.

McKee, David A., Addison L. Lawrence, and Wade L. Griffin (1989). "Stocking Strategies and an Investment Analysis for Producing Penaeus setiferus as a Live Bait-Shrimp on the Texas Coast." Journal of the World Aquaculture Society, 20(2):72-80.

An economic and investment analysis was performed to determine the viability of bait-shrimp farming in Texas. A single pond analysis producing 5 - 5.5 g shrimp always had higher returns above selected cost (RASC) than producing 4 - 4.5 g shrimp. Stocking 0.01 g shrimp had a higher RASC than stocking 0.25 g, 0.50 g, or 0.75 g shrimp. In the 20 pond analysis, which accounted for marketing considerations, stocking 0.25 g shrimp had the highest RASC. The investment analysis, assuming average management, was declared bankrupt by the end of the fifth year. Under "excellent" management the internal rate of return was only 11.7%. It is unlikely that bait-shrimp farming will become a viable industry in Texas in the near future.

McKelvey, Richard D. and William Zavoina (1975). "A Statistical Model for the Analysis of Ordinal Level Dependent Variables." Journal of Mathematical Sociology, 4:103-120.

This paper develops a model with assumptions similar to the linear model for use when the observed dependent variable is ordinal. This model is an extension of the dichotomous probit model and assumes that the ordinal nature of the observed dependent variable is due to methodological limitations in collecting the data that force the researcher to lump together and identify various portions of an otherwise interval level variable. The model assumes a linear effect of each independent variable as well as a series of break points between categories for the dependent variable. Maximum likelihood estimators are found for these parameters along with their asymptotic sampling distributions and an analogue of  $R^2$  (the coefficient of determination in regression analysis) is defined to measure goodness of fit. The use of the model is illustrated with an analysis of Congressional voting on the 1965 Medicare Bill.

McKelvey, Robert (1983). "The Fishery in a Fluctuating Environment: Coexistence of Specialist and Generalist Fishing Vessels in a Multipurpose Fleet." Journal of Environmental Economics and Management, 10:287-309.

The fishery is a prime example of a common property renewable resource industry. A second prominent feature is the extreme variability of its environment, both biologic and economic. Traditionally fishing vessels have harvested a single species or aggregation, but now powerful multipurpose vessel have been introduced that switch targets as opportunities arise. These vessels represent an adaptation to the fluctuating environment: they give up efficiency of specialized operations for flexibility under changing conditions. We analyze, from the point of view of economic efficiency, the common property operation of a mixed fleet of generalist and specialist fishing vessels in a fluctuating environment.

McKenna, James E., Jr. (1994). "Commercial Landings and Quota Monitoring of Florida's 1992-1993 King Mackerel Fishery." In South Atlantic Fishery Management Council, Gulf of Mexico Fishery



Management Council, and Mid-Atlantic Fishery Management Council (1994). "Draft Regulatory Amendment for the Fishery Management Plan for Coastal Pelagics in the Gulf of Mexico and South Atlantic." South Park Building, 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, January, 31 pp.

A description of commercial landings in the Florida Atlantic mackerel fishery and fishery management implications.

McKenzie, George W. (1979). "Consumer's Surplus Without Apology: Comment." American Economic Review, 69(3):465-468.

Two main problems with Robert Willig's criteria for determining when consumer surplus reasonably approximates the equivalent and compensating variations are examined: (a) it cannot be easily generalized to cases where the prices of several commodities vary; (b) it is valid only when price and income changes are relatively small. Secondly, numerical examples are used to illustrate that the magnitudes of error involved may be far from negligible. Finally this procedure is contrasted with the Pearce and McKenzie approach that enables an exact not an approximate money metric welfare indicator to be constructed on the basis of observable information.

McKinney, David A. (1991). "The Individual Transferable Fishing Quota Management System, A Review of Recent Programs from an Enforcement Perspective." Report prepared for the National Marine Fisheries Service, Office of Law Enforcement, Special Agents in Charge, August 1, 32 pp.

The individual transferable quota and similar fisheries programs are relatively new concepts in resource management. In an ITQ program each qualified fisherman is given the right to harvest a select portion of the total allowable catch. This paper provides an overview of select ITQ fishing systems and proposed systems currently underway in five different countries including the United States. Since there already exists ample biological resource data on the various systems, this paper emphasizes international fishing quota programs from an enforcement perspective.

McKinney, David A. (1993). "Enforcement Methodology of Federal Individual Quota Fisheries." Paper presented at the Workshop on Enforcement Measures, Organization for Economic Co-Operation and Development, Directorate for Food, Agriculture, and Fisheries, Committee for Fisheries, Paris, September 21-22.

Although conceptual and framework differences exist, individual quota fisheries are no more dependent upon enforcement than their traditional counterparts. The crucial difference is the enforcement strategy within each system. The key to an economically feasible enforcement effort is a properly designed individual quota fishery. This paper defines the unique role of enforcement in Federal individual quota fisheries and discusses the strategies and tactics necessary in achieving acceptable levels of compliance.

McLaren, Keith R. (1982). "Estimation of Translog Demand Systems." Australian Economic Papers, December:392-406.

It is argued that the estimation and testing procedure of the transcendental logarithmic direct and indirect utility functions should be further modified in two respects, by relating approximations used to the sample data and by reexamining which variables are endogenous and which exogenous.

McLemore, B. Michael (1996). Gulf Shrimp Amendment 9 and Statistical Review Advisory Panel; November Meeting. Memorandum to the Gulf of Mexico Fishery Management Council, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL, 2 pp.

A memorandum stating the legal position that the Council may take action on red snapper bycatch reduction in shrimp trawls without concluding a statistical review of the TED induced finfish bycatch reduction.

Mace, Pamela M. (1993). The Bioeconomic Consequences of Risk Averse Fisheries Management Strategies. Draft report, P.O. Box 7357, Silver Spring, MD, July.

This paper investigates the short and long term biological and economic consequences of risk averse fisheries management strategies. In particular, what circumstances are necessary for conservative strategies to outperform less conservative and risky strategies in terms of stock size, yields, and revenues. The more conservative the strategy, the higher the stock size; however, the potential effects on cumulated yields and discounted revenues are less obvious.

Mace, Pamela M. (1994). An Evaluation of the Effectiveness of the Current Minimum Size for Atlantic Swordfish. ICCAT Working Document, SCRS/94/114, Revised, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD.

The benefits of the current ICCAT minimum size regulation for Atlantic swordfish (125 cm LJFL or 25 kg round weight, with 15% tolerance by number) were examined in terms of the gains in yield per recruit (YPR) and spawning per recruit (SPR), and the risks of recruitment overfishing. Sensitivity analyses showed that smaller minimum sizes combined with zero tolerance could result in comparable levels of YPR and SPR. However, in all cases the SPR based on recent (1991) fishing mortality rates is small relative to the level required for population replacement. Reduced risk of recruitment overfishing will require either a much larger minimum size, much improved survival of undersized returns, or lower fishing mortalities overall.

Mace, Pamela M. (1994). Relationships Between Common Biological Reference Points Used as Thresholds and Targets of Fisheries Management Strategies. Can. J. Fish. Aquat. Sci., 51:110-122.

Relationships between various biological reference points (BRPs) used to define thresholds and targets of fisheries management strategies were examined for a range of combinations of life history characteristics. Rank orderings of the selected BRPs were strongly influenced by the degree of density dependence in the underlying spawning-recruitment (S-R) relationship. The validity of  $F_{0.1}$ ,  $F_{max}$ , and  $F_{20\%}$  (the fishing mortality at which spawning per recruit is 20% of the maximum), and other reference fishing mortality rates as approximations to  $F_{msy}$  or as thresholds of over fishing is highly dependent on life history characteristics, particularly the degree of density dependence in the S-R relationship. It is recommended that  $F_{40\%}$  be adopted as a target fishing mortality rate when the S-R relationship is unknown and that threshold levels of biomass be related to the estimated or assumed degree of density dependence in the S-R relationship. Two new methods of calculating threshold biomass levels are suggested as alternatives to the familiar 20%  $B_0$  rule.

Mace, Pamela M. (1995). Meeting Report from Workshop #1 on Limited Access for Atlantic Swordfish and Atlantic Shark Fisheries. Highly Migratory

Species Management Division, National Marine Fisheries Service, 1315 East West Highway, Silver Springs, MD, January.

A workshop on limited access for Atlantic swordfish and shark fisheries to scope out issues and options for limited access management is summarized in this report.

Mace, Pamela M. (1996). Comparisons Between Maximum Economic Yield and Maximum Sustainable Yield. Draft report, Highly Migratory Management Division, National Marine Fisheries Service, Silver Spring, MD, April, 14 pp.

Classical economic theory says that at equilibrium the fishing mortality associated with maximum economic yield is less than fishing mortality at maximum sustainable yield and that biomass at maximum economic yield is greater than at maximum sustainable yield. But, results can be different if the model is modified to include fish schooling or aggregation, discount rate, and time horizon effects. Thus, economics will not necessarily save the day, even when fisheries are managed using economic objectives (e.g. under ITQs).

Mace, Pamela M. (1996). Developing and Sustaining World Fisheries Resources: the State of the Science and Management. Keynote Presentation, World Fisheries Congress, Sidney, Australia, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD.

A review of world fisheries and the general state of management is presented with predictions for the future of fisheries management being more cooperative between fishermen, biologists, economists, and managers.

Mace, Pamela M. (1996). An Evaluation of the Use of SPR Levels as the Basis for Overfishing Definitions in Gulf of Mexico Finfish Fisheries Management Plans. Draft report, Gulf of Mexico SPR Management Strategy Committee, April, 44 pp.

This report summarizes the conclusions of the SPR Committee, which cover the following broad areas: general considerations about the applicability of SPR reference points (Section I), topics of special relevance to Gulf of Mexico fisheries (Section II), evaluation of current SPR reference points for Gulf of Mexico species (Section III), and recommendations for future development of OY and overfishing definitions (Section IV). Includes copies of an overhead presentation used to present the results to the fishery management councils.

Mace, Pamela M. and Wendy L. Gabriel (1998). Evolution, Scope, & Current Applications of the Precautionary Approach in Fisheries. Presentation, National Stock Assessment Workshop, National Marine Fisheries Service, Key Largo, FL.

The evolution of the precautionary principle and approach from a series of international meetings and agreements is summarized. How it is applied in internationally managed fisheries is compared to the U.S. history of management. The conclusion is that it is just another attempt to impose the same management regime that has existed in the past and has failed to prevent stock and fishery collapses.

Mace, Pamela, Steve Freese, Dominique Greboval, John Ward, Robin Tuttle, Kathy Downs, Tanya Coleman, and Bill Fox (1997). FAO/NMFS Overcapacity Initiative. Draft proposal, National Marine Fisheries Service, 1315

East-West Highway, Silver Spring, MD, February, 8 pp.

Proposed organizational outline for the FAO expert consultation group on global overcapacity in fisheries. Outlines for background papers on measuring overcapacity and guidelines for controlling overcapacity are included as well as a proposed list of participants.

Mace, Pamela, L. Botsford, J. Collie, W. Gabriel, P. Goodyear, J. Powers, V. Restrepo, A. Rosenberg, M. Sissenwine, G. Thompson, and J. Witzig (1996). Scientific Review of Definitions of Overfishing in U.S. Fishery Management Plans. Supplemental Report, NOAA Technical Memorandum, NMFS-F/SPO-21, September, 20 pp.

A class of biological reference points, referred to as non-equilibrium measures of spawning potential ratio, that have been proposed and used to measure current stock status with respect to overfishing are reviewed. These are commonly used as reference points for fisheries in the southeastern U.S. (e.g. red snapper and mackerel) but were omitted from the report Scientific Review of Definition of Overfishing in U.S. Fishery Management Plans. Example calculations for simulated and real fish stocks are included. The report recommends the adoption of static and transitional SPR as a measure of overfishing and in rebuilding plans, respectively.

Macinko, Seth (1993). "Investigation of the Basic Bioeconomic Dynamics of Bycatch Problems in Gulf of Mexico Fishery Management." Draft final report, S/K Award No. NA27FD0068-01, November, 44 pp.

A stylized model of a set of Gulf fisheries is developed to investigate the bioeconomic characteristics of bycatch problems. The simulation run isolate three distinct effects attributable to the introduction of a bycatch reduction device (BRD) into the fishery for stock X; a bycatch catchability effect; an operating cost effect; and a target species catchability effect. The BRD does not result in increases in stock size for species Y, it does increase recreational and commercial fishing effort for species Y substantially, and it increases fishing pressure in the fishery for species X.

Macinko, Seth (1993). "Public or Private?: United States Commercial Fisheries Management and the Public Trust Doctrine, Reciprocal Challenges." Natural Resources Journal, 33:919-955.

This article explores contemporary debates over property rights in United States fisheries in the context of the public trust doctrine. The debate surrounding the privatization of harvesting rights in the halibut and sablefish fisheries off Alaska is used as a case study. The public trust perspective guides a new reading of the Alaska debate offering insight into current conceptualizations of both property rights in fisheries and the public trust doctrine itself. A contextual analysis of the early public trust doctrine reveals a strong symmetry between the debate over the early doctrine and that over the Alaska fisheries. both are debates over fundamental ideas regarding the interrelationships between natural resources, rights, equity, progress, and nationhood. A public trust-driven reading of the Alaska debate reveals how much our ideas about rights, and consequently about the public trust doctrine itself, have changed. In our quest for environmental preservation we have all but abandoned earlier public trust doctrine in exchange for the malleability of current articulations of the doctrine.

Macinko, Seth (1994). "Investigation of the Basic Bioeconomic Dynamics of Bycatch Problems in Gulf of Mexico Fishery Management." Final report, S/K Award No. NA27FD0068-01, November, 44 pp.

A stylized model of a set of Gulf fisheries is developed to investigate the bioeconomic characteristics of bycatch problems. The simulation run isolate three distinct effects attributable to the introduction of a bycatch reduction device (BRD) into the fishery for stock X; a bycatch catchability effect; an operating cost effect; and a target species catchability effect. The BRD does not result in increases in stock size for species Y, it does increase recreational and commercial fishing effort for species Y substantially, and it increases fishing pressure in the fishery for species X.

Mackerel Stock Assessment Panel (1993). "1993 Report of the Mackerel Stock Assessment Panel." Final report of the Mackerel Stock Assessment Panel held March 29-31, 1993, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory Contribution Number MIA-92/93-57.

The stock assessment for the migratory coastal pelagics (mackerel) stocks in the Gulf of Mexico.

Mackerel Stock Assessment Panel (1995). "1995 Report of the Mackerel Stock Assessment Panel." Final report of the Mackerel Stock Assessment Panel held March 21-23, 1995, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory Contribution Number MIA-94/95-30.

The stock assessment for the migratory coastal pelagics (mackerel) stocks in the Gulf of Mexico.

Mackerel Stock Assessment Panel (1997). "1997 Report of the Mackerel Stock Assessment Panel." Final report of the Mackerel Stock Assessment Panel held March 31 - April 4, 1997, Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL and South Atlantic Fishery Management Council, Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina, April, 32 pp.

The stock assessment for the migratory coastal pelagic (mackerel) stocks in the Gulf of Mexico.

Mackerel Stock Assessment Panel (1998). "1998 Report of the Mackerel Stock Assessment Panel." Final report of the Mackerel Stock Assessment Panel held March 23 - 26, 1998, Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL and South Atlantic Fishery Management Council, Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina, 24 pp.

The stock assessment for the migratory coastal pelagic (mackerel) stocks in the Gulf of Mexico.

Mackinson, Steven, Ussif Rashid Sumaila, and Tony J. Pitcher (1997). Bioeconomics and Catchability: Fish and Fishers Behaviour During Stock Collapse. Fisheries Research, 31:11-17.

During periods of stock collapse, an increase in the catchability exhibited by many small pelagic fish is a consequences of two factors: their schooling habit and the remarkable efficiency of today s technology intensive fishing fleets. The net result is that a virtually constant catch per unit effort may be achieved regardless of stock size. Three models of catchability used to highlight the consequences of fish behavior and fishing technology

during stock collapse are extended to examine the effects of incorporating profit motivated economic behavior of fishers. Three scenarios are examined: (1) cooperation by fishers to achieve maximum economic yield (MEY); (2) non-cooperation resulting in open access equilibrium; (3) non-cooperation with allocation subsidies allowing fishers to increase effort beyond the open access equilibrium. Incorporating economic behavior in the density-dependent catchability models may result in an alarming increase in the rate of stock depletion, since fishers maintain high profits even during low stock abundance. We discuss the consequences of using a model where catchability is assumed constant for the management of fisheries on small schooling pelagic fish.

Mager, Andreas, Jr. (1985). "Five-Year Status Reviews of Sea Turtles Listed Under the Endangered Species Act of 1973." National Marine Fisheries Service, Protected Species Management Branch, Duval Building, 9450 Koger Boulevard, St. Petersburg, FL 33702, January, 90 pp.

A five year review of listed species is required under section 4 of the endangered species act. Information published between 1978 and 1984 is summarized in this review by NMFS, and an assessment is made of the current status of the populations of sea turtles that are listed pursuant to the Endangered Species Act of 1973 (ESA). The leatherback sea turtle (*Dermochelys coriacea*) and hawksbill sea turtle (*Eretmochelys imbricata*) were listed as endangered throughout their range on June 2, 1970. The population of Kemp's ridley (*Lepidochelys kempii*) was listed as endangered on December 2, 1970. The green sea turtle (*Chelonia mydas*) was listed on July 28, 1978, as threatened except for the breeding populations of Florida and the Pacific coast of Mexico that are listed as endangered. At the same time, the loggerhead sea turtle (*Caretta*) was listed as threatened wherever it occurs. These sea turtles were listed because, to varying degrees, their populations had declined as the result of human activities. Many of their nesting beaches had been destroyed by encroachment of the human population into coastal habitats. Sea turtle populations had been reduced by uncontrolled harvesting for commercial purposes and by mortality incidental to activities such as commercial fishing. In many cases, existing regulatory mechanisms were not providing sufficient encouragement for conservation.

Mager, Andreas, Jr. (1988). "National Marine Fisheries Service Habitat Conservation Efforts in the Coastal Southeastern United States for 1987." Marine Fisheries Review, 50(3):43-50.

Data quantifying the cumulative acreage of coastal habitat affected by Corps of Engineers (COE) programs that regulate development in wetlands of the southeastern United States are provided for 1987. The National Marine Fisheries Service (NMFS), Southeast Region, made recommendations on 4,713 water development proposals submitted by or to the COE. Of these, 1,054 proposed to alter 21,756 acres of fishery habitat through 3, 506 acres of dredging, 2,899 acres of filling, 1,303 acres of draining, and 14,048 acres of impounding. The NMFS did not object to alteration of 8,135 acres and recommended the conservation of 13, 621 acres. To offset habitat losses, 7,139 acres of mitigation were recommended by NMFS or proposed by applicants and/or the COE. Of the wetland alterations accepted by NMFS, nearly 5,000 acres involved impounding for marsh management in Louisiana. A follow up survey of 266 permits issued by the COE during 1987 revealed that only 46 percent of NMFS recommendations were accepted by the COE. On a permit by permit basis, 25 percent of NMFS recommendations were partially accepted, 21 percent were completely rejected, and 8 percent were withdrawn.

Mager, Andreas, Jr. (1990). "National Marine Fisheries Service Habitat Conservation Efforts in the Southeastern United States for 1988." Marine Fisheries Review, 52(1):7-13.

Data quantifying the area of habitat affected by Federal programs that regulate development in coastal zones of the southeastern United States are provided for 1988. The National Marine Fisheries Service made recommendations on 3,935 proposals requiring federal permits or licenses to alter wetlands. A survey of 977 of these activities revealed that 359,876 acres of wetlands that support fishery resources under NMFS purview were proposed for some type of alternation or manipulation. Almost 95 percent of this acreage was for impounding and or manipulation of water levels in Louisiana marshes. The National Marine Fisheries Service did not object to alternation of 173,284 acres and recommended the conservation of 186,592 acres. To offset habitat losses, 1,827 acres of mitigation were recommended by the NMFS or proposed by applicants and/or the Corps of engineers (COE). From 1981 to 1988 the NMFS has provided indepth analyses on 8,385 projects proposing the alteration of at least 656,377 acres of wetlands.

Mager, Andreas, Jr. and Gordon W. Thayer (1986). "National Marine Fisheries Service Habitat Conservation Efforts in the Southeast Region of the United States From 1981 through 1985." Marine Fisheries Review, 48(3):1-8.

The National Marine Fisheries Service (NMFS) is quantifying the cumulative acreage of habitat involved in the Corps of Engineers' (COE) programs relating to water development in the Southeast Region of the United States. From January 1981 through December 1985 the NMFS commented on 23,292 proposals to alter wetlands that had been submitted to the COE. Of these, detailed habitat information was obtained on 5,385 projects involving the potential alteration of 184,187 acres of wetlands. Dredging was proposed for over 80,227 acres and 45,893 for filling, 5,846 for draining, and 52,222 for impounding. NMFS did not object to the alteration of 48,500 acres and recommended the conservation of 135,687 acres. The proposed habitat losses were potentially offset by the 110,406 acres recommended for mitigation. The degree to which our recommendations were incorporated into permits by the COE also was documented. NMFS recommendations were accepted overall 50 percent off the time, partially accepted 24 percent of the time, and rejected 26 percent of the time. Applicant compliance with permit conditions averaged 80 percent. NMFS recommendations on permit applications are made by the Southeast Regional Office and its area offices, but are dependent on up-to-date research information provided by research laboratories of the Southeast Fisheries Center. The close link between these facilities in NMFS fisheries habitat conservation efforts is described.

Magnuson, John J. (Chairman) (1994). An Assessment of Atlantic Bluefin Tuna. Committee to Review Atlantic Bluefin Tuna, Ocean Studies Board, Commission on Geosciences, Environment, and Resources, National Research Council, National Academy Press, Washington, D.C.

This report summarizes independent advice requested by the National Oceanic and Atmospheric Administration on the scientific basis of management for the Atlantic bluefin tuna. The committee notes that research on the biology of Atlantic bluefin tuna is not continuing at an intensity necessary to answer major biological questions pertaining to the management of the fisheries.

Maguire, Jean-Jacques, Barbara Neis, and Peter R. Sinclair (1994).

"What Are We Managing Anyway?: The Need for an Interdisciplinary Approach to Managing Fisheries Ecosystems." C.M 1994/T:48, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 14 pp.

This paper proposes an interdisciplinary approach to fisheries management and fisheries science as a solution to the problems currently facing fisheries managers.

Maharaj, Vishwanie (1989). "The By-Catch in the Artisanal Shrimp Trawl Fishery, Gulf of Paria, Trinidad." Masters Thesis, Department of Fisheries, Aquaculture, and Pathology, University of Rhode Island, Narragansette, Rhode Island.

Annual ratio estimates were 9:1 finfish to shrimp and 14.7:1 bycatch to shrimp, with the highest ratios observed during August to December and the lowest during late January to May, the dry season. Extrapolation of ratios, using shrimp catch statistics indicate that for 1986, 974,000 kg finfish and 620,000 kg crabs (*Callinectes* spp.) were caught incidentally by artisanal shrimp trawlers fishing in the Gulf of Paria. Of this total incidental catch (1,594,000 kg), approximately 1,500,400 kg were discarded (94%).

Maharaj, Vishwanie (1995). "Valuation of Atlantic Salmon Sport Fishing in New England and an Economic Analysis of Farming Adult Atlantic Salmon for a Sport Fishery." Ph.D. Dissertation, Department of Natural Resource Economics, University of Rhode Island, Kingston, Rhode Island.

This study focuses on estimating demand for Atlantic salmon sport fishing in New England. Sport fishing demand is modeled as a function of attributes of salmon fishing opportunities, and characteristics of salmon anglers. Models with level of interest variables and motives for fishing give better out of sample predictions than models with demographics and models with site attributes. Providing a number of assumptions hold, optimization results indicate that it would be economically viable to rear adult Atlantic salmon for a sport fishery..

Maharaj, Vishwanie (1998). "The Economic Importance of Marine Recreational Fishing in the United States; Case Studies: Striped Bass and Bluefin Tuna." American Sportfishing Association, 1033 North Fairfax Street, Suite 200, Alexandria, Va.

This report summarizes the economic benefits of marine recreational fishing in the United States, and presents two case studies on fisheries that are important to both the commercial and the recreational fishing sectors. The first case study analyzes a success story, the restoration of striped bass along the Atlantic Coast. The second case study describes a newly developed winter bluefin tuna sport fishery in North Carolina that contributes more than \$3.5 million to the local economy, and holds even greater economic potential if the fishery is properly managed.

Maharaj, V and C. Recksiek (1991). "The Bycatch from the Artisanal Shrimp Trawl Fishery, Gulf of Pria, Trinidad." Marine Fisheries Review, 53(2):9-15.

Samples of shrimp trawl catches were collected from a commercial



artisanal vessel fishing inside the 6 fm isobath in the Gulf of Paria, Trinidad. Annual ratio estimates were 9 finfish: shrimp and 14.7 bycatch:shrimp, with the highest ratios observed August through December and the lowest from late January through May, the dry season.

Mahony, J. (1996). Landings Quota Report. National Marine Fisheries Service, Northeast Fisheries Center, Water Street, Woods Hole, MA, April, 2 pp.

Landings of swordfish for year to date and the first half of April by gillnet and other gear types in the mid-Atlantic and New England.

Mahood, Robert K. (1977). "Socioeconomic Impact on the White Shrimp Fishery by Opening and Closing Sounds." Coastal Fisheries Section, Coastal Resources Division, Georgia Department of Natural Resources, 45 pp.

The study was divided into two phases to accurately assess the economic and social benefits derived from opening and closing sounds to commercial shrimping. Phase I consisted of field work, publicity, shrimp tagging, and monitoring environmental factors. Phase II evaluated shrimp movements from the estuaries and economic and social benefits derived from opening and closing sounds.

Major, Philip (1994). Individual Transferable Quotas and Quota Management Systems: a Perspective from the New Zealand Experience. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

This paper explores the experience of New Zealand in implementing a comprehensive quota management system to cover a multispecies fishery including crustacea and shellfish. In particular it explores the pressures that have come to bear on the fisheries management process in terms of the Government's goal to create an economically efficient and effective conservation regime for the New Zealand fisheries.

The paper will explore the conflicts that arise between industry and Government on the setting of total allowable catches, bycatch allowances, the allocation of quota, the establishment of the system and the interrelationship between conservation, recreational and commercial fishing groups.

The paper will also suggest a range of mechanisms that might be suitable to overcome the difficulties that New Zealand has experienced in the implementation of its quota management scheme.

Malvestuto, Stephen P. and Michael D. Hudgins (1996). Optimum Yield for Recreational Fisheries Management. Fisheries, 21(6):6-17.

Optimum yield (OY) calls for fishery professionals to deliberately and meaningfully incorporate biological, economic, and social values into fishery management decision making. This invitation eventually will require a large, multidisciplinary data base for a fishery, but that reality is in the distant future. For now, OY compels us to consider a paradigm shift. The new paradigm would require decision makers to choose a list of essential variables that would be examined and weighed in concert before developing management plans. Here, we present four OY management accounts (biological, sociocultural, economic, and human health) as the conceptual framework for this OY data gathering. Depending on the mix of user groups, each management account would generate several important variables that should be considered as a starting point for OY decision making for a fishery. The suggested data

can be obtained easily through routine creel surveys. Our reconceptualization of OY is intended to shift the content and focus of recreational fishery management plans toward evaluating and promoting diverse sociocultural benefits to anglers and communities.

Manar, Thomas A. (ed.) (1973). "Shrimp '73 - A Billion Dollar Business." Marine Fisheries Review, March-April, 35(3-4):1-80.

An issue of the journal devoted to a single topic; shrimp.

Mangel, Marc and Richard E. Plant (1985). Regulatory Mechanisms and Information Processing in Uncertain Fisheries. Marine Resource Economics, 4(1):389-418.

We study the effects on fisherman decision processes of periodic (e.g., weekly) individual quotas. In the model, the fisherman must choose at the start of each week on which of two grounds to fish. The catch per week on each ground is a random variable and the fisherman does not know with certainty the parameters of the distribution of that variable. He does have estimates on each parameter and can improve these estimates by Bayesian updating. The choice of a fishing ground takes into account the expected catch on that ground and the expected improvement in information from fishing on that ground. Our study is concerned with the effect of weekly quotas on the joint production of information and fish. Various policy implications are discussed, and the results are compared with the policy analysis of Clark (1980) in the deterministic case. We know that the quota affects the value of information and that if quotas are transferable, then the quota may limit its own value.

Manooch, Charles S. III, Steven P. Naughton, Churchill B. Grimes, and Lee Trent (1987). "Age and Growth of King Mackerel, Scomberomorus cavalla, From the U.S. Gulf of Mexico." Marine Fisheries Review, 49(2):102-108.

An age and growth study of king mackerel in the Gulf of Mexico from Key West to the Yucatan Peninsula, Mexico from 1980 through 1985. Von Bertalanffy growth equations are estimated for male, female, and both sexes combined. Age at recruitment to commercial and recreational fisheries off various states is reported. Total instantaneous mortality estimates are given that show that female rates are lower than rates for males.

Manski, Charles F. and Daniel McFadden (eds.) (1981). Structural Analysis of Discrete Data with Econometric Applications. The MIT Press, Cambridge, Massachusetts.

This volume deals with parametric statistical inference on structural conditional probability models in which some or all of the endogenous variables are discrete valued. Taken together, these chapters provide a methodological foundation for the analysis of economic problems involving discrete data and chart the current frontiers of this subject.

Manski, Charles F. (1991). "Regression." Journal of Economic Literature, 29(March):34-50.

This article expositis the achievements and concerns of the rich modern literature on the estimation of regressions. to keep the discussion within bounds, I restrict attention to the case in which  $y$  is scalar and focus on those regressions that provide best predictors of  $y$  conditional on  $x$ . This class of regressions is easily described and covers the majority of

applications.

Manzella, Sharon A., Charles W. Caillouet, Jr., and Clark T. Fontaine (1988). "Kemp's Ridley, Lepidochelys kempfi, Sea Turtle Head Start Tag Recoveries: Distribution, Habitat, and Method of Recovery." Marine Fisheries Review, 50(3):24-32.

The Kemp's ridley sea turtle head start research project is an international conservation effort to increase the wild population of Kemp's ridleys and to create a second nesting beach on Padre Island, Texas. Turtles are reared in captivity for about 10 months, tagged, and released at various locations in the Gulf of Mexico, but primarily off Padre Island. Tag recoveries are summarized by distribution, method of recovery, habitat, and season.

A total of 12,422 turtles from nine year classes (1978-86) of Kemp's ridleys have been released since the project began in 1978. As of 31 December 1987, 547 (4.4 percent) tag recoveries have been reported. Tag recovery data show turtles were reported from Mexico, all of the Gulf Coast states, and most of the states on the U.S. east coast as far north as New York. A few tag recoveries were reported from France and Morocco. Primary recovery locations are Texas (60.9 percent), Louisiana (14.0 percent), and Florida (10.3 percent), and primary tag recovery methods include strandings (34.4 percent) and shrimp trawls (27.6 percent). Tag recovery habitat data show that occurrence in bay waters or ocean waters is about equal with 45.8 and 31.8 percent, respectively. Kemp's ridleys probably move into bays and shallow coastal areas to feed. Seasonally, 52.5 percent of the tag recoveries occur during April, May, and June.

Marasco, Richard J. and Joseph M. Terry (1982). "Controlling Incidental Catch, An Economic Analysis of Six Management Options." Marine Policy, April:131-139.

The authors identify a management approach to the problem of incidental catch and utilize that approach to evaluate six management options which are being considered to control incidental catch in the US fishery conservation zone of the Bering Sea. The evaluation is in terms of the ability of management to minimize the impact and control costs of incidental catch. The authors conclude that the use of economic disincentives tends to be preferable due to the inefficiencies and extensive information requirements of the alternative options.

Marasco, Richard J., Rebecca Baldwin, Nic Bax, and Tina Landen (1989). "Bycatch: A Bioeconomic Assessment of North Pacific Groundfish Fisheries." Draft Report, ICES, MSM Symp/No. 31.

In its early years, the North Pacific Fishery Management Council spent considerable time setting catch quotas and dividing them between foreign, joint venture, and domestic fisheries. Conservation of stocks and the development of a United States groundfish fishery were the main concerns during this period. Expansion of United States groundfish fisheries has increased the contentiousness of allocation decisions. One of the most politically volatile allocation issues is the catch of nontarget species (bycatch) in the groundfish fishery, particularly by trawlers. Mathematical programming techniques are used to explore this issue. Models constructed contain both biological and economic components. Costs and benefits of controlling bycatch in both target and nontarget fisheries are examined.

Margavio, A.V. and Shirley Laska (1992). "The Louisiana Shrimp Fishery: A Management Challenge." Draft report, The Environmental Social

Science Research Institute, Department of Sociology, University of New Orleans, New Orleans, LA 70148, 50 pp.

The paper explores the lessons learned about the TED controversy using data collected under contract.

Margavio, A.V., Shirley Laska, James Mason, and Craig Forsyth (1992). "A Sociopolitical Analysis of Marine Management: The TEDs Case." Draft report, University of New Orleans.

A sociopolitical model of marine resource conflicts was elaborated using the Turtle Excluder Device (TED) conflict and protest as an illustrative case. The model is grounded in the theories and perspectives of four relevant sociopolitical perspectives: 1) public policy/public administration, 2) environmental sociology, 3) collective behavior, and 4) economic power and labor organization/labor disputes. The approach combines the four perspectives into a single vision. The model focuses (1) both objective interests and subjective values in conflict, (2) conflict history as the unit of analysis, (3) the roles of government; (4) the role of science, and (5) the social impacts.

Marine Fisheries Commission (1991). "Coastal Pelagics Survey Research." CM-287, 2540 Executive Center Circle, West, Suite 106, Tallahassee, Florida 32301, January.

Much of the information necessary to make allocation decisions is either unavailable or dated. Therefore, the need for timely social and economic data is critical to Commission decision making. Such information must be specifically collected to determine social and economic impacts, economic values placed on the resource by different groups, market demand for different product forms, and the identification of import and export channels. This project will use survey research to address allocation questions for the coastal pelagics, specifically the king and spanish mackerels. Includes a data set on disk.

Marine Policy Center and Environmental Solutions International (1995). Market-Based Incentives to Reduce Fisheries Bycatch. Preliminary Draft Report, National Marine Fisheries Service, NOAA Contract No. 50-DGNF-5-00172, September, 58 pp.

This preliminary report represents a first step at considering the potential for the use of market-based incentives to aid in the resolution of fishery bycatch problems. Market-based incentives have several advantages over more traditional command and control approaches, including cost-effective allocations of environmental controls; incentives for firms to seek technological solutions; flexibility; returns to the public for the use of its resources; and lower administrative costs in some cases.

Marshall, Nelson (19??). "Fishery Yields of Coral Reefs and Adjacent Shallow-Water Environments." Draft report.

A review of recent efforts to estimate the sustained yield of reefs from the landings of species harvested from this ecosystem.

Marshall, Rose (1986). "Use of Minimum Bid Requirements to Achieve Intertemporal Allocation Efficiency for Oil and Gas Leases." Presented at the University of Rhode Island, Chief, Branch of Economic Studies, Offshore Resource Evaluation Division, Department of the Interior.

Current policy requires that a bid for an Outer Continental Shelf (OCS) oil and gas tract equal or exceed \$150 per acre. Otherwise, the bid cannot be considered for acceptance. This analysis was conducted to address the questions raised concerning the minimum bid level in Attachment 1 of Appendix K to the 5 year Secretarial Issue Document.

Martin, Dean F. (1995). "Why Don't We Have More Red Tides in Florida." Local, National, Global Health News, 5(11), 3 pp.

With the present state of knowledge of red tides, particularly in Florida coastal waters, the major challenge may be to explain why they do not occur more often. It appears that at least five major factors are responsible for this blessing. These are: (1) environmental stress, (2) enemy organisms, (3) currents and other hydrographic factors, (4) possibly critical-nutrient limitation, and (5) photodynamic action. The significance of these factors are reviewed as a guide to potential management strategies.

Martinez, Eduardo X., James M. Nance, and Roger J. Zimmerman (1996). A Model for Assessment of Ecological Interactions Among Living Marine Resources in the Gulf of Mexico: Implications for Bycatch Management and Shrimp Production. Executive Summary, Report to the Gulf of Mexico Fishery Management Council, National Marine Fisheries Service, Southeast Fisheries Science Center, Galveston Laboratory, 4700 Avenue U, Galveston, TX, March, 19 pp.

Excess bycatch in shrimp trawls is seen as an important cause for declines in stocks of some commercially important finfish, endangered sea turtles, and other living resources in the Gulf of Mexico. Measures to reduce bycatch have been proposed to alleviate such declines. These measures may have the effect of releasing more shrimp predators or allowing small fish to grow larger and thus become predators. Shrimp stocks might then be impacted by increasing the incidence of finfish predation. Although the interaction of shrimp and finfish predators in a Gulf of Mexico estuary has been described in detail, limited information is available regarding shrimp predation in offshore waters, and its effect on shrimp stocks. Development of an ecosystem based model is desirable to guide research and management. However, it is important to remember that predictive results of such models are based on assumptions and the quality information available.

Marullo, Frank (1973). "An Automatic Pumping Device for Sampling Postlarval Shrimp (Penaeus spp.)." Marine Fisheries Review, 35(3-4):24-26.

Described is an automatic sampling device used to collect and preserve postlarval shrimp. At timed intervals, seawater is pumped through collecting nets that retain samples of organisms including shrimp. A maximum of 12 samples can be collected in 24 hours. Each sample is preserved immediately in 10 percent Formalin. These samples may be removed once after each 24 hours of operation, or they may be accumulated with similar samples over a longer period of time. Comparisons is made between catches with the automatic device and those made with the Renfro beam trawl.

Mason, Charles F., Todd Sandler, and Richard Cornes (1988). "Expectations, the Commons, and Optimal Group Size." Journal of Environmental Economics and Management, 15:99-110.

This article derives a formula for the optimal number of exploiters of a commons, whose output is sold in an imperfectly competitive market and whose exploiters hold nonzero or non-Nash conjectures. We express the optimal

number of exploiters in terms of the conjecture, the elasticity of input productivity, and the price elasticity of market demand. Consistent conjectures—those that agree with reality—imply the full tragedy of the commons and zero profits for the exploiters.

Mason, Janet E. (1995). Species Trends in Sport Fisheries, Monterey Bay, Calif., 1959-86. Marine Fisheries Review, 57(1):1-16.

Three surveys spanning 28 years were examined for changes in species caught by recreational fishermen from small boats (skiffs) and commercial passenger fishing vessels (CPFV s) in California s Monterey Bay region. As fishing effort increased, the catch of certain nearshore species of rockfish, Sebastes spp., declined. CPFV fishing was conducted farther from port and in deeper water to compensate for declining abundance while most skiffs remained in traditional areas close to port. The trend toward deeper water CPFV fishing has been interrupted only temporarily by increased availability of nearshore species. Life history characteristics of rockfish including residential behavior, variable recruitment, and natural longevity contribute to a vulnerability to localized overfishing for several species.

Mather, Frank J. III, John M. Mason, Jr., and Albert C. Jones (1995). Historical Document: Life History and Fisheries of Atlantic Bluefin Tuna. NOAA Technical Memorandum, NMFS-SEFSC-370, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida, June, 165 pp.

The objective of this work is to review and summarize available information on the fisheries, distribution, and other aspects of the life history of the Atlantic bluefin tuna, Thunnus thynnus thynnus (Linnaeus, 1758).

Mathews, C.P. (1992). "Fisheries Management: The Kuwaiti Experience." Draft report, Zoology Department, University of Reading England and Institute Pertanian Bogur, Indonesia.

The paper reviews the history of fisheries management, biological analysis, and economic analysis pertaining to the Kuwaiti shrimp fishery.

Matichich Michael J., Diane E. Russell, Jennifer Steel, and William B. Ziebertz, Jr. (1995). Applications of Economics in Coastal Management. NOAA Center for Coastal Ecosystem Health, 1950 South Hobson Street, Charleston, SC.

A workshop report that provides coastal resource managers, agency, and academic economists in the Southeast Region the opportunity to work together to understand the application of the tools of environmental economics in the management of coastal resources. The introduction gives readers an understanding of the applications and limitations of the document. Section 2 explores the role of economics in issues of environmental management. The history of environmental economics is included, with brief descriptions of early theory and the evolving role economics plays in coastal management decisions. Social welfare is also addressed, with special emphasis placed on non-market values. Finally, specific areas in which economics can aid in the decision making process are presented. Section 3 contains a summary of the range of economic tools available to coastal resource managers. In the fourth section, coastal zone decision making is addressed. Finally (section 5) the concerns and experiences participants shared with the group as a whole and in break out group sessions during the workshop are described.

Matthews, Dayna (1997). Beyond IFQ Implementation: A Study of Enforcement Issues in the Alaska Individual Fishing Quota Program. Report for David McKinney, Chief of Enforcement for the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Enforcement, Silver Spring, Maryland, April, 97 pp.

This report evaluates the enforceability, compliance, security, and integrity of IQ programs nationwide. After a literature review of ITQ and enforcement studies, the Alaskan IFQ program is explained and evaluated. Utilizing an interview approach with program participants, the report concludes that enforcement has been successful. By all valid indicators, the IFQ program appears to be working, with voluntary compliance and industry acceptance and satisfaction continuing to rise.

Matthews, Dayna (1997). Beyond IFQ Implementation: A Study of Enforcement Issues in the South Atlantic Wreckfish Individual Transferable Quota Program. Report for David McKinney, Chief of Enforcement for the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Enforcement, Silver Spring, Maryland, May, 48 pp.

This report evaluates the enforceability, compliance, security, and integrity of IQ programs nationwide. After a literature review of ITQ and enforcement studies, the Wreckfish ITQ program is explained and evaluated. Utilizing an interview approach with program participants, the report concludes that enforcement has been successful. By all valid indicators, the ITQ program appears to be working, with voluntary compliance and industry acceptance and satisfaction continuing to rise.

Matthews, Dayna (1997). Beyond IFQ Implementation: A Study of Enforcement Issues in the Mid Atlantic Surf Clam and Ocean Quohog Individual Transferable Quota Program. Report for David McKinney, Chief of Enforcement for the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Enforcement, Silver Spring, Maryland, June, 73 pp.

This report evaluates the enforceability, compliance, security, and integrity of IQ programs nationwide. After a literature review of ITQ and enforcement studies, the surf clam and ocean quohog ITQ program is explained and evaluated. Utilizing an interview approach with program participants, the report concludes that enforcement has been successful. By all valid indicators, the ITQ program appears to be working, with voluntary compliance and industry acceptance and satisfaction continuing to rise.

Matthews, Geoffrey A. and Thomas J. Minello (1994). Technology and Success in Restoration, Creation, and Enhancement of Spartina Alterniflora Marshes in the United States. Volume 1 -- Executive Summary and Annotated Bibliography, Decision Analysis Series No. 2, NOAA Coastal Ocean Program, National Oceanic and Atmospheric Administration, Coastal Ocean Office, 1315 East West Highway, Sta. 15140, Silver Spring, MD, August.

This project was undertaken to provide resource managers, habitat researchers, coastal planners, and the general public with an assessment of the technology and success in restoration, enhancement and creation of salt marshes in the United States. The objective was to be accomplished through the development of three products: 1) an annotated bibliography of the pertinent data, 2) an inventory of restored, enhanced, or created Spartina alterniflora marshes, and 3) a directory of people working salt marsh creation

and restoration. This executive summary describes these products and provides an overall assessment of our understanding regarding restoration, enhancement, and creation of salt marsh habitats. In particular, we have stressed Spartina alterniflora marshes and habitat functions related to the support of fishes, crustaceans, and other aquatic life.

Matthews, Geoffrey A. and Thomas J. Minello (1994). Technology and Success in Restoration, Creation, and Enhancement of Spartina Alterniflora Marshes in the United States. Volume 2 -- Inventory and Human Resources Directory, Decision Analysis Series No. 2, NOAA Coastal Ocean Program, National Oceanic and Atmospheric Administration, Coastal Ocean Office, 1315 East West Highway, Sta. 15140, Silver Spring, MD, August.

Our objectives in developing this database of created Spartina alterniflora marshes were: 1) to form a register of the marshes and estimate the number and location of these marshes, 2) to determine how many of these marshes have been monitored for functional success and animal utilization, 3) to develop an inexpensive and easy to use data base and entry system to track future restoration/creation activities, 4) to promote via this database a greater awareness of the impacts of altering coastal wetlands and the need for full ecologically functional replacement.

Matthews, Kathleen R. and Laura J. Richards (1991). Rockfish (Scorpaenidae) Assemblages of Trawlable and Untrawlable Habitats off Vancouver Island, British Columbia. North American Journal of Fisheries Management, 11:312-318.

We compare assemblages of demersal rockfishes (Scorpaenidae) associated with two areas of the continental slope off northern Vancouver Island, British Columbia, Canada. Twenty and 21 sets of sunken gill nets were completed on trawlable and untrawlable areas, respectively. The species assemblages on the two areas were markedly different, as demonstrated by their diversity, evenness, and percent similarity and by cluster analysis. On the trawlable area, the catch was numerically dominated by Pacific ocean perch, Sebastes alutus, (37.6%), splitnose rockfish, S. diploproa (23.5%), greenstriped rockfish, S. elongatus, (12.7%), and bocaccio, S. Paucispinis, (7.3%). This contrasted with the untrawlable area, where the catch was numerically dominated by sharpchin rockfish, S. zacentrus, (70.8%), and redbanded rockfish, S. Babcocki, made up half (14.5%) the remaining catch. We found no evidence to support the claim by some fishermen that exploited rockfishes on trawlable areas, especially Pacific ocean perch, are maintained and replenished by immigration from hard bottom areas, However, rockfish stocks on hard bottom areas may be subject to increased exploitation as fishing techniques improve.

Matlock, Gary C. (1992). "A Model for Forecasting Brown Shrimp Landings in Texas." Draft report, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744.

The brown shrimp harvest from the Gulf of Mexico off Texas is predicted annually by the National Marine Fisheries Service using a forecasting model that relates juvenile shrimp abundance in the Galveston Bay system during each spring (April-June) to the subsequent annual (July-June) offshore harvest. Predictions since 1981 when a closure of the Exclusive Economic Zone off Texas (Texas Closure) was implemented to compliment the closure of the Texas territorial Sea during June through mid-July have underestimated the actual reported landings. A revised model that incorporates the effect of the Texas Closure on yield should improve the reliability and precision of forecasted yields. The relationship between yield and juvenile shrimp abundance changed



significantly after the Texas Closure was implemented; the slope of the relationship almost doubled from the pre-Closure years to the Closure years.

Matlock, Gary C. (1996). Atlantic Swordfish Drift Gillnet Fishery Closed. National Marine Fisheries Service, Office of Sustainable Fisheries, Silver Spring Maryland, 1 pp.

An announcement closing the drift gillnet fishery for swordfish for six months to avoid harm to the right and humpback whale populations that coexist on the fishing grounds for the winter season.

Matlock, Gary C. (1997). Final Rule for Atlantic Sharks. Memorandum for Rolland A. Schmitt, National Marine Fisheries Service, Office of Sustainable Fisheries, Silver Spring, Maryland, 3 pp.

The Small Business Administration (SBA) issued a letter to the NMFS indicating their disagreement with NMFS's finding that the proposed rule for Atlantic sharks would not have a significant economic impact on a substantial number of small businesses. NMFS stands by its original finding that the rule will not have a significant impact on a substantial number of small businesses.

Matlock, Gary C. (1997). Subsidies in Fisheries - A NOAA White Paper. Memorandum for Steve Pennoyer, National Marine Fisheries Service, Office of Sustainable Fisheries, Silver Spring, Maryland.

A policy and process for dealing with fishery subsidies in international organizations is developed.

Matlock, Gary C. (1998). Position of the National Marine Fisheries Service on the role of Individual Fishing Quotas (IFQs) in Fisheries Management. Director, Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Spring, MD, March, 14 pp.

Presentation to the Individual Fishing Quota Study Committee of the Ocean Studies Board of the National Research Council of the National Academy of Sciences.

Matlock, Gary C., Gary E. Saul, and C.E. Bryan (1988). "Importance of Fish Consumption to Sport Fishermen." Fisheries, 13(1):25-26.

Retention and consumption of fish by sport fishermen are generally reported in the scientific literature to be less important than the recreational experience. On this basis, the Texas Parks and Wildlife Commission prohibited for 120 days the retention of red drum (Sciaenops ocellatus) and spotted seatrout (Cynoscion nebulosus) in a small bay after a massive coast wide fish kill in 1984. Simultaneously, the bag, possession, and size limits for these species were made more restrictive in all other Texas bays on the gulf of Mexico. An attempt to adopt the rule prohibiting retention on a permanent basis was adamantly opposed by fishermen for the affected bay. This response was unexpected. Either the generalization that keeping fish is not very important is incorrect or the fishermen's reaction is a localized phenomenon and within the expected variation of the published generalizations. This study examines the five possible explanations for the generalization being incorrect. Inadequacies in data gathering and analysis appear to be the most likely explanation. The experience in Texas indicates that retention of fish can be of paramount importance to fishermen. Ditton and Fedler (1989) response negatively to these conclusions.

Matthews, Geoffrey A. (1982). "Relative Abundance and Size Distributions of Commercially Important Shrimp During the 1981 Texas Closure." Maine Fisheries Review, 44(9-10):5-15.

Relative abundances of commercial shrimp, Penaeus spp., and lengths of brown shrimp, Penaeus aztecus, are determined for Texas shelf waters during the 1981 Texas closure, 22 May-15 July. A total of 274 samples were collected in water where bottom depths ranged from 4 to 45 fathoms in four statistical subareas covering the Texas Gulf coast. Greatest abundances of Penaeus were found between 10 and 20 fathoms in each subarea. Shrimp were more abundant in the southern subareas (20 and 21) than in the northern ones (18 and 19). Relative abundances during the 1981 closure were usually greater than those calculated from the 1961-65 Bureau of Commercial Fisheries' and the 1975-80 Texas Parks and Wildlife Department's historical shrimp collections for similar months. Mean total lengths of brown shrimp in waters where bottom depths were from 4 to 10 fathoms were close to 100 mm, those in 11-20 fathoms were close to 115 mm, and those in 21-30 fathoms were close to 130 mm. When mean total lengths of brown shrimp were compared among the three data sets, means of the 1981 closure surpassed those of the two historical data sets where bottom depths were from 4 to 10 fathoms during June. Closure mean lengths between 11 and 20 fathoms were less than those from Bureau of Commercial Fisheries data and were greater than those from Texas Parks and Wildlife Department data. Closure mean lengths in 21-30 fathoms were smaller than those from both agencies' data.

Matthews, Geoffrey A. (1992). "Brown Shrimp Harvest Prediction - Western Gulf of Mexico." Abstract in Kenneth N. Baxter and Elizabeth Scott-Denton (eds.), Proceedings of the Southeast Fisheries Science Center Shrimp Resource Review, NOAA Technical Memorandum, NMFS-SEFSC-299, August, 186 pp.

The prediction of brown shrimp harvest is based on the Baxter Bait Shrimp Index that has provided accurate estimates of shrimp catch for the last 30 years, explaining 67% of the annual variation in landings off Texas. Other methods have been tested, but have not been able to match the BBSI method in predictive ability.

Matthiasson, Thorolfur (1996). Why Fishing Fleets Tend to be Too Big . Marine Resource Economics, 11(3):173-179.

The aim of fisheries management is to avoid over investment in fleet capacity and over exploitation of economically exploitable fish stocks. In this paper, a model is developed where a (big) share of rents created by control accrues to boat owners while costs are covered by the general public, which also gets a (small) share of the rent. The distribution of rents is governed by administrative rule which opens the possibility of profitable rent seeking. Cost of control is assumed to increase as rent per boat increases. Control outlays are assumed to be determined so as to maximize gains to the general public. It is shown that the optimal size of the fishing fleet exceeds the size that maximizes fishery rent. It is also shown that the higher the share that accrues to the general public, the closer the optimal fleet size is to the rent maximizing fleet size.

Matthiasson, Thorolfur (1997). Consequences of Local Government Involvement in the Icelandic ITQ Market. Marine Resource Economics, 12(2):107-126.

This paper gives an account of the development of fishery regulation and management in Iceland, including the development of cod stocks, and the fishing fleet in Iceland since 1945. There was considerable experimentation

with fishery management systems in Iceland beginning in 1975. Many economists and others predicted that the fishing fleet would be reduced as a result of the new regimes, but this has not happened to the extent anticipated. Local governments have traditionally had a stake in the Icelandic fisheries. The motives of local municipalities might conflict with the motives pursued by the fishery managers. A theoretical model is developed to understand the consequences of local politicians involvement in the quota market. Furthermore, it is indicated that the degree of ease with which the less effective fishing firms find ways to circumvent the profitability consequences of the management regime depends on the initial allocation of fishing rights.

Matulich, Scott C. (1993). "Rationalizing Comprehensive Rationalization: Reconsidering Efficiency and Equity Implications of Individual Transferable Quotas (ITQ) in North Pacific Fisheries." Agricultural Economics Staff Paper A.E. 93-5, Department of Agricultural Economics, Washington State University, Pullman, WA, June, 30 pp.

The allocation of quota shares to harvesters is examined when vertically integrated firms exist in the fishery. Allocation to processors is seen as more efficient than share allocation solely to harvesters when a Pareto optimality condition is imposed on the management regulation. The author contends that independent processors who expand capacity to handle landing gluts from open access fisheries should also receive a share of the quota allocation if fixed capital is included in a dynamic analysis of the fisheries adjustment path. This "2-pie" allocation system reduces transaction costs and promotes long run efficiency.

Matulich, Scott C. (1993). "Reconsidering Equity and Efficiency Implications of Individual Transferable Quotas (ITQ) in North Pacific Fisheries." Department of Agricultural Economics, Washington State University, Pullman, WA, November, 30 pp.

The allocation of quota shares to harvesters is examined when vertically integrated firms exist in the fishery. Allocation to processors is seen as more efficient than share allocation solely to harvesters when a Pareto optimality condition is imposed on the management regulation. The author contends that independent processors who expand capacity to handle landing gluts from open access fisheries should also receive a share of the quota allocation if fixed capital is included in a dynamic analysis of the fisheries adjustment path. This "2-pie" allocation system reduces transaction costs and promotes long run efficiency.

Max, Wendy and Dale E. Lehman (1988). "A Behavioral Model of Timber Supply." Journal of Environmental Economics and Management, 15:71-86.

A dynamic behavioral model of timber supply is developed. The diverse motivation of forest owners is recognized and the implications for optimal harvest patterns is explored. This model is particularly relevant for the non-industrial private forest (NIPF) sector, and has possible uses for public forest management. Properties of the optimal NIPF timber supply curve are established, and the effects of various taxes are examined. To explore a more structured model, simulations are conducted based upon data from a typical redwood region. The projections provide indicative results for tax and other timber land policies. These results are seen to depend crucially on the forms of the landowner's utility function and upon the function relating standing timber to non-income outputs of the forest. Directions for needed empirical research are then indicated.

May, Robert M. (1974). Stability and Complexity in Model Ecosystems. Princeton University Press, Princeton, New Jersey.

This book surveys a variety of theoretical models bearing on aspects of population stability in biological communities of interacting species. Some of the broader themes are the relation between stability and complexity in general multispecies models; the relation between stability in randomly fluctuating environments as opposed to deterministic ones; and the way environmental fluctuations are liable to put a limit to niche overlap, a limit to similarity, among competing species in the real world. Minor themes include the way nonlinearities can produce stable limit cycle oscillations in real ecosystems; the role played by time-delays in feedback mechanisms, and the way that addition of extra trophic levels can stabilize them; the relation between stability within one trophic level and total web stability; and why strong predator-prey links may be more common in nature than strong symbiotic links. The survey is neither impersonal nor encyclopedic, but rather is an idiosyncratic reflection of the authors own interests.

May, Robert M. (1980). "Mathematical Models in Whaling and Fisheries Management." Lectures in Mathematics in the Life Sciences, 13:1-62.

This article aims to present and discuss some mathematical problems that arise in the management of fish and whale populations. Some of the topics are chosen for their intrinsic mathematical interest and have little direct relation to real management problems, but most of the work does indeed relate directly to management questions such as the catch quotas for baleen and sperm whales. The basic mathematical model used by the International Whaling Commission is described. Then the notion of maximum sustainable yield is introduced and discussed. The article concludes with a discussion of the problems posed by multispecies fisheries, especially those where more than one trophic level is subject to harvesting. Such problems ultimately blend biology with economics and even politics; more full review are given elsewhere (Beddington, J.R. and R.M. May (1981). "Management of multispecies fisheries." Sci. Amer. In preparation).

May, R.M. (ed.) (1984). Exploitation of Marine Communities. Report of the Dahlem Workshop on Exploitation of Marine Communities, Berlin 1984, April 1-6. Springer-Verlag, New York.

Report of the Dahlem Workshop on Exploitation of Marine Communities, Berlin 1984, April 1-6. This volume aims to be a useful appraisal of the state of the art discussion of four themes; (1) dynamics of single populations, (2) dynamics of systems with many species, (3) management under uncertainty, and (4) multispecies management.

May, Robert M., John R. Beddington, Colin W. Clark, Sidney J. Holt, and Richard M. Laws (1979). "Management of Multispecies Fisheries." Science, 205(4403):267-277.

With the overexploitation of many conventional fish stocks, and growing interest in harvesting new kinds of food from the sea, there is increasing need for managers of fisheries to take account of interactions among species. In particular, as Antarctic krill-fishing industries grow, there is a need to agree upon sound principles for managing the Southern Ocean ecosystem. Using simple models, we discuss the way multispecies food webs respond to the harvesting of species at different trophic levels. These biological and economic insights are applied to a discussion of fisheries in the Southern Ocean and the North Sea and to enunciate some general principles for

harvesting in multispecies systems.

Mead, Walter, A. Moseidjord, D. Muraoka, and P. Sorensen (1985). "Introduction." In Offshore Lands: Oil and Gas Leasing and Conservation on the Outer Continental Shelf. San Francisco, Pacific Institute for Public Policy Research.

Using microeconomic principles, it can be shown that if the trustee government selects resource management policies that create incentives counter to efficient production or impose wasteful procedures on the private lease operator, the cost of these policies is paid out of economic rent and is borne by the public in the form of reduced living standards. The goal of resource conservation is not served.

Mead, Walter, A. Moseidjord, D. Muraoka, and P. Sorensen (1985). "The Historical and Legal Framework of Outer Continental Shelf Leasing." Chapter 1 in Offshore Lands: Oil and Gas Leasing and Conservation on the Outer Continental Shelf. San Francisco, Pacific Institute for Public Policy Research.

The legal framework of Outer Continental shelf leasing is reviewed and the history of offshore leasing from the first state of Louisiana offshore leases in the 1940's to the present are traced.

Mead, Walter, A. Moseidjord, D. Muraoka, and P. Sorensen (1985). "An Analysis of the Effectiveness of Bonus Bidding for Issuing OCS Oil and Gas Leases." Chapter 3 in Offshore Lands: Oil and Gas Leasing and Conservation on the Outer Continental Shelf. San Francisco, Pacific Institute for Public Policy Research.

This chapter contains a theoretical and empirical investigation of the traditional method of issuing federal OCS leases, cash bonus bidding with a fixed royalty. This method of leasing has been criticized for restricting competition and failing to return the fair market value of public lease rights to the government. Results of our empirical analysis of the traditional bonus bid leasing system are reported, based on 1,223 federal Gulf of Mexico leases issued from 1954 through 1969, with a record of oil and gas production extending through 1979. This empirical research was designed to answer the questions raised by critics of bonus bid leasing: Are the results the outcome of competitive market process? Did the government get fair value for its lease rights?

Meany, F. (1977). "License Limitation in a Multipurpose Fishery." Australian Fisheries, 36(11):8-19.

Because a given management strategy has proved successful in a single method fishery, it should not be assumed that it is appropriate for a multi-purpose fishery, that is much more complex. For a multi-purpose fishery to be managed to its best advantage its special characteristics must be recognized and a scheme developed that makes due allowance for the strengths and weaknesses of these characteristics.

Meany, T.F. (1979). "Limited Entry in the Western Australian Rock Lobster and Prawn Fisheries: An Economic Evaluation." J. Fish. Res. Board Can., 36:789-798.

Limited entry was first introduced into the rock lobster and prawn fisheries in 1963. Both fisheries have been characterized by rapidly rising prices for species caught. Although some sectors of the rock lobster fishery

have remained moderately profitable, excessive reinvestment in boats and equipment has greatly reduced potential profitability. No trend towards company ownership of boats has been evident in this fishery. The prawn fishery was initially developed with a high degree of company ownership and the proportion of company ownership has increased. Overcapitalization has not occurred to any great extent in this fishery and profitability has remained high.

Mendelsohn, Robert (1980). "The Demand for Characteristics of Goods." Discussion Paper No. 80-12, Department of Economics, University of Washington, Seattle, Washington 98195.

This paper identifies theoretical flaws in past attempts to estimate the demand for characteristics of goods and recommends new procedures that overcome these flaws. First, one can estimate the demand for characteristics only by examining the outcomes of several independent markets. Second, if characteristic prices are nonlinear, the quantity demanded by a consumer hinges upon the entire price schedule not just the price of the marginal unit purchased.

Mendelsohn, Robert (1984). "Estimating the Structural Equations of Implicit Markets and Household Production Functions." Review of Economics and Statistics, 66:673-677.

Whenever marginal prices are nonconstant, as in most hedonic and household production function markets, ordinary least squares estimates of the price elasticities of structural equations will be biased. A two-stage least squares estimation procedure is developed and applied to estimate hedonic (and potentially household production function) demand functions when price gradients are nonlinear.

Mendelsohn, Roy (1978). "Optimal Harvesting Strategies for Stochastic Single-Species, Multiage Class Models." Mathematical Biosciences, 41:159-174.

Qualitative properties of optimal harvesting Policies for stochastic, single-species, multiage class models are described. For many problems the k-dimensional problem (k is the number of age classes) can be reduced to k one-dimensional problems, that can be solved far more readily. When such separability does not occur, bounds can be put on the derivatives of an optimal policy function which can greatly increase computational efficiency.

Menzies, Robert A. and J. Michael Kerrigan (1980). "The Larval Recruitment Problem of the Spiny Lobster." Fisheries, 5(4):42-46.

With any renewable natural resource, if various parameters such as mortality, fecundity, and recruitment are known, resource managers can project harvest rates so as to sustain reasonable yields. Assessment of these parameters is sometimes difficult because of peculiarities in the life cycle or behavior of the resource species. In many cases the most difficult parameter to determine is identification of the management unit. This is particularly acute in the case of spiny lobster because of their long lived pelagic, planktonic stage. However, because of their worldwide economic importance, considerable effort has gone into research on their life cycle.

Mercer, M.C. (ed.) (1982). "Multispecies Approaches to Fisheries Management Advice." Can. Spec. Publ. Fish. Aquat. Sci., 59: 169 pp.

This special publication comprises the proceedings of an international workshop convened at the Northwest Atlantic Fisheries Centre in St. John's, Newfoundland, November 26-29, 1979. The purpose of the workshop was to discuss the results of recent multispecies research, in applications to management, and to consider future directions for research in this field.

Merryday, Steven D. (1998). "Southern Offshore Fishing Association, et al., vs. William M. Daley. Case No. 97-1134-CIV-T-23C, United States District Court, Middle District of Florida, Tampa, Division.

The plaintiffs, a coalition of shark fishermen and shark fishing organizations, challenge the 1997 commercial harvest quotas imposed by the U.S. Secretary of Commerce and his designees ( Secretary ) for the capture of Atlantic sharks currently under federal management. The plaintiffs allege that the administrative decision is unsupported by the record and is contrary to law. I conclude that the Secretary acted within his regulatory discretion in setting the quotas but failed to conduct a proper analysis to determine the quotas economic effect on small business.

Merryday, Steven D. (1998). "Southern Offshore Fishing Association, et al., vs. William M. Daley. Case No. 97-1134-CIV-T-23C, United States District Court, Middle District of Florida, Tampa, Division, November.

The Judge established a special master to oversee the management of the shark fishery.

Meuriot, Eric (1986). "Fishing Fleet Replacement: The French Policy from 1945 - 1983." Marine Policy 10(4): 294-309.

The author describes the French fishing fleet replacement policy from 1945 to 1983 and ascertains from it the objectives and constraints of public policy. While the theoretical and practical negative effects of open access fisheries were well assessed, the French experience provides an example of the difficulties of carrying out a policy limiting access to fisheries. Domestic conflicts of interest and open competition with foreign countries failed to limit the overall fishing capacity of the French fleet. They have also led the government to focus on short term distributional issues rather than on long term efficiency. It is the author's opinion that similar case studies could be useful for understanding the evolution of the fishing sector as well as for putting into perspective the results of the theoretical literature on open access fisheries.

Mid-Atlantic Fishery Management Council (1981). "Amendment #3 to the Fishery Management Plan for the Surf Clam and Ocean Quahog Fisheries and Supplemental Environmental Impact Statement." Room 2115, Federal Building, North and New Streets, Dover, Delaware.

This amendment creates an indefinite permit moratorium for the surf clam fishery.

MIG, Inc. and the USDA Economic Research Service (1998). 1998 National IMPLAN User s Conference. Proceedings, 1940 South Greeley St., Suite 101, Stillwater, MN, Oct. 15-16, 145 pp.

A collection of papers presented at the conference that use IMPLAN to conduct Input-Output analysis of various natural resource issues.

Milazzo, Matteo (1997). Trip Report: South East Atlantic Fisheries. Memorandum to Gary Matlock through Dean Swanson, December 18.

A detailed trip report of an international meeting held in Windhoek, Namibia to lay the groundwork for the establishment of a new regional fisheries management body - the South East Atlantic Fisheries Organization (SEAFO). In addition to a summary of the consultation process, a review of the Namibian fisheries and protected species is included. One of the most contentious issues was the sharing of economic benefits from the exploitation of highseas stocks between distant water fleets and coastal states.

Milazzo, Matteo (1998). Managing Capacity in World Fisheries. A Draft U.S. Position Paper, Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Spring, MD.

A draft position paper prepared for an informal meeting on excess capacity in fishing fleets between the U.S., Japan, Mexico, and the European Union prior to the October FAO formal consultation on managing capacity in Rome.

Milazzo, Matteo (1998). Managing of Fishing Capacity. U.S. Position Paper, Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Spring, MD, October, 7 pp.

A position paper prepared for the October 26-30, 1998 FAO Consultations on excess capacity in global fisheries.

Milazzo, Matteo (1998). Subsidies in World Fisheries. World Bank Technical Paper No. 406, The World Bank, 1818 H Street, N.W., Washington, D.C.

The first effort to estimate the order of magnitude of major subsidies to the fishing sector on a world wide basis is made. The findings support earlier assumptions that massive levels of subsidies have indeed been a major driving force behind much of the expansion of fishing effort in many parts of the world.

Milazzo, Matteo, John M. Ward, and Theo Brainerd (1999). National Capacity Task Force FY 2000 Work Plan. Draft report, Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Spring, MD., 3 pp.

Work plan to complete the training in and estimation of capacity for selected domestic commercial and recreational fisheries.

Miller, David L. (1994). Learning from the Mexican Experience: Area Apportionment as a Potential Strategy for Limiting Access and Promoting Conservation of the Florida Lobster Fishery. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

In discussing the organization of Mexico's lobster fishery, this paper seeks to illustrate how one fishing cooperative's common property resource management system reduces the problem of free ridership by granting individual property rights. In so doing, the paper provides a preliminary exploration of how the relative disorder characterizing the Florida lobster fishery (overcapitalization, poaching, trap theft or destruction, race to fish, conflicts with recreational harvesters, etc.) might be reduced further if the newly instituted access limiting trap quota system were to include provisions for the allocation of individual (sea floor) property rights.



Miller, George C. (1971). "Commercial Fishery and Biology of the Freshwater Shrimp, Macrobrachium, in the Lower St. Paul River, Liberia, 1952-53." U.S. Department of Commerce, NOAA, NMFS, Special Scientific Report - Fisheries No. 626, February, iii+13 pp., 8 Figs., 7 Tables.

The biological population parameters and characteristics of a family of fresh water shrimp that is harvested commercially in Liberia.

Miller, Morton M. (1975). "Recovery from a Crisis--A Fishing Industry Perspective." National Marine Fisheries Service, Economic and Marketing Research Division, Washington, D.C., July.

The shrimp industry by virtue of its being the most valuable U.S. fishery is faced with problems that typify the general problems facing the industry during this recovery period, e.g. costs, market strength, and import competition. For these reasons, and for the practical reason of data availability, shrimp operations were selected for a summary graphic analysis that would put the status of the U.S. fishing industry in current perspective.

Miller, Morton M. (1975). "The Role of Shrimp Imports in a Declining Sea Foods Market - A Background Paper." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Division of Economic and Marketing Research, April, 50 pp.

The report provides a summary of the general market picture for fishery products in the U.S., a discussion of the shrimp situation, and the impact of imports on shrimp markets in the U.S.

Miller, Morton M. (1975). "Recovery from a Crisis--A Fishing Industry Perspective." Report, Economic and Marketing Research Division, National Marine Fisheries Service Washington, D.C., July.

The financial predicament in the shrimp fishery predicated upon the energy crisis and the resulting industry wide recovery problem are summarized in a series of charts and graphs. The fuel cost situation is worsening and overshadowing uncertain gains in the market place. The immediate future promises continued economic hardship for the shrimp industry, and others in fishing.

Miller, Morton M. and John E. Greenfield (1975). "Prognosis for the Financial Ills of the Gulf Shrimp Industry." Report, Division of Economics and Marketing Research, National Marine Fisheries Service.

The trends in the shrimp industry are analyzed within the context of the national economy to predict when the impact of the energy crisis on vessel operating costs will subside or consumer demand will increase leading to a reduction in the cost-price squeeze that caused vessel owner-operators to be in a financial crisis. Trends indicate that a recovery had already begun by the time the analysis was completed.

Miller, Morton M. and Richard Marasco (1976). "Statement on Applying Import Controls on Shrimp Products Entering the United States." Economics and Marketing Research Division, National Marine Fisheries Service, Washington, D.C., April, 10 pp.

This is an economic discussion paper that attempts to place the problem

of shrimp import controls in perspective. The International Trade Commission is conducting an investigation of the shrimp import situation, under authority of Section 201 (b) (1) of the Trade Act of 1974, in which a determination will be made as to whether those imports have caused economic injury to the U.S. Shrimp industry. The principal issues addressed are the justification for intervention, the potential effectiveness of intervention, and the long term implications.

Miller, Morton M. and Darrel A. Nash (1971). "Regional and Other Related Aspects of Shellfish Consumption - Some Preliminary Findings From the 1969 Consumer Panel Survey." U.S. Department of Commerce, NOAA, NMFS, Circular 361, June, iv+18 pp., 21 Figs., 3 Tables, 10 apps.

A consumer survey panel, consisting of representative households throughout the United States, recorded their fishery product purchases for a 12 month period beginning in February 1969. They were participants in a study conducted under the aegis of the National Marine Fisheries Service, Division of Economic Research. This paper deals mainly with study findings respecting the consumption of major species of shellfish at home and away from home. Findings of the study indicate marked regional preferences for individual shellfish items. The study also indicated an association between high income households and shellfish consumption with oysters a single notable exception. Age of consumer has an apparent bearing on shellfish consumption as it was found that older consumers are the more disposed toward consumption of these products. It also appears that half or more of the crabs and lobsters are consumed in meals outside the home, but the majority consumed of other products was at home.

Miller, Morton M. and Richard W. Surdi (1974). "Shrimp-A New Picture for 1974." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, June, 42 pp.

The shrimp industry was undergoing a period of adjustment to altered conditions within the industry and the general economy. This report summarizes the general trends in the economy and their likely impacts on the prices, inventories, substitute commodities, and consumer demand for shrimp.

Miller, Morton M. and Richard W. Surdi (1981). "Productivity in the Gulf of Mexico Shrimp Fishery." National Marine Fisheries Service, Office of Policy and Planning, Economic Analysis Staff, Washington, D.C., July, 117 pp.

Because of data constraints this analysis of the productivity of the Gulf shrimp fishery was limited to an analysis of several partial measures of productivity. The analysis indicates that productivity in the industry has declined in recent years.

Miller, Mort, Samuel Herrick, Dale Squires, John Walden, Douglas Lipton, and Ivar Strand (1992). "A Cost-Benefit Analysis of Pollock and Cod Quota Allocations in the Bering Sea/Aleutian Islands and Gulf of Alaska Groundfish Fisheries." Final Report, The NMFS Economics Special Studies Team, NOAA, NMFS, Washington, D.C.

The cost-benefit analysis of the North Pacific Fishery Management Council's proposal to reallocate TAC for pollock and cod demonstrates that the shift in production results in a significant reduction in the value of the pollock stocks and society loses a significant number of dollars that could

otherwise be put to productive alternative uses.

Milliken, William J. (1994). "Individual Transferable Fishing Quotas and Antitrust Law." Ocean and Coastal Law Journal, 1(1):35-57.

This article examines the legal implications of ITQs with regard to antitrust law. It begins by identifying the benefits of the ITQ approach and considering the potential anticompetitive effects of an ITQ system. It then discusses the legal requirements for finding of monopoly, illegal price restraints, and other impermissible restraints on competition. The article concludes that ITQ systems can be designed to avert the possibility of excessive accumulation of shares in the hands of a few, and that such ITQ systems are unlikely to have effects that will result in antitrust violations.

Milliman, Scott R. (1986). "Optimal Fishery Management in the Presence of Illegal Activity." Journal of Environmental Economics and Management, 13:363-381.

A simple fishery model is developed with legal and illegal markets for fish, the latter market being combated by enforcement efforts put forth by a social regulator. In response to enforcement, violators undertake avoidance activities to escape detection. The possible impacts of illegal activity on optimal fishery management are then explored, and some policy implications are suggested. Concurrently, optimal regulation is calculated when: (a) only legal surplus is maximized versus (b) when both legal and illegal surplus is maximized. The rationale for these two regimes and their divergence in optimal management policies is outlined.

Milon, J.W. (1987). "The Economic Benefits of Artificial Reefs: An Analysis of the Dade County, Florida Reef System." Sea Grant Project No. R/LR-E-9-PD, Grant No. NA85AA-D-SG059, Report Number 90, Florida Sea Grant College, December, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida 32611.

This report presents results from a research project to identify recreational uses of artificial reefs by private boat owners in Dade County, Florida and to evaluate the merits of alternative methods to measure the economic benefits of artificial reef development. Results from a mail survey of registered boat owners in 1985 showed that approximately 29 percent of respondents who fished during the survey period used at least one of the artificial reefs in Dade County. Catch rates at artificial reef sites were generally higher than at nonreef sites. Approximately 13 percent of respondents who participated in sport diving during the survey period used the artificial reefs. The percent of divers who spearfished at artificial reefs was about the same as at nonreef sites. Results from an experiment using three different contingent valuation formats indicated that both current users and nonusers had a positive willingness to pay for new artificial reef development; the valuation format had a significant influence on the mean valuation. Several different variations on the basic travel cost method were also used to assess the economic benefits of a new artificial reef; these modeling alternatives also yielded different estimates of users' economic benefits. Extensions of the sample benefit estimation methods to the population of Dade county private boaters provide a range of estimated economic present values for new and existing artificial reefs in Dade County. Recommendations for future research on modeling artificial reef participation and on economic benefit estimation are provided.

Milon, J.W. (ed.) (1988). "Marine Fishery Allocations and Economic

Analysis." Proceedings of a Regional Workshop sponsored by the Southern Natural Resource Economics Committee, May, 40 pp.

Copies of papers presented at a symposium on marine fishery allocation decisions are contained in this report.

Milon, J.W. (1988). "Modeling Site and Quality Substitution Effects in Sport Fishing Demand Models." Draft Report, Food and Resource Economics Department, University of Florida, Gainesville, FL.

Alternative sport fishing demand models are evaluated in terms of their statistical performance and the derived welfare estimates for changes in recreational catch rates for king mackerel. This analysis permits an examination of the possible errors that can occur due to different behavioral models of sport fishing demand and estimation procedures. The results of this analysis provide information to policy analysts and decision-makers about the performance of alternative economic demand models using Marine Recreational Fishing Statistics Intercept Survey (MRFSIS) data and the derived measures of welfare change from these models for possible changes in king mackerel catch rates.

Milon, J.W. (1988). "A Nested Demand Shares Model of Artificial Marine Habitat Choice by Sport Anglers." Marine Resource Economics, 5(3):191-214.

There is a growing public interest in the development of artificial habitats to enhance and diversify coastal marine resources for recreational and commercial uses. In this paper, a hierarchical discrete choice model of recreational demand for artificial habitat is presented using a nested multinomial logit analysis of artificial and natural habitat site choice by sport anglers. The model can be used to evaluate the effects of site characteristics and socioeconomic attributes of individual sport anglers on the share allocation of marine fishing trips and to estimate the economic benefits of new artificial habitat. An empirical application using survey data from sport anglers in southeast Florida is reported. The model parameters are used to estimate the expected use benefits and distributional implications of alternative new artificial habitat sites. Extensions and limitations of the model for artificial habitat planning are considered.

Milon, J.W. (1988). "Travel Cost Methods for Estimating the Recreational Use Benefits of Artificial Marine Habitat." Draft report, forthcoming in South. J. Agric. Econ.

The growing popularity of marine recreational fishing has created considerable interest in artificial marine habitat development to maintain and enhance coastal fishery stocks. This paper provides a comparative evaluation of travel cost methods to estimate recreational use benefits for new habitat site planning. Theoretical concerns about price and quality effects of substitute sites, corner solutions in site choice, and econometric estimation are considered. Results from a case study indicated that benefit estimates are influenced by the way these concerns are addressed but relatively simple single site models can provide defensible estimates. Practical limitations on data collection and model estimation are also considered.

Milon, J.W. (1989). "Estimating Recreational Angler Participation and Economic Impact in the Gulf of Mexico Mackerel Fishery." Marfin Contract No. NA86WC-H-06116.

This study uses the Marine Recreational Fisheries Statistics Survey to

estimate travel cost demand models for recreationally caught king mackerel in the Gulf of Mexico and to evaluate the economic impact of possible alternative catch regulations such as changes in catch rates or bag limits.

Milon, J. Walter (1989). "Specification of the Recreational Catch Rate for Evaluating Regulations in the Gulf Of Mexico Mackerel Fishery." Staff Paper #370, Food and Resource Economics Department, Institute of food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

Regulation of marine recreational fishing has been achieved through bag restrictions that influence the composition of kept and released catch. Prior economic research on marine recreational fishing has focused on total daily catch with no recognition of the composition. In this paper a formal model of recreational demand for the composition of species catch is presented. Empirical analysis using data on king mackerel anglers from the 1986 Marine Recreational Fishing Statistics Survey for the Gulf of Mexico shows that distinct kept and released effects can be identified. Welfare measures developed from the empirical results reveal a sizeable difference in effects of changes in recreational catch when alternative catch rate measures are used. Policy evaluations that do not account for catch composition in recreational demand models may provide incorrect estimates of the economic effects of catch regulations.

Milon, J.W. (1990). "Assessment of Methods to Model Recreational Effort, Participation, and Demand for Benefits Valuation." Draft report in Kearney/Centaur (1990). "Evaluation and Demonstration of Valuation Methodologies Applicable to Sport and Commercial Fisheries." Draft report, Alexandria, VA.

Evaluate and assess the quality of travel cost valuation models for recreationally caught king mackerel in the Gulf of Mexico reported in 1988 using data from the Marine Recreational Fishing Statistics Survey (MRFSS). Determine whether the valuation estimates were useful to fishery managers responsible for allocation of king mackerel stocks. Assess the potential for improved valuation models of marine recreations demand based on recent advances in the theoretical literature and possible enhancements to the MRFSS. Develop a travel cost modeling approach to improve the precision and usefulness to valuation estimates for marine fishing.

Milon, J.W. (1991). "Measuring the Economic Value of Anglers' Kept and Release Catches." North American Journal of Fisheries Management, 11:185-189.

Economic measures of the value of recreational catch typically have been based on the aggregate number of fish caught per unit effort. Fishery management councils, however, regulate recreational catch through bag limits and size restrictions that influence the composition of kept and released fish in the catch, not just the number of fish caught. Statistical tests for pooled site travel cost demand models for anglers of king mackerel (*Scomberomorus cavalia*) in the Gulf of Mexico region showed that indicators of kept and released catches outperformed an aggregate indicator. Accounting for the composition of catch had a significant effect on economic measures of the gains and losses from catch regulations and suggested that aggregate indicators may give misleading estimates of the change in economic value due to regulations. Economic studies of the value of recreational catch in other fisheries should give more consideration to the effects of regulations on the composition of kept and released catches and to the social factors that influence the keep or release decision.

To test the results of this methodological approach, a data set should be created based on a theoretical model of recreational fisherman behavior when exploiting a common property resource. Impose management regulations such as size and bag limits for a fishing trip. Estimate the model and compare the estimated parameters to the known or true parameters for management implications (consumer surplus). Modify the model with a catch and keep constraint, if known and estimated parameters differ and compare to the Milon elasticity results that seem counter intuitive on page 187.

Milon, J.W. (1993). "A Study of Recreational Demand for Gulf of Mexico Group King Mackerel Using 1990 and 1991 MRFSS Data." Final Report for the Gulf of Mexico Fishery Management Council, Tampa, FL. Prepared by Food and Resource Economics Department, University of Florida, Gainesville, FL 32611-0240, March.

Using 1990 and 1991 MRFSS data, this study estimated pooled site travel cost demand models for anglers targeting king mackerel within the range of the Gulf group king mackerel stock. Econometric results from the models indicated that there was no statistical support for a positive relationship between king mackerel catch rates and demand. Alternative specifications of a pooled site travel cost demand model yielded inconsistent and mostly statically insignificant results for the catch rate variables. Other variables in the models performed as expected and were consistent with prior pooled site demand model results. Because king mackerel catch rates were not statistically significant determinants of recreational demand, it was not possible to compute net economic values (consumers' surplus) from the pooled site demand models. The econometric results raise serious concerns about the usefulness of travel cost demand models to estimate net economic values for recreational catch given the existing structure of the MRFSS. The intercept survey does not provide sufficient information to estimate changes in anglers' probability of targeting different species. More complete data and further research will be needed to provide fishery managers with reliable, defensible measures of the net economic value of king mackerel to recreational anglers.

Milon, J. Walter (1993). "U.S. Fisheries Management and Economic Analysis: Implications of the Alaskan Groundfish Controversy." Invited paper prepared for the annual meetings of the American Agricultural Economics Association, Orlando, Fl, August 2, 15 pp.

The paper discusses the recent inspector general (IG) audit of the North Pacific Fishery Management Council's use of input-output analysis to determine Alaskan groundfish allocation. The IG determined that cost/benefit analysis should have been the basis for the decision. However, economic efficiency analysis is not destined to be used in allocation decisions in the future. Given the MFCMA and the national standards, future allocation decisions can be made regardless of whether benefits exceed costs or not.

Milon, J. Walter (1993). "U.S. Fisheries Management and Economic Analysis: Implications of the Alaskan Groundfish Controversy." American Journal of Agricultural Economics, 75(5):1177-1182.

The paper discusses the recent inspector general (IG) audit of the North Pacific Fishery Management Council's use of input-output analysis to determine Alaskan groundfish allocation. The IG determined that cost/benefit analysis should have been the basis for the decision. However, economic efficiency analysis is not destined to be used in allocation decisions in the future. Given the MFCMA and the national standards, future allocation decisions can be made regardless of whether benefits exceed costs or not.

Milon, J. Walter (1998). Title Unknown. Chapter 5, Apogee Research, Inc. and Resource Economics Consultants, Inc.

The report discusses the theory of travel cost models and explains the reasons for selecting a particular type of model, a random utility model (RUM), to develop and apply in this study. The section also describes the specification and data for the random utility model developed for the Indian River Lagoon and the regression analysis performed with the model. Finally, the section describes the results of the modeling effort: the estimated value of access to the Lagoon for recreational fishing and the value of increased catch rates for all Lagoon species and for popular nearshore target species (redfish, snook, and seatrout).

Milon, J. Walter and Eric Thunberg (1991). "A Regional Analysis of Marine Recreational Fisheries Participation and Attitudes about Fisheries Management." Proposal, Florida Sea Grant.

The project objectives are to estimate resident participation in specific fisheries in different regions in Florida and project participation through the year 2020. Determine whether socioeconomic factors such as age, household composition, etc. influence participation rates in specific Florida fisheries. Determine whether catch rates and/or catch limitations influence anglers' target species choices in different regions. Measure anglers' perceptions of current fishery management policies and alternative policies that could be used in the future.

Milon, J. Walter, Katharine Wellman, and John Gauvin (1992). "Consideration of the Potential Use of Individual Transferable Quotas in the South Atlantic Mackerel Fishery." Volume IV in Lee G. Anderson (1992). "Consideration of the Potential Use of Individual Transferable Quotas in U.S. Fisheries." Vol 1-5. Final Report, NOAA Contract No. 40AANF101849.

This report discusses the development of an individual transferable quota system for the recreational south Atlantic mackerel fishery.

Milon, J. Walter, Eric Thunberg, Charles M. Adams, and C.T. Jordan Lin (1994). "Recreational Anglers' Valuation of Near-Shore Marine Fisheries in Florida." Report prepared for the Florida Marine Fisheries Commission under Contract No. C-705 from the Florida Department of Natural Resources by the Food and Resource Economics Department, University of Florida, Gainesville, FL, Technical Paper-73, Florida Sea Grant College Program, University of Florida, P.O. Box 110409, Gainesville, FL, January.

This report describes and summarizes the results from a state wide survey of Florida resident saltwater anglers. The survey was designed to provide estimates of the economic value anglers place on marginal changes in management of selected near shore marine species using the contingent valuation method.

Milon, J. Walter, Sherry L. Larkin, Donna J. Lee, Kathryn J. Quigley, and Charles M. Adams (1998). "The Performance of Florida's Spiny Lobster Trap Certificate Program." Technical Paper-XX, Florida Sea Grant College Program, University of Florida, P.O. Box 110409, Gainesville, FL, July.

The purpose of this assessment is to review the performance of the Florida spiny lobster trap certification program (TCP) using historical catch

and effort data and changes in the number of certificates held by each individual since the program began. This review includes administrative costs incurred by the FDEP, revenues collected, and the transfer of certificate ownership since the TCP was enacted. Actual costs and revenues are compared to initial projections to determine whether the TCP has fulfilled initial expectations about its viability as a self-financing regulatory mechanism. The volume of certificate transfers and the reported transfer prices are evaluate to determine whether transferability has contributed to the overall performance of the TCP. In addition to the financial self-sufficiency of the program and characteristics of the transfer market, changes in certificate concentration, entry and exit behavior, and geographic distribution of certificates will also be evaluated.

Minerals Management Service (1986). "Advance Material for Outer Continental Shelf Policy Committee Incentives for Encouraging Leasing and Exploration in Frontier Areas." Offshore Resource Evaluation Division, September.

A package of material including the legal authority, the work commitment bidding system, etc. that was provided to the committee to assist in their discussion of incentives to encourage the development of frontier areas.

Miranda, Marie Lynn (1986). "United States Shrimp Imports, 1980-1986." Draft report, Economics and Statistics Office, Southeast Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Miami, FL, August, 7 pp.

This report discusses the role and influence of shrimp imports on the U.S. shrimp production industry, with reference to the January 1981 to June 1986 period. Most of the analysis is done for count sizes 26-30 and 41-50 as well as total shrimp imports. Also contains an earlier draft of the report.

Mirman, Leonard J. (1979). "Dynamic Models of Fishing: A Heuristic Approach." In P.T. Liu and J.G. Sutinen (eds.) Control Theory in Mathematical Economics, New York, Marcel Dekker.

Models of the interaction of biological and economic aspects of fishing or any renewable resource are studied. The underlying attribute of all the models is that the population is dynamic. The first two sections deal with countries that are interested in the welfare of their citizens. The last two sections use profit maximization instead of utility maximization as the objective of the countries. Generally, monopolists under either system consume more fish than do duopolists.

Mirman, Leonard J. and Daniel F. Spulber (eds.) (1982). Essays in the Economics of Renewable Resources. North Holland Publishing Co., New York.

This volume presents fifteen essays that explore and extend theoretical aspects of the developments in economics of renewable resources. The volume begins with a selective survey of these developments and suggestions for future research. The modeling of renewable resource management within a capital theoretic framework and the resulting optimal harvesting policies are then examined. Resource management in the presence of biological and technical nonconvexities and subject to environmental uncertainty is considered in detail. The problems of free and restricted access to renewable resource stocks are analyzed within the framework of industry structure, conduct and performance. Emphasis is also placed upon the question strategic interfirm competition for resources within a game theoretic framework. The



volume concludes with an examination of alternative regulatory policies.

Mishan, E.J. (1948). "Realism and Relevance in Consumer's Surplus." The Review of Economic Studies, 15/16(3):27-33.

Mishan reviews the literature on consumer surplus and finds only two of the five definitions to be tenable for a rise or a fall in price.

Mishan, E.J. (1959). "Rent as a Measure of Welfare Change." American Economic Review, 49(3):386-394.

Little further reflection is necessary to recognize that consumer surplus and economic rent are both measures of the change in the individual's welfare when the set of prices facing him are changed or the constraints imposed upon him are altered. Any distinction between them is one of convenience only; consumer surpluses have reference to demand prices, economic rent to supply prices. Furthermore, no consideration of logic precludes our measuring the individual's gain - in terms of compensated valuation or equivalent valuation - from, say, a simultaneous fall in price of a good bought and a rise in the price of a service provided.

Mishan, E.J. (1966). "A Survey of Welfare Economics, 1939-1959." In Surveys of Economic Theory, Vol. 1. MacMillan Press, London.

A survey of the literature dealing with the formal development of welfare economics.

Mishan, E.J. (1971). "The Postwar Literature on Externalities: An Interpretative Essay." Journal of Economic Literature, 9:1-28.

External economies appears as one of the chief causes of divergences between private net product and social net product. Externalities provide the standard exception to the equation of optimality with universal perfect competition. This interpretative survey is organized around four topics: (1) the problems of definition, (2) the traditional doctrine in the light of later refinements, (3) the relation of external economies to public goods, and (4) the new concern with environmental spillovers.

Mishan, E.J. (1976). "The Use of Compensating and Equivalent Variations in Cost-Benefit Analysis." Economica, 43(May):185-197.

The author addresses three issues concerning the use of compensating variation in cost-benefit analysis: (1) equity, (2) reliability of compensating variation, and (3) equivalent variation is as good as compensating variation for the measurement of gains and losses. Compensating variation is demonstrated to be the best available method for determining costs and benefits.

Missios, Paul C. and Charles Plourde (1997). Transboundary Renewable Resource Management and Conservation Motives. Marine Resource Economics, 12(1):29-36.

A simple two country theoretical model of transboundary fishing conflicts in which one country has a nonlucrative incentive to conserve the fish stock is presented to examine the effect of such a conservation motive on the steady state stock level and to analyze how this stock level is affected by the division of the harvest. It is demonstrated that a conservation motive for one or both countries serves to increase the stock level and that this level is dependent on the harvest share of the country with motive. A brief

application to the Canada-European Union turbot and Canada-United states salmon disputes suggests consistency between the principles of the model and reality.

Mitchell, Carlyle L. (1997). Fisheries Management in the Grand Banks, 1980-1992 and the Straddling Stock Issue. Marine Policy, 21(1):97-109.

This paper examines fisheries management problems on the Grand Banks that were due to divided jurisdiction between Canada's 200 mile Fisheries Zone and the Northwest Atlantic Fisheries Organization's (NAFO) area outside this zone, which brought to the fore the predicaments associated with straddling stocks. These were epitomized by the northern cod fishery. Because Canadian scientists overestimated the stocks, northern cod became the basis of a growth industry for Canada and for considerable fishing activity in the NAFO zone by vessels from NAFO member and non-member countries during the 1980s. From 1985 onwards, straddling stocks became a contentious issue between Canada and NAFO with respect to management measures and their enforcement. This issue became particularly acute towards the end of the 1980s when the overestimation of the northern cod stock became apparent, leading to a reduction in the TACs for this species and to Canada's closure of this fishery in 1992. This had severe economic implications for Canada's Atlantic Coast fishing industry but resulted in the international acceptance of a new UN Convention for Straddling Stocks and Highly Migratory Species in 1995.

Mitchell, Chris, C. Darning Cowles, Nevette Bowen, Rafe Petersen, and Henry Mitcheill (1996). Building A Bycatch Strategy in the North Pacific: Western Alaska - A Matter of Cultural and Community Survival. A report to the National Marine Fisheries Service from the Alaska Fisheries Development Foundation, February, 19 pp.

The report of a bycatch workshop held in Alaska to summarize the diversity of opinions held throughout the state. Central to this report is the idea that Western Alaskans feel that bycatch is as much of a sociological as an economic problem. Based upon this knowledge, NMFS should be able to design real solutions to real problems on a more localized basis.

Mitchell, John F. and Arvind Shah (1992). Report on TED Efficiency Trials Aboard a Mexican Shrimp Trawler, A U.S./Mexico Cooperative Study November 9-20, 1992. Foreign TED Technology Transfer Program, National Marine Fisheries Service, Southeast Fisheries Science Center, Mississippi Laboratory, Pascagoula Facility, P.O. Drawer 1207, Pascagoula, MS, 20 pp.

Gear specialists with the National Marine Fisheries Service and the National Fisheries Institute of Mexico collected information on catch rates of shrimp and bycatch from trawls equipped with super Shooter and Anthony Weedless style TEDs aboard a Mexican shrimp trawler in November 1992. Trawling operations were conducted in Mexican waters of the Gulf of Mexico along the northern coast of the state of Tamaulipas.

Catch data was collected from TED versus non-TED equipped trawls during 179 hours of comparative towing. Shrimp catch per unit effort (CPUE = lb/h) for the Super Shooter TED and corresponding control net was 5.34 and 5.53 lb/h respectively resulting in a difference of 3.4 percent. Shrimp CPUE for the Anthony Weedless TED and corresponding control net was 6.42 and 6.66 lb/h respectively resulting in a difference of 3.6 percent. Differences in the catches of shrimp and bycatch between TED equipped nets and their corresponding control nets were not statistically significant over all phases of the test.

Mitchell, Laura and Laura Grignano (1992). "Current Trends in Ecologic-Economic Valuation of Wetlands." Technical Report No. 92-8, College of William and Mary, Virginia Institute of Marine Science, School of Marine Science, Wetlands Program, Gloucester Point, Virginia 23062, August.

This report outlines some techniques employed in assigning economic value to wetlands and discusses the application of economic valuation of natural resources and some of the problems associated with the process.

Mock, C.R. (1973). "Shrimp Culture in Japan." Marine Fisheries Review, 35(3-4):71-76.

A presentation on Japanese shrimp aquaculture and the progress being made by researchers to perfect their techniques.

Moffett, A.W. (1970). The Shrimp Fishery in Texas. Texas Parks and Wildlife Department, Austin, Texas.

This bulletin is designed to introduce the reader to the biology of the commercial species of shrimp and the fishery in Texas.

Moloney, David G. and Peter H. Pearse (1979). "Quantitative Rights as an Instrument for Regulating Commercial Fisheries." J. Fish. Res. Board Can., 36:859-866.

A method of regulating commercial fisheries by providing fishing enterprise with transferable rights to harvest specific quantities of fish is described and analyzed in terms of its incentives for economic efficiency in harvesting, its administrative practicability, and its amenability to alternative objectives with respect to the division of resource rents between fishermen and the government. The regime proposed can, under certain realistic conditions, be expected to maximize resource rents and to permit the gains to be distributed flexibly. This approach is found to have certain superior characteristics over the main alternative proposals for rationalizing fishing.

Moncol, N. Dolores, J.W. Tate, Barbara C. Barbour, N.B. Webb, and F.B. Thomas (19??). "Investigations on the Mechanical Processing and Additive Treatment of Shrimp." Draft Chapter III.

The objectives of this study were to evaluate the efficiency of a relatively small, portable, shrimp processing machine and the effect of selected food grade additives on the quality of shrimp.

Monk, Grant and Grant Hewison (1994). A Brief Criticism of the New Zealand Quota Management System. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

New Zealand's quota management system (QMS) is designed to limit access to fisheries through the establishment of private property rights in the form of ITQs and also to conserve fish stocks through biologically determined TACs that are set for each fishery within defined Quota Management Areas. By limiting access to fisheries, the QMS attempts to address the problem of open access to common property fishery resources, which have traditionally led to a destructive race for fish.

The QMS system has a number of shortcomings. The system focuses primarily on single species management and largely fails to address broader

ecosystem considerations. Political pressure has led to the setting of TACs at levels beyond maximum sustainable yield. Bycatch and under reporting continue to be major problems in the fisheries, as the system is difficult to enforce and monitor. The creation of private property rights has proven effective in expanding the New Zealand fish trade into international markets, but many species remain overfished. In addition, the system requires that the government compensate quota holders when a decision to lower TAC levels is made.

While the New Zealand QMS is attractive in theory, in practice it has a number of drawbacks, and is not a panacea for long term conservation of fisheries. Others intending to embark along similar lines to New Zealand's fisheries management system would be well advised to critically examine its present deficiencies.

Montegut, R.S. (1979). "Planning To Buy a Shrimp Boat." Louisiana Cooperative Extension Service Sea Grant Publication LSU-TL-79-005, Louisiana State University, Baton Rouge, La, 11 pp.

The shrimp industry in the Gulf of Mexico is dominated by owner operated shrimp boats. These businessmen are interested in a lifestyle as well as earning a profit. The lifestyle is one not faced by the investor choosing not to operate his shrimp boat. Absentee owners generally experience higher repair and maintenance costs, higher insurance costs and lower shrimp catches. Understanding the situation faced by an absentee owner compared to the experienced owner operator will be helpful in making your investment decisions. Also, there are already a large number of shrimpers competing with expensive boats for a fully utilized supply of shrimp. Thus, the skills and number of your competitors in shrimping must be considered before you invest in the business.

Montgomery, Claire A., Gardner M. Brown, Jr., and Darius M. Adams (1994). The Marginal Cost of Species Preservation: The Northern Spotted Owl. Journal of Environmental Economics and Management, 26:111-128.

Because species survival is not certain, the decision to save a species is not an all-or-nothing choice but rather a marginal one. The appropriate unit for both benefit and cost functions is the likelihood of survival and the appropriate question is how certain we want to be of species survival. The intensity of the species preservation debate is also fired by strong equity concerns. We illustrate these points for the case of the northern spotted owl by constructing a marginal cost curve for its survival and by disaggregating welfare loss by region and by market level.

Moore, Charles J. (1984). "A Socio-Economic Survey of the Seventh Annual Arthur Smith King Mackerel Tournament." South Carolina Marine Resources Center, Technical Report Number 58, May, 13 pp.

This report presents the results obtained from the 1983 socio-economic survey and provides comparison with results obtained during 1979.

Moore, Charles J. (1984). "User-Information Needs and the Role of Information in Fisheries Development and Management." Chapter 11 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

During the 1982 marine recreational fisheries symposium, Larkin (1982) presented a set of natural laws governing the management of sport and

commercial fisheries. Larkin's first law is "People go sport fishing so that they can tell fish stories." This paper will accept this "Law" and examine what information is needed, what the modes of communication are and, more importantly, the role of this information in marine recreational fisheries development which will allow for the best fish stories to be told.

Moore, Charles J. and Charles H. Farmer, III (1981). "An Angler's Guide to South Carolina Sharks." Recreational Fisheries, Office of Conservation, Management and Marketing, South Carolina Wildlife and Marine Resources Department, P.O. Box 12559, Charleston, South Carolina, May, 65 pp.

A guide for the sportsman and general reference to sharks taken in South Carolina waters.

Morey, Edward R. (1981). "The Demand for Site-Specific Recreational Activities: A Characteristics Approach." Journal of Environmental Economics and Management, 8:345-371.

A model of constrained utility maximizing behavior is developed to explain how a representative individual allocates his ski days among alternative sites. The physical characteristics of the ski areas and the individual's skiing ability are explicit arguments in the utility function; the budget allocation is given along with the parametric costs to ski (including travel costs, entrance fees, equipment costs, and the opportunity cost of his time). Shares (a site's share being the proportion of ski days that the individual spends at that site) are derived and assumed multinomially distributed, a stochastic specification that maintains the inherent properties of the shares. Maximum likelihood estimation confirms the basic hypothesis that costs, ability, and characteristics all are important determinants of the sites' shares. The model explains a large proportion of the skier's allocation of ski days. A multinomial logit model of skier behavior is also developed and maximum likelihood estimates of its parameters are obtained. Examination of the summary statistics from my model and the logit model indicates that my model predicts the skier's choice of sites better than the logit model.

Morey, Edward R. (1984). "The Choice of Ski Areas: Estimation of a Generalized CES Preference Ordering with Characteristics." The Review of Economics and Statistics, ??: 584-590.

A generalized CES (GENCES) preference ordering is developed and estimated. It incorporates characteristics of both the individual and the activities. The GENCES is used to explain the share of ski time an individual allocates to each ski area as a function of site characteristics, skiing ability, and costs. The stochastic specification limited the shares to the 0-1 simplex. This specification was found to be more appropriate than the conventional normality assumption. The null hypothesis that preferences are homothetic and additive is rejected. Characteristics, ability, and costs are important determinants of demand. The estimated elasticities provide numerous insights into skier behavior.

Morey, Edward R., Donald Waldman, Djeto Assane, and Douglass Shaw (1995). "Searching for a Model of Multiple-Site Recreation Demand that Admits Interior and Boundary Solutions." American Journal of Agricultural Economics, 77(!): 129-140.

For most recreation demand data sets, different individuals visit different subsets of the available sites. Interior solutions (i.e.,

individuals who visit all recreational sites) are not the norm. Boundary solutions (i.e., individuals who do not participate, or who visit some, but not all, of the sites) predominate. We critique eight demand models in terms of their ability to accommodate boundary solutions. Three models are recommended for consideration when there are multiple sites and the data set includes a significant number of boundary solutions: a repeated nested-logit model, a multinomial share model, and a Kuhn-Tucker model.

Morrison, Catherine J. (1985). On the Economic Interpretation and Measurement of Optimal Capacity Utilization with Anticipatory Expectations. Review of Economic Studies, 52(169): 295-310.

This study builds on recent research giving the notion of capacity utilization clearer economic foundations. In this research optimal output  $Y^*$  is defined as the minimum point on the firm's short run average total cost curve, and capacity utilization is then computed as  $CU = Y/Y^*$ , where  $Y$  is actual output. Here I extend these concepts to include adjustment costs due to changes in the stock of capital, and nonstatic expectations of future output demand and input prices. The more general notion of  $CU$  is shown to depend on the shadow values of the firm's quasi-fixed inputs, and is decomposed to isolate the effects of anticipatory expectations. An empirical comparison is then made between traditional indices and alternative economic  $CU$  measures, using annual U.S. manufacturing data 1954 - 1980. The calculated indices exhibit plausible patterns, which can be interpreted as the effects of nonstatic expectations and adjustment costs.

Morrison, N.A., D.H. King, M.L. Quinto, and N.B. Webb (19??). "Effect of Various Additives and Temperature Applications on the Texture of Shrimp." Draft Chapter IV.

The main objective of this investigation was to determine the influence of cooking, PH, and frozen storage on the texture of shrimp.

Moss, Charles B., Gretchen Greene, and Eric Thunberg (1994). "Estimation of Recreational Anglers' Value of Reef-Fish in the Gulf of Mexico." Draft report, Department of Food and Resource Economics, University of Florida, Gainesville, FL.

Several public policy issues in the Gulf of Mexico region involve the value of the reef fish recreational fishery. This study estimates the economic impact of this fishery using a travel cost procedure. The results indicate that the fishery generates \$460 million within the state of Florida.

Motulsky, Harvey J. and Lennart A. Ransnas (1987). "Fitting Curves to data Using Nonlinear Regression: A Practical and Nonmathematical Review." FASEB J., 1:365-374.

Many types of data are best analyzed by fitting a curve using nonlinear regression, and computer programs that perform these calculations are readily available. Like every scientific technique, however, a nonlinear regression program can produce misleading results when used inappropriately. This article reviews the use of nonlinear regression in a practical and nonmathematical manner. The review is designed to demystify nonlinear regression so that both its power and its limitations will be appreciated.

Moussavian, Mohammed and Larry Samuelson (1984). "On the Extraction of an Exhaustible Resource by a Monopoly." Journal of Environmental Economics and Management, 11(2):139-146.

Hotelling's r-percent rule does not hold for monopoly extractors of durable exhaustible resources. An example with a nondurable resource in which the rule also fails to hold is presented. An economy with a fixed average propensity to save is modeled. The monopoly extractor recognizes that resource extraction, by affecting output and hence capital accumulation, affects future demand. The firm exploits this effect by causing the marginal profitability of extraction to grow faster or slower than the rate of interest, depending upon initial conditions. Conditions are developed under which the growth rate will be less than the interest rate.

Moxnes, Erling (1993). "Mismanagement of Fish Resources." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

In the literature on renewable resources, the commons problem is held to be the crucial factor explaining experienced mismanagement. In this report an economic experiment demonstrates that serious mismanagement can occur even when property rights are assigned. Mismanagement is measured both in terms of over investment and over utilization. The most likely explanation is a misperception of time lags, also found in studies of other dynamic systems. For policy making this finding adds the dimension of learning to the previous dimension of cooperation and conflict resolution.

Moyer, Camilla C. (1994). "Minutes." Memorandum, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 W. Kennedy Blvd., Tampa, Florida, October, 23 pp.

The minutes of the Ad Hoc Red Snapper Advisory Panel meeting held in New Orleans on August 8-9, 1994 concerning proposed red snapper individual transferable quota and license limitation fishery management regulations.

MRAG Americas, Inc. (1999). NMFS Response to the 1997 Peer Review of Red Snapper (*Lutjanus Campechanus*) Research and Management in the Gulf of Mexico. Tampa, Florida, May.

In response to a peer review of the research and management of red snapper, NMFS prepared this response to that review incorporating the expertise of NMFS and outside economists. The report contains a response to the peer review and a research plan to for red snapper in the Gulf of Mexico.

Mueller, Dennis C. (1976). "Public Choice: A Survey." Journal of Economic Literature, 14(2):395-433.

Public choice can be defined as the economic study of nonmarket decision making, or, simply the application of economics to political science. The basic behavioral postulate of public choice, as for economics, is that man is an egoistic, rational, utility maximizer.

Mueller, Dennis C. and Wallace E. Oates (1986). "The Management of the Chesapeake Bay: Alternative Structures for Decision-Making." Working draft report presented at the Economics of Managing Chesapeake Bay II, Annapolis, MD., May, 27 pp.

Optimal jurisdiction is explored by developing a model of Chesapeake Bay using three management alternatives: (1) the existing jurisdictional structure, (2) a Chesapeake Bay political jurisdiction, and (3) a national jurisdiction.

Muller, Robert G. (1988). "Spanish Mackerel Summary." Department of

Natural Resources, Bureau of Marine Research, St. Petersburg, Florida, June, 7 pp.

This summary is not a stock assessment but rather an interim report addressing the Spanish mackerel fisheries in Florida. The items addressed in summary are: (a) commercial landings, (b) quota impacts on commercial landings, (c) recreational landings, (d) bag limit impacts on recreational landings, and (e) need for additional analyses.

Muller, Robert G. (1989). "Spanish Mackerel Summary." Department of Natural Resources, Bureau of Marine Research, St. Petersburg, Florida, May, 5 pp.

This summary is not a stock assessment but rather an interim report addressing the Spanish mackerel fisheries in Florida. The items addressed in summary are: (a) commercial landings, (b) quota impacts on commercial landings, and © need for additional analyses.

+, Robert G. and Michael D. Murphy (1994). "Report on Inshore Finfish Trends." Report prepared for the Florida Marine Fisheries Commission by the Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL, June, 16 pp.

This report summarizes landings, effort, and catch per unit effort trends for red drum, spotted seatrout, mullet, and an additional 20 finfish species.

Munro, Gordon R. (1979). "The Optimal Management of Transboundary Renewable Resources." Canadian Journal of Economics, 12(3):355-376.

This paper investigates the question of the optimal management of renewable resources jointly owned by two states. A dynamic model of fisheries is combined with Nash's theory of two-person cooperative games. Conflicts in the management strategies of the two states arising from differences in perceptions of the social rate of discount, fishing effort costs, and consumer preferences are examined. Cases are considered in which the two partners can and cannot make side or transfer payments to one another. It is concluded that side payments greatly ease the resolution of resource management conflicts.

Munro, Gordon R. (1986). "The Management of Shared Fishery Resources under Extended Jurisdiction." Marine Resource Economics, 3(4):271-296.

The management of shared fishery resources is one of the prime management issues to have arisen as a consequence of extended fisheries jurisdiction. This paper reviews the issue from a bioeconomic perspective. A major conclusion arising from this review is that it should in principle be possible for joint owners of shared resources to develop effective joint management programs, even though they may have significantly different views on optimal management strategy. Avenues of future research on the issue are also discussed.

Munro, Gordon R. (1989). "Coastal States and Distant-water Fishing Nation Relations: An Economist's Perspective." Marine Fisheries Review, 51(1):3-10.

This paper presents an analytical framework to be used by economists in



studying the relationship of coastal states with distant water fishing nations (DWFN) seeking access to the coastal state's 200 mile extended fisheries jurisdiction zone.

Munro, Gordon R. (1998). "A Theoretical Framework for Examining Interactions Between Subsidies, Overcapitalization and Resource Overexploitation: Short Term and Long Term Consequences." PECC Task Force on Fisheries Cooperation and Development Workshop on The Impact of Government Financial Transfers on Fisheries Management, Resource Sustainability and International Trade, Manila, August, 21 pp.

This paper discusses the interactions between subsidies and fishery resource overexploitation and overcapitalization. Even benign subsidies upon closer inspection are seen to have decidedly malign aspects.

Munro, Gordon R. and Anthony D. Scott (1985). "The Economics of Fisheries Management." Chapter 14 in Kneese, Allen V. and James L. Sweeney (ed.). Handbook of Natural Resource and Energy Economics, Vol. II, Elsevier Science Publishers B.V.

The major development in fisheries economics that is stressed in this chapter is the shift away from static to dynamic or capital-theoretic analysis. Dynamic considerations in turn lead naturally to a consideration of problems arising from uncertainty.

Murawski, Steven A. (1997). Meeting the Challenges of Bycatch: New Rules and New Tools. In Solving Bycatch, Considerations for Today and Tomorrow, Alaskan Sea Grant College Program Report No. 96-03, University of Alaska, Fairbanks, Alaska, 322 pp.

Bycatch considerations have become critical constraints on the prosecution and development of marine fisheries in the nation and the world. Unless species and size selectivity of fishing techniques are improved, tough new rules will place additional requirements on existing fisheries or fisheries may be closed all together. In these circumstances, the industry will likely be unable to develop fisheries for the nation's few remaining underutilized resources. This workshop has two important objectives: (1) review recent developments in bycatch reduction, and (2) promote dialogue on research and policy goals for the future.

Since the first National Industry Bycatch Workshop, held in Newport Oregon, there has been considerable gear based research, supported by industry, associations, and government partnerships. Technical standards for evaluating bycatch reduction have been developed and applied in some situations. Bycatch monitoring programs have been expanded to include a widening array of fisheries and the nature and extent of the bycatch problem subjected to quantitative evaluation. This information has exonerated some fisheries, and excoriated others. Recently, more sophisticated real time bycatch monitoring systems have been developed, with capabilities for information dissemination. However, much remains to be done. Although often assumed, specific goals for bycatch management have rarely been articulated. Development of goals is a necessary step if we are to measure our success solving bycatch. New approaches to information sharing, and personal accountability to operate cleanly are challenges which must be faced. As well, the scientific community needs to define how clean is clean enough? and to evaluate the consequences of bycatch reduction alternatives on species and ecosystems. Regulatory schemes that encourage innovation and responsibility through incentives for bycatch reduction and discourage those who jeopardize personal and collective fishing opportunities through

disincentives, must be implemented.

Murawski, S.A. and J.T. Finn (1986). "Optimal Effort Allocation Among Competing Mixed-Species Fisheries, Subject to Fishing Mortality Constraints." Can. J. Fish. Aquat. Sci., 43:90-100.

A linear programming (LP) approach to effort allocation among two or more fisheries (fleets) exploiting several common species/stocks is described and applied to otter trawl fisheries exploiting demersal fish stocks on Georges Bank (northeastern United States). Total instantaneous fishing mortality on a particular species (i) is computed as the linear summation of fishing mortalities generated by each fishery (j):

$$F_i = \sum_j q_{ij} f_j$$

where  $f_j$  is the amount of standardized fishing effort exerted in fishery j and  $q_{ij}$  is the catchability coefficient for species i taken in fishery j. Mortality on species i due to both directed fishing and bycatch can thus be accounted for in the  $q_{ij}$ 's. Optimal allocation of effort among the j fisheries may be considered a minimization problem (minimize  $\sum_j f_j$ ), subject to the constraints that fishing mortality rates on particular species are maintained at, above, or below certain predefined levels. Fishing mortality goals for individual species can be based on various biological and/or economic criteria: fishing mortality rates that prevent growth or recruitment overfishing, or that optimize productivity from predator-prey systems. Other constraints in the LP model may be included to modify optimal solutions based on various economic and social considerations (e.g. protection of certain fisheries). Sensitivity analyses indicate the general infeasibility of maintaining relatively high or low fishing mortality rates on ubiquitously distributed species, while moderately fishing species with more discrete distributions, due to bycatch considerations.

Murphy, G.I. (1977). "Clupeoids." In J.A. Gulland (ed.), Fish Population Dynamics, Wiley-Interscience, New York, pp. 283-308.

There has always been considerable interest in the population dynamics of the clupeoids, in part because of the size of the fisheries, but also because their landings tend to fluctuate widely, and because some populations have collapsed under exploitation. In some instances the collapse seems to be relatively permanent. The six million tons of lost production detailed in Table 35 may not be the end, as Peruvian anchovy catches fell to four million tons in 1972, and did not significantly exceed two million tons in 1973.

Murphy, Thomas M. and Sally R. Hopkins-Murphy (1989). "Sea Turtle and Shrimp Fishing Interactions: A Summary and Critique of Relevant Information." Center for Marine Conservation.

This report examines the interactions between sea turtle populations and the shrimp fleet, particularly from North Carolina to Florida, by analyzing major aspects of each that relate to this interaction. The major aspects examined are the density and distribution of marine turtle nesting, marine turtle carcass strandings, incidental captures of marine turtles in shrimp trawls, shrimping effort, and aerial observations of turtles at sea. Each section on these major aspects looks at historic and current information, values and uses for the information and shortcomings and cautions regarding these data. The report also summarizes and critiques the primary source documents upon which management and research decisions are made by the two federal agencies that have legal jurisdiction over sea turtles.

Murray, James D., James J. Bahen, and Roger A. Rulifson (1992).

"Management Considerations for Bycatch in the North Carolina and Southeast Shrimp Fishery." Fisheries, 17(1):21-26.

Many observers believe that commercial shrimp bycatch will be the most important issue southeastern U.S. fishery managers must address during the next several years. Although the biological impact of bycatch on fish stocks is uncertain for many species, there is evidence that it may already be affecting red snapper, mackerel, and weakfish stocks. Available management measures to reduce bycatch include area and season closures and gear modification requirements. Recent experiences in the southeast with turtle excluder devices are instructive for developing policy and implementing management regimes. Through a 1990 amendment to the Fishery Conservation and Management Act, Congress established a 3 year program to assess the impact on fishery resources of incidental harvest by the shrimp trawl fishery. The Gulf and South Atlantic Fisheries Development Foundation is forming a steering committee to develop a strategic plan and to establish criteria for evaluating gear for the management of bycatch in the southeast shrimp fishery. The North Carolina Marine Fisheries Commission (NCMFC) recently required the Division of Marine Fisheries to establish the goal of reducing bycatch to the absolute minimum, and appointed a scrap-fish committee to develop draft recommendations for affected fisheries. To achieve an acceptable compromise by the fishery constituency, good coordination, communication, and citizen participation processes are required. The committees offer an important opportunity for developing bycatch management systems.

Murray, James D., Jeffrey C. Howe, David G. Lindquist, and David C. Griffith (1987). "Using FAD's to Attract Fish at Coastal Fishing Piers." Marine Fisheries Review, 49(2):143-154.

Eighteen midwater fish aggregating devices (FADs) were deployed alternatively off the ends of two piers (one acting as a control) in Wrightsville Beach, N.C., to evaluate their ability to attract coastal fishes. Creel censuses of pier fishermen and diver surveys of FADs were conducted to determine (1) the aggregation capabilities of FADs, by number, size, and fish species; attracted baitfish, (2) the effect of FADs on catch per unit of effort by species; no difference in catch rates, and (3) the durability of the FADs in this environment; most damaged during category 2 hurricane.

Murray, James D., Jeffrey C. Johnson, and David C. Griffith (1987). "Encouraging the Use of Underutilized Marine Fishes by Southeastern U.S. Anglers, Part II: Educational Objectives and Strategy." Marine Fisheries Review, 49(2):138-142.

This paper, the second of a two part series, focuses on the educational program and the process of increasing demand for under utilized marine fishes by recreational fishermen in the southeastern United States. Short and long term objectives, strategy, development of educational materials, and results are discussed. We point out how the species were selected for development and how the research findings influenced the information presented in the materials. The advantages of initiating projects that contain both research and extension components are pointed out. We show how marketing and consumer behavior research techniques can be used to shape an educational program. Also discussed is the importance of producing multifaceted educational materials and training a network of educators to conduct educational programs to achieve widespread distribution and adoption of information.

Murray, James D., Roger Rulifson, and James Bahen (1991). "Laboratory and Field Experimentation of Three Finfish Separator Devices to Reduce Bycatch in the Shrimp Fishery." Final Project Report,

Saltonstall-Kennedy Grant # NA90AA-H-SK048, SERO, NMFS, NOAA, USDOC.

Standard shrimp trawls used in the southeastern USA commercial fishery were modified in an attempt to reduce the amount of unwanted fish and invertebrates retained during normal shrimp trawling procedures. A statistical sampling design was used to test the effectiveness of finfish separator devices (FSD) towed in combination with unmodified nets in coastal waters off Brunswick, Georgia, in 1990. Several problems hampered statistical analysis of the data, including slight differences in the towing of port and starboard nets, onboard modifications of FSDs during testing to correct design deficiencies, and seasonality of shrimp catches in combination with large masses of sargassum and jellyfish in trawls during fall sampling. The modified Parrish TED was the only FSD that had a significant reduction in the percent difference in total biomass compared to the control net.

Murray, Thomas J. (1996). Creation of a Real-Time and Historical Shark Fishery Data Series. Grant Number NA27FD0069-01, Center for Economic and Management research, University of South Florida.

This project has three goals. The first is to create a vessel level data base that can be used to understand the economic operations of the shark fishery and the implications of shark management plans. Second, the project establishes a protocol for the continuous updating of the database. Third, a spreadsheet was developed that permits the establishment of a baseline assessment of costs and returns to shark fishermen.

Musaiger, Abdulrahman O. (1987). "Marine Fisheries in Bahrain." Marine Fisheries Review, 49(3):96-99.

Since the end of the 1970's, serious efforts have been focused on developing the fishery sector that has been in decline since the 1930's when higher incomes in the oil production industry began attracting labor and capital away from the fishing industry. Actually, the Bahrain islands are rich in fishery resources with many potentially productive sites on the inhabited coasts. However, the efforts to develop fisheries are facing many difficulties. This paper briefly highlights Bahrain's fisheries and gives some possible measures to develop them.

Muse, Ben (1991). "Survey of Individual Quota Programs." Draft report, Alaska Commercial Fisheries Entry Commission, June, pp. 32.

By 1980 fishermen had individual quotas in Iceland, the Bay of Fundy, Ontario, Manitoba, Wisconsin, and British Columbia. Most programs were fairly small, but one covered over 700 gillnet fishermen on Lake Winnipeg in Manitoba. Since 1980 the number of programs has increased greatly. This appendix describes individual quota programs in the United States, Iceland, Canada, New Zealand, and Australia. The survey is wide rather than deep; the programs are not described in detail.

Muse, Ben and Kurt Schelle (1985). "A Fiscal Model for the Southeast Alaska Salmon Drift Gill Net Fishery in 1981." CFEC Report Number 83-3, Commercial Fisheries Entry Commission, Pouch KB, Juneau, Alaska 99811, January, pp. 82.

This paper illustrates a methodology for using mail survey data, vessel licensing information, and catch records to derive a model to estimate operating costs and net returns measures in a fishery. Operating costs, net operating income, and returns to labor and management are estimated for the

Southeastern Alaska salmon drift gill net fishery.

Muse, Ben and Kurt Schelle (1985). "Net Return Estimates for the Southeast Alaska Salmon Drift Gill Net Fishery, 1980-1982." CFEC Report Number 84-9, commercial Fisheries Entry Commission, Pouch KB, Juneau, Alaska 99811, April, pp. 17.

This report summarizes the results of CFEC research into the net returns of Southeast Alaska salmon drift gill net fishermen in 1980, 1981, and 1982. A brief description of the CFEC financial model for this fishery is provided as well as various outputs of that model. Results summarized include estimates of average fleet operating costs for each year and estimates of average net operating income and average returns to labor for the fleet and for various parts of it.

Muse, Ben and Kurt Schelle (1986). "A Fiscal Model for the Cook Inlet Salmon Drift Gill Net Fishery in 1982." Document Number CFEC 85-4, Commercial Fisheries Entry Commission, Pouch KB, Juneau, Alaska 99811.

This report describes a model designed to produce estimates of Cook Inlet salmon drift gillnetters' net operating incomes and returns to labor and management. In 1982, a good year in this fishery, mean returns to labor and management for owner operators, assuming a 10% opportunity cost of capital, were about \$8,801.

Muse, Ben and Kurt Schelle (1988). "New Zealand's ITQ Program." CFEC 88-3, Alaska Commercial Fisheries Entry Commission, Box KB, Juneau, Alaska 99801, June.

In the last four years New Zealand has started an ambitious program of individual fisherman's quotas in its commercial fisheries. This paper describes the provisions of the program, its evolution, and its impacts on the New Zealand fisheries through June, 1988.

Muse, Ben and Kurt Schelle (1989). "Individual Fisherman's Quotas: A Preliminary Review of Some Recent Programs." CFEC 89-1, Alaska Commercial Fisheries Entry Commission.

Individual fisherman's quota programs are relatively new approaches to fisheries management that appear to offer an attractive way to manage some fisheries. In an individual quota program each quota holder is given the right to harvest a portion of the total allowable catch in a fishery. This paper briefly describes twelve individual quota programs which have recently been implemented in Atlantic Canada, Ontario, Iceland, New Zealand, Australia, and the United States. Topics discussed include the initial allocation of shares, the nature of the bundle of rights contained in the shares, enforcement, and the apparent impacts of each program.

Musick, J.A. (1995). Comments on Proposed Modifications of the Fisheries Management Plan for Sharks of the Atlantic Ocean. School of Marine Science, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, Virginia, June 7, 12 pp.

Several problems exist with the current Fisheries Management Plan for sharks and proposed changes in the FMP for 1995. Many of these problems were recognized by the Shark Panel of Experts that was convened at the NMFS Workshop in Miami in March 1994. Unfortunately, some important comments were omitted, and more importantly, dissenting conclusions and recommendations were

ignored. The Panel members have no way of telling what the consensus recommendations were because such a consensus was not reached at the meeting, but rather we were invited to make comments on a draft workshop report prepared by NMFS. Consequently the following comments are offered.

Myers, R.A., A.A. Rosenberg, P.M. Mace, N. Barrowman, V.R. Restrepo (1994).  
In Search of Thresholds for Recruitment Overfishing. ICES J. Mar Sci., 51:191-205.

In this study we consider the problem of estimating, for management purposes, a minimum biomass reference level at which recruitment to a fish stock is seriously reduced. We take an empirical, comparative approach to the problem by examining observations on a wide range of fish stocks. Eight methods for estimating spawning stock biomass thresholds for recruitment overfishing are investigated. Their behavior is tested using stock and recruitment data for 72 finfish populations, each with at least 20 years of data. We considered three classes of thresholds defined by : (1) the stock size corresponding to 50% of the maximum predicted average recruitment; (2) the minimum stock size that would produce a good year class when environmental conditions are favorable; and (3) the stock size corresponding to 20% of various estimates of virgin stock size. The estimators of the first type are generally preferable because they are easily understood, relatively robust if only data at low stock sizes are available, and almost always result in higher levels of recruitment above the threshold.

Nakamura, Eugene L. (1976). "Recreational Fisheries for Snappers and Groupers in the Gulf of Mexico." Pages 77-85 in Harvey R. Bullis, Jr. and Albert C. Jones (eds.) (1976). "Proceedings: Colloquium on Snapper-Grouper Fishery Resources of the Western Central Atlantic Ocean. Report Number 17, Gulf States Marine Fisheries Commission, New Orleans, Louisiana, Texas A&M University Sea Grant College and Mississippi-Alabama Sea Grant Consortium, November, 333 pp.

Recreational fishing for snappers and groupers is conducted mainly from boats: party, charter, and private boats. Available statistics for snappers and groupers caught in the Gulf of Mexico indicate that catches by recreational anglers are substantially higher than those by commercial fishermen. In 1970, the number of recreational anglers fishing in the Gulf of Mexico for snappers was estimated at 437,000 and for groupers at 301,000. The average annual expenditure by salt water anglers was estimated at \$178. Thus, the 437,000 anglers spent about \$77.8 million and the 301,000 anglers spent about \$53.6 million in pursuit of their avocation. These numbers probably are not additive, since the grouper anglers also may have fished for snappers. In 1973, the number of private boats fishing in the Gulf of Mexico was estimated at 348,595; the number of party boats and charter boats was estimated at 437. The annual gross revenue for these 437 commercial sport boats was estimated at \$26.9 million. Comparable data for the private boats were not available.

Nakamura, E.L., H.A. Brusher, and J.K. Lacey (1987). "Report on the 1986 Charterboat Survey of 15 Coastal Areas of the Southeastern U.S." Draft report, National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory, Panama City, FL.

The Fishery Management Plan for Coastal Migratory Pelagic Resources of the Gulf of Mexico and the U.S. south Atlantic as amended on September 22, 1985, requires statistical reporting of fishing activities on coastal pelagic fishes for the purpose of providing information for management. A survey of charterboats was conducted in 1986 under this authority by the Southeast

Fisheries Center. This report summarizes the data for king mackerel and Spanish mackerel caught by charterboats in the 1986 survey.

Nakamura, E.L., H.A. Brusher, and J.K. Lacey (1987). "Catch-Per-Unit-Effort of Snappers, Groupers, and Red Drum by Southeastern Charterboats in 1986." Draft report, National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory, Panama City, FL.

Under the authority of an amendment to the Fishery Management Plan for Coastal Migratory Pelagics resources, that among other requirements declared mandatory reporting, a survey of charterboats in the southeast was conducted. Only the reporting of catches of coastal pelagics was mandatory. However, six noncoastal pelagic fishes were added to the list of fishes in the charterboat logbooks. The six were red snapper, (Lutjanus campechanus), vermilion snapper (Rhomboplites aurorubens), yellowtail snapper (Ocyurus chrysurus), gag (Mycteroperca microlepis), black sea bass (Centropristis striata), and red drum (Sciaenops ocellatus). This report summarizes the catch and effort for these six as reported by responding charterboat captains in 1986.

Nance, James M. (1991). "Shrimp Recruitment Overfishing Analysis." Report for the Gulf of Mexico Fishery Management Council, June, 5 pp.

Recruitment and parent stock estimates are proposed as measures of overfishing in the shrimp fishery.

Nance, James M. (1991). "Gulf of Mexico White Shrimp Analysis." Report for the Gulf of Mexico Fishery Management Council, February, 9 pp.

This report was prepared to respond to questions about the catch of Gulf of Mexico white shrimp in the state managed territorial sea and the federal managed exclusive economic zone.

Nance, James M. (1991). "Estimation of Effort for the Gulf of Mexico Shrimp Fishery." Report to the Gulf of Mexico Fishery Management Council, December.

Description of the shrimp fishing effort trends in the Gulf of Mexico and how they are estimated.

Nance, James M. (1991). "Estimation of Effort for the Gulf of Mexico Shrimp Fishery." Galveston Laboratory, Southeast Fisheries Center, National Marine Fisheries Service, May, 12 pp.

Description of the shrimp fishing effort trends in the Gulf of Mexico and how they are estimated. Only the mathematical models and the analytical techniques applied in the effort estimation will be explained. Thus, it is advisable to become familiar with the fishery data utilized in these procedures. Therefore, this effort review should be read in conjunction with a companion report that provides a detailed description of both the data and the procedures employed to collect these data from the Gulf of Mexico shrimp fishery (Poffenberger, 1991) attached.

Nance, James M. (1992). "Shrimp Recruitment Overfishing Analysis for 1991." Report for the Gulf of Mexico Fishery Management Council, July, 6 pp.

Recruitment and parent stock estimates are proposed as measures of

overfishing in the shrimp fishery.

Nance, James M. (1992). "Estimation of Effort for the Gulf of Mexico Shrimp Fishery." NOAA Technical Memorandum, NMFS, SEFSC, 300, February, 12 pp.

Description of the shrimp fishing effort trends in the Gulf of Mexico and how they are estimated.

Nance, James M. (1992). "Biological Review of the 1992 Texas Closure." Report to the Gulf of Mexico Fishery Management Council, Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, December, 28 pp.

This report contains an overview of selected effects of the 1992 Texas closure.

Nance, James M. (1992). "Analysis of White Shrimp Closure in the Gulf of Mexico." Report to the Gulf of Mexico Fishery Management Council, Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, December, 28 pp.

The GMFMC requested that NMFS investigate the feasibility of improving economic returns from the white shrimp fishery through cooperative management measures with Gulf coast states. The General Bioeconomic Fisheries Simulation Model (GBFSM) developed at Texas A&M University (Grant et al. 1981) was used to simulate various white shrimp closures in the Gulf of Mexico. This report contains the results of this analysis.

Nance, James M. (1992). "Shrimp Fishing Effort Estimation Workshop." Report of a Workshop, NMFS Galveston Laboratory, Galveston, TX, June 17-19.

Shrimp fishing effort workshop final report.

Nance, James M. (1993). "Analysis of White Shrimp Closures in the Gulf of Mexico." NOAA Technical Memorandum, NMFS-SEFSC-321, Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, March, 12 pp.

In response to a Gulf of Mexico Fishery Management Council request, the National Marine Fisheries Service investigated the feasibility of improving economic returns from the white shrimp fishery through cooperative management measures with Gulf coast states. The General Bioeconomic Fisheries Simulation Model (GBFSM) developed at Texas A&M University (Grant, et al., 1981) was used to simulate various white shrimp closures in the Gulf of Mexico. Each of the white shrimp closure options have a positive benefit to the shrimp fishery (profits to the vessel owners) in the Gulf of Mexico.

Nance, James M. (1993). "Gulf of Mexico Shrimp Fishery Recruitment Overfishing Definition Workshop 2." NOAA Technical Memorandum, NMFS-SEFSC-323, Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, April, 12 pp.



This report summarizes the findings of a two day workshop required by the Gulf of Mexico Fishery Management Council to review the current definitions of overfishing; recommend changes, if needed, to the current definitions of overfishing; and recommend action that might be taken if overfishing levels are surpassed in any of these stocks for three of the four shrimp species named in the fishery management plan.

Nance, James M. (1993). "Review of the Rock Shrimp Fishery off the East Coast of the United States." NOAA Technical Memorandum, NMFS-SEFSC-324, Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, April, 18 pp.

The report summarizes the landings and effort data for south Atlantic rock shrimp from 1981 through 1991. Although several species of rock shrimp exist along the east coast of the United States, most are either too small in size or not abundant enough for commercial harvest. The majority of the rock shrimp landed from the east coast are Sicyonia brevirostris. The weights reported are in pounds of headed shrimp. The dollar values are in actual dollars reported in each year. No attempt has been made to standardize the dollar values reported in each year. No attempt has been made to standardize the dollar values for comparisons between years. The effort values are in days fished as reported by the NMFS and state port agents. Days fished represent the actual time fishing and not the length of a trip (i.e., days out of port). No attempt has been made to standardize the effort data by vessel class or trawl type.

Nance, James M. (1993). "Biological Review of the 1992 Texas Closure." NOAA Technical Memorandum, NMFS-SEFSC-325, Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, April, 30 pp.

This report contains an overview of selected effects of the 1992 Texas Closure that is designed to increase the yield of brown shrimp and eliminate the waste of the resource caused by discarding undersized shrimp caught during a period in their life cycle when they are growing rapidly. The western Gulf of Mexico should experience a combined annual brown shrimp production level of between 44.9 and 55.4 million pounds during the 1992-1993 season. This estimate is below the 55.9 million pound average for the area.

Nance, James M. (1993). "Shrimp Trawl Bycatch Characterization Study." MARFIN Final Report, Grant Number 93NMFS20, December, 10 pp.

Sixty seven trips have been completed for this bycatch research project during the period from May 1992 through September 1993. Trip length varied from 1 to 27 days. A total of 770 sea days were used to collect the data from 1027 tows during these 67 trips. Thirty nine different vessels have been used in the study. Data files produced from all 67 trips are complete and archived in the computer. Only data collected from May 1992 through April 1993 in the Gulf of Mexico has been summarized (i.e. species composition).

Nance, James M. (1993). "Council Effort Presentation." Memorandum for Andy Kemmerer, Regional Director, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL, November.

Copies of the visual material that may be included in the SEFSC presentation to the Gulf of Mexico Fisheries Management Council on shrimp fishing effort estimation.

Nance, James M. (1993). "Stock Assessment Report 1993, Gulf of Mexico Shrimp Fishery." National Marine Fisheries Service, Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas, June.

The need to better manage the penaeid shrimp stocks of the United States, to insure that all involved in the fishery may benefit from this common resource, has prompted this research effort. This stock assessment report deals only with the 1960-1993 commercial catch statistics for brown shrimp (Penaeus aztecus), white shrimp (Penaeus setiferus), and pink shrimp (Penaeus duorarum) from the U.S. Gulf of Mexico shrimp fishery. This analysis provides the annual update of the status of the shrimp stocks first presented at the Southeast Fisheries Center's Second Stock Assessment Workshop (Nichols, 1984).

Nance, James M. (1994). "Stock Assessment Report 1994, Gulf of Mexico Shrimp Fishery." National Marine Fisheries Service, Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas, June.

The need to better manage the penaeid shrimp stocks of the United States, to insure that all involved in the fishery may benefit from this common resource, has prompted this research effort. This stock assessment report deals only with the 1960-1994 commercial catch statistics for brown shrimp (Penaeus aztecus), white shrimp (Penaeus setiferus), and pink shrimp (Penaeus duorarum) from the U.S. Gulf of Mexico shrimp fishery. This analysis provides the annual update of the status of the shrimp stocks first presented at the Southeast Fisheries Center's Second Stock Assessment Workshop (Nichols, 1984).

Nance, James M. (1995). A Biological Review of the Tortugas Pink Shrimp Fishery Through December 1994. National Marine Fisheries Service, Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas, July.

The trends in landings and fishing effort for the Tortugas pink shrimp fishery are presented. Landings have been depressed in recent years, catch per unit effort has been below average, and while yield per recruit has been enhanced since the Tortugas closure, recruitment has been low. No cause for the decrease in the pink shrimp fishery can be established at this time, although problems within the habitat are suspected.

Nance, James M. (1995). Royal Red Landings by Month as a Function of Percentage of the MSY Value (392,000 pounds of tails). A letter, National Marine Fisheries Service, Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas, July.

A letter in response to an information request from the Gulf of Mexico Fishery Management Council presenting landings of royal red shrimp as a percentage of MSY, monthly from January, 1993 to March, 1995.

Nance, James M. (1995). Shrimp Recruitment Overfishing Analysis for 1994. National Marine Fisheries Service, Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas, July.

Summary of results from the recruitment overfishing analysis of landings for brown, white, pink, and royal red shrimp. No stocks have been overfished according to the report.

Nance, James M. (1996). "Biological Review of the 1995 Texas Closure." NOAA Technical Memorandum, NMFS-SEFSC-379, Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, April, 27 pp.

In 1981, the Gulf of Mexico Shrimp Fishery Management Plan (FMP) was implemented with a primary objective being to increase the yield of brown shrimp harvested from Texas offshore waters. Since then, various aspects of the Texas Closure management measure have been analyzed and reported on by scientists at the Southeast Fisheries Science center (SEFSC). This report contains an overview of selected effects of the 1995 Texas closure and will be presented to the Gulf of Mexico Fishery Management Council (GMFMC) in January 1996.

Nance, James M. (1998). "Congressional Bycatch Report." Draft report. Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, April, 64 pp.

A summary of the biological and economic research accomplished to address the finfish bycatch problem in the Gulf of Mexico shrimp fishery. The emphasis is on the biological data collected through the observer program funded by NMFS and industry by MARFIN. The economic data is summarized in a qualitative discussion of the problem using preliminary estimates of the impact of proposed BRD regulations. The report concludes that the interaction between the shrimp and finfish fisheries in the Gulf of Mexico constitutes a management and economics problem that is controversial, challenging, and, as yet, unresolved in the case of most southeast finfish stocks.

Nance, James M. and E.F. Klima (1990). "Shrimp Recruitment Overfishing Definition." Report Prepared for the Gulf of Mexico Fishery Management Council.

The purposes of this paper are to highlight recent fishery trends observed in the Gulf of Mexico shrimp stocks and explore possible critical index values that could be used to monitor the possibility that recruitment overfishing could be occurring in the fishery.

Nance, James M., Nina Garfield, and J. Anthony Paredes (1991). "A Demographic Profile of Participants in Two Gulf of Mexico Inshore Shrimp Fisheries and Their Response to the Texas Closure." Marine Fisheries Review, 53(1):10-18.

A social study of the shrimp fisheries of Galveston Bay, Texas, and Calcasieu Lake, La., was made during the summer of 1987 to examine the impacts of the seasonal closure of the Federal waters off Texas and to understand the infrastructure and demographic processes of these two diverse fisheries. Survey instruments were administered to 159 shrimp boat captains; 89 from Galveston Bay and 70 from Calcasieu Lake. Shrimp-house owners were interviewed in each region as well.

The results suggest that the inshore fisheries are distinct from the offshore fisheries. The infrastructure of the two inshore fisheries examined differ in that the market distribution of shrimp from Galveston Bay was more diffuse than from Calcasieu Lake. Much more of the shrimp harvested from Galveston Bay was channelled into the surrounding community than from Calcasieu Lake.

The distribution of age, years as a commercial fisherman, and family involvement in fishing suggest that participation in Calcasieu Lake's and

Galveston Bay's inshore fisheries have expanded concurrent with declining economies. While overall the Texas closure had little impact on either of the inshore fisheries, the Galveston Bay shrimpers experienced more of a direct impact on their livelihood than Calcasieu Lake shrimpers.

Nance, James M., E.F. Klima, and Thomas E. Czaplak (1989). "Gulf of Mexico Shrimp Stock Assessment Workshop." NOAA Technical Memorandum, SEFC-NMFS-239, USDOC, NOAA, NMFS, SEFC, Galveston Laboratory, October, 41 pp.

A technical review of the biological status of the brown, pink, and white shrimp fisheries was recommended by the Gulf of Mexico Fishery Management Council. This workshop was convened to assess the present status of the fisheries, review stock assessment techniques and make recommendations about areas of focus for research. The workshop panel was comprised of national experts, state and federal officials, and the scientific support staff from the NMFS, Galveston Laboratory.

Nance, James M., E.F. Klima, and E.X. Martinez (1990). "Impacts of Proposed Brown Shrimp Fishery Management Closures in the Gulf of Mexico." Report for the GMFMC, January 1991. NMFS, Galveston Laboratory, December, 27 pp.

In January, 1990, the Gulf of Mexico Fishery Management Council requested that the Southeast Fisheries Center investigate the feasibility of improving the economic returns from the brown shrimp fishery through cooperative management measures with Louisiana and other Gulf coast states. During the past year, a simulation model was developed at the Galveston Laboratory to study the impact of closure options on the brown shrimp fishery. The basic premise of the model was to prohibit fishing on emigrating juvenile brown shrimp and allow the population to increase to a larger and more valuable average size. The complete analysis involved four phases: 1) construction of the biological model to simulate yields in numbers of shrimp and pounds; 2) calculation of revenues from simulated landings and regional price structure; 3) determination of fishing costs based on published cost information and data regarding the size of the fishery (i.e., number and type of fishing vessels); and 4) simulation of four separate time period closure options in the brown shrimp fishery for different regional areas within the Gulf of Mexico.

Nance, James M., Edward F. Klima, and Frank J. Patella (1991). "Biological Review of the 1991 Texas Closure." Report to the Gulf of Mexico Fishery Management Council, December.

A review of the 1991 Texas Closure regulation with a discussion of the reallocation of shrimp within Texas.

Nance, James M., Edward F. Klima, and Frank J. Patella (1992). "Biological Review of the 1991 Texas Closure." NOAA Technical Memorandum, NMFS-SEFSC-301, February, 18 pp.

A review of the 1991 Texas Closure regulation with a discussion of the reallocation of shrimp within Texas.

Nance, James M., Eduardo X. Martinez, and Edward F. Klima, (1994). "Feasibility of Improving the Economic Return from the Gulf of Mexico Brown Shrimp Fishery." North American Journal of Fisheries Management, 14:522-536.

A bioeconomic model was developed to investigate the feasibility of improving the economic return from the fishery for brown shrimp *Penaeus aztecus* through cooperative federal and state management closures in the U.S. Gulf of Mexico. Four different closure periods were simulated with the model. The closure options were evaluated for Texas only (current condition) and for the entire U.S. Gulf of Mexico (proposed condition). The model provided an accurate biological simulation of the brown shrimp fishery in the Gulf of Mexico. Each of the evaluated closures gave positive net profits to the fishery as a whole. However, these benefits were mainly for larger vessels (greater than 50 feet in length). None of the proposed closures increased the profits for boats (undocumented vessels of unknown lengths), and only some closures increased the profits for smaller vessels (Less than 50 feet in length).

Nance, James M., Edward F. Klima, Peter F. Sheridan, K. Neal Baxter, Frank J. Patella, and Dennis B. Koi (1988). "Review of the 1987 Texas Closure for the Shrimp Fishery Off Texas and Louisiana." Report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Galveston Laboratory, Galveston, Texas, January, 116 pp.

This report provides information to determine how well the objectives of the Texas closure regulation were achieved in 1986 and 1987 and to determine if a 15 nautical mile closure meets all the objectives of the closure regulation as effectively as a 200 nautical mile closure. Social as well as economic impacts are discussed.

Nash, Darrel A. and Frederick W. Bell (1969). "An Inventory of Demand Equations for Fishery Products." Bureau of Commercial Fisheries, Economic Research Working Paper Series, No. 10, July, 31 pp.

This paper contains demand equations that were selected as the most representative of all those submitted to the conference on fishery product demand. The respective demand functions were chosen as the best function for each species so far developed in that area.

National Academy of Sciences (1979). "Basic Productivity Concepts: Meaning and Measurement." Chapter 3 in Measurement and Interpretation of Productivity, Washington, D.C.

This chapter develops the concept of productivity within the framework of production theory by means of empirical production functions. It explains how partial productivity and multi-factor productivity may be measured within the framework of the economic accounts. It develops further the concepts of output and inputs that underlie the productivity relationship.

National Marine Fisheries Service (1974). "Status of Shrimp Industry: August 1974", Southeast Regional Office, St. Petersburg, Florida, September, 7 pp.

The shrimp industry in the Gulf and south Atlantic is suffering severe economic hardship. Vessel owners are caught in a unprecedented cost-price squeeze and the average vessel is not even covering variable costs at present. Since September 1973, Gulf shrimp prices have fallen an average of 41 percent, while variable costs have risen substantially. Nonetheless, most vessels continue to fish for reasons that include the fisherman's eternal hope for the "big catch." If conditions do not change, many vessel operators will probably be forced out of the fishery by January 1975. Shrimp processors, principally

breeders, have suffered losses totaling millions of dollars and hundreds of employees of these firms have lost their jobs. The total effect on the associated local economies is not known, but many counties have applied or asked for disaster assistance in the form of food stamps, low cost loans or other temporary economic relief. Further up the marketing chain the losses are not quite as severe, principally because the restaurants and retailers do not depend so heavily on shrimp as their principal livelihood. Still, losses have been suffered at all marketing levels.

National Marine Fisheries Service (1976). "Gulf Coast Shrimp Data Annual Summary, 1975." Current Fisheries Statistics No. 6925, National Oceanic and Atmospheric Administration, Washington, D.C., July, 26 pp.

Tabulations in this bulletin contain data on the shrimp catch landed by U.S. craft at U.S. ports along the Gulf of Mexico for trips completed during the period indicated. The figures include the species, size, depth, area fished, and actual fishing time in number of days.

National Marine Fisheries Service (1978). "Gulf Coast Shrimp Data Annual Summary, 1976." Current Fisheries Statistics No. 7225, National Oceanic and Atmospheric Administration, Washington, D.C., November, 13 pp.

Tabulations in this bulletin contain data on the shrimp catch landed by U.S. craft at U.S. ports along the Gulf of Mexico for trips completed during the period indicated. The figures include the species, size, depth, area fished, and actual fishing time in number of days.

National Marine Fisheries Service (1979). "Gulf Coast Shrimp Data Annual Summary, 1977." Current Fisheries Statistics No. 7523, National Oceanic and Atmospheric Administration, Washington, D.C., December, 13 pp.

Tabulations in this bulletin contain data on the shrimp catch landed by U.S. craft at U.S. ports along the Gulf of Mexico for trips completed during the period indicated. The figures include the species, size, depth, area fished, and actual fishing time in number of days.

National Marine Fisheries Service (1984). "United States Imports of Fishery Products." Office of Industry Services, International Trade Staff Report 84-3, May.

This paper reports on trends in imports of fishery products to the United States through 1983, with particular attention to (1) imports' effects on the United States fishing and processing sectors, (2) tuna, shrimp, salmon, and northeast and northwest groundfish species, and (3) present import restricting measures applied by the United States government.

National Marine Fisheries Service (1985). "Fishery Management - Lessons from Other Resource Management Areas." NOAA Technical Memorandum, U.S. Department of Commerce, National Oceanic & Atmospheric Administration, Office of Policy and Planning, Washington, D.C. 20230, July, 59 pp.

These overall approaches are not mutually exclusive and deserve further discussion. In particular, a tax or fee system may support the other approaches. There is probably no single "best" approach. Instead, a case-by-case decision is necessary. The IFQ, for example, has many theoretical

advantages, especially compared to a limit on input factors, but implicitly assumes that total yield from the fishery can be reasonably predicted (not true) and that an individual quota can be enforced. Although areal leases can be used for fugitive resources, this approach might not gain public acceptance because of possible monopolistic aspects (wrong). Taxes or fees return the greatest revenues to the general public and do not create a property or access right. All approaches, except the limit on input factors, promote efficiency but might be more expensive to enforce. Limits on inputs factors might be most acceptable to fishermen and easiest to enforce but have proven to be inflexible and ineffective for managing common property resource.

National Marine Fisheries Service (1986). "Final Secretarial Fishery Management Plan, Regulatory Impact Review, and Regulatory Flexibility Analysis for the Red Drum Fishery of the Gulf of Mexico." National Oceanic and Atmospheric Administration, Department of Commerce, December.

Fishery Management Plan for Red Drum in the Gulf of Mexico.

National Marine Fisheries Service (1987). "Status of the Fishery Resources off the Northeastern United States for 1987." NOAA Technical Memorandum NMFS-F/NEC-50, Northeast Fisheries Center, Conservation and Utilization Division, Woods Hole, Massachusetts, October, 132 pp.

This report describes trends in recreational and commercial fisheries in the overview section and summarizes the general status of the major finfish and shellfish resources off the northeast coast of the United States from Cape Hatteras to Nova Scotia through 1986 in the species synopses section. Many of the assessments are described in Laboratory Reference Documents at the Woods Hole Laboratory and may be obtained upon request. The most recent complete assessments for each stock are cited in the appropriate species synopsis.

National Marine Fisheries Service (1987). "Final Supplement to the Final Environmental Impact Statement Listing and Protecting the Green Sea Turtle, Loggerhead Sea Turtle, and Pacific Ridley Sea Turtle Under the Endangered Species Act of 1973." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, June.

The final supplemental environmental impact statement (FSEIS) describes final regulations being promulgated by NOAA, NMFS that require shrimp trawlers 25 feet and longer in offshore waters from North Carolina through Texas to use turtle excluder devices (TEDs) during certain times of the year. Shrimp trawlers less than 25 feet long are required to restrict their tow times to 90 minutes or less. Shrimp trawlers in inshore waters must also limit their tow times to 90 minutes or less.

National Marine Fisheries Service (1987). "Fishing Trends and Conditions in the Southeast Region, 1987." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida.

This report contains information on existing conditions and developments in the commercial fishing industry in the southeastern United States during 1987. The information was provided by Federal and state fishery reporting specialists located in major fishing ports throughout the southeast. The landings and value data provided at the end of the report are preliminary and

subject to change.

National Marine Fisheries Service (1988). "Aquaculture and Capture Fisheries: Impacts in U.S. Seafood Markets." Report Prepared Pursuant To The National Aquaculture Improvement Act of 1985 (P.L. 99-198), National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C., April, 230 pp.

The objective of the National Aquaculture Improvement Act of 1985 was to stimulate development of a domestic aquaculture industry. However, concerns that marine aquaculture could affect certain traditional capture fisheries exist. This report examines U.S. seafood markets for shrimp and salmon that are supplied with products from commercial capture fisheries and aquaculture enterprises (domestic and foreign).

National Marine Fisheries Service (1989). "Imports and Exports of Fishery Products, Annual Summary, 1989." MF-6, Current Fisheries Statistics No. 9802.

Annual summary of fishery trade statistics for 1989.

National Marine Fisheries Service (1989). "Report of the Mackerel Stock Assessment Panel." Contribution Number CRD-89/90-12, U.S. Department of Commerce, NOAA, NMFS, SEFC, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, Florida 33149.

Condition of the stock of king mackerel and Spanish mackerel in the Gulf of Mexico and the south Atlantic for 1989.

National Marine Fisheries Service (1989). "Summary Report from Trawl Tow Time Versus Sea Turtle Mortality Workshop." Draft report, Southeast Fisheries Center, Mississippi Laboratories, Pascagoula, Mississippi, August 10-11, 22 pp.

Except under certain conditions where trawling periods are limited by fishing conditions to about 45 minutes bottom time, synchronized tow times may not be a practical management option for the conservation of sea turtles in offshore shrimp fisheries of the southeast region. Furthermore, there seems to be little room for reasonable compromise. Jeopardy of sea turtles increases rapidly at bottom tow times above 45 minutes, while on the other hand, production capabilities of the shrimp fisheries decrease rapidly at bottom tow times less than about 105 minutes. The extremes of the situation seem too great to reasonably expect a practical solution predicated on enforceable maximum tow times.

National Marine Fisheries Service (1990). "Estimated Number of Boats/Vessels and Crew in the Mackerel Fisheries During 1989." Draft report, Statistics and Data Management Office, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida 33149, March, pp. 6.

A survey of the number of king and Spanish mackerel vessels and boats operating in the fishery during 1989 by port agents.

National Marine Fisheries Service (1990). "Use of Marine Mammals in Swim-With-The-Dolphin Programs." Final Environmental Impact Statement, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service,



Office of Protected Resources, April.

This EIS addresses the issue of whether the use of bottlenose dolphins in swim with the dolphin programs should be allowed after April 30, 1990. The preferred alternative is the continuation of existing programs on an experimental basis until December 31, 1991 with additional conditions.

National Marine Fisheries Service (1990). "Magnuson Fishery Conservation and Management Act." Public Law 94-265, As amended through November 28, 1990. National Oceanic and Atmospheric Administration, Department of Commerce.

An act to provide for the conservation and management of the fisheries and for other purposes.

National Marine Fisheries Service (1991). "Economic Impact of ABC Ranges for Gulf Group King and Spanish Mackerel." Gulf and South Atlantic Fishery Management Council Presentation, Southeast Regional Office, National Oceanic and Atmospheric Administration, Department of Commerce, April.

The report contains some basic background information that has an important bearing on the nature and extent of the economic implications of choosing a particular TAC from within the ABC range that is available to the council. This information includes the number of commercial and charterboat permits over time, the gag limits that apply in the EEZ and in the states, the allocation formulas used to compute quotas from specified levels of TAC, the ABC ranges for the 1991/92 fishing year, and the quotas that result from the various levels of TAC. The economic implications for commercial fishermen, recreational anglers and charterboat operations are estimated in terms of exvessel values, changes in recreational value (consumer surplus), changes in charterboat profits and changes in charterboat revenues. Also, month of closure predictions are made for the mackerel group/user combinations.

National Marine Fisheries Service (1991). "Shrimp Trawl Bycatch Research Requirements." National Oceanic and Atmospheric Administration, Department of Commerce, November, 66 pp.

This paper provides a scientifically sound basis for developing and implementing a comprehensive, research plan for understanding and reducing shrimp bycatch in the Southeast Region as required by the 1990 Amendments to the Magnuson Fishery Conservation and Management Act.

National Marine Fisheries Service (1991). "Strategic Plan of the National Marine Fisheries Service Goals and Objectives." National Oceanic and Atmospheric Administration, U.S. Department of Commerce, June, 21 pp.

The strategic plan indicates the principles that will guide the National Marine Fisheries Service (NMFS) and the program emphasis that is necessary for NMFS to fulfill its mission and support the National Oceanic and Atmospheric Administration strategic plan.

National Marine Fisheries Service (1991). "Environmental Assessment and Supplemental Regulatory Impact Review of Proposed Regulations Expanding Sea Turtle Conservation Requirements in the South Atlantic and Gulf of Mexico." National Oceanic and Atmospheric Administration, U.S. Department of Commerce, September, 55 pp.

This assessment examines the environmental impact of regulations proposed by the National Marine Fisheries Service that require increased conservation measures year round by shrimp trawlers in the south Atlantic and Gulf of Mexico to reduce the incidental catch and mortality of sea turtles in shrimp trawls. This proposed rule would amend those requirements currently contained in the 1987 sea turtle conservation regulations (52 FR 24244, June 27, 1987). This report recommends that TEDs be required for all shrimp trawls at most places and most times of the year from Cape Hatteras, North Carolina, to the Texas-Mexico border to protect sea turtles as recommended by a National Academy of Science study and required under the Endangered Species Act of 1973.

National Marine Fisheries Service (1991). "Our Living Oceans." NOAA Tech. Memo. NMFS-F/SPO-1, November, 123 pp.

This report is a status review of U.S. living marine resources that have commercial, recreational, and ecological significance. The report is broken down into five distinct regions reflecting the Northeast Atlantic, Southeast Atlantic and Gulf of Mexico, Hawaii and the Pacific Islands, and Alaska.

National Marine Fisheries Service (1992). "Abstracts for Fifth Annual MarFin Conference." Fifth Annual MarFin Conference, Corpus Christi, Texas, October 28-29.

Refer to attached agenda for assistance in locating a specific abstract. Abstracts for projects not presented are also included. The last section contains research recommendations provided by conference participants.

National Marine Fisheries Service (1992). "Analysis of the Potential Economic Benefits From Rebuilding U.S. Fisheries." Office of the Senior Scientist for Fisheries, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, Silver Spring, Maryland, April, 7 pp.

This report provides two measures of the potential magnitude of economic and social benefits that may be realized by rebuilding U.S. fisheries. First, many U.S. fishery resources are over utilized and fishing industries over capitalized. The report estimates the potential net benefits resulting from the recovery of depleted stocks and the full and efficient utilization of all fishery resources. These net benefits from the foundation for economic investment and growth of the industry. Second, public officials and resource managers are also interested in the immediate and long term effects of their decisions on the overall economic activity, independent of economic efficiency. Therefore, the report also estimates the cumulative direct, indirect, and induced effects of increased harvesting on the Nation's Gross National Product and on employment.

National Marine Fisheries Service (1992). "Environmental Assessment and Supplemental Regulatory Impact Review of Proposed Regulations Expanding Sea Turtle Conservation Requirements in the South Atlantic and Gulf of Mexico." National Oceanic and Atmospheric Administration, Department of Commerce, September.

A qualitative discussion of the costs associated with various proposed sea turtle conservation regulations. Benefits are defined to be numbers of sea turtle deaths prevented relative to the status quo in the fishery. No use is made of economic theory as it applies to the fishery in the report. Alternatives considered are restricted to the use of turtle excluder devices or no shrimp harvesting. Alternative measures to restrict turtle mortality

such as property rights are not discussed.

National Marine Fisheries Service (1992). "Evaluation of Bycatch Reduction Devices, Sampling Protocol Manual for Data Collection." Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas, September.

The Southeast Area Monitoring and Assessment Program (SEAMAP) has a standard data collection system used by state and federal research labs and universities in the southeast region. This method of data collection is recommended for the regional bycatch research program to standardize data collection procedures, analyses, and allow data to be pooled into a common data base using existing hardware and software.

National Marine Fisheries Service (1992). "Fisheries of the United States, 1991." Current Fishery Statistics No. 9100, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, May, 113 pp.

Current landings and values for fishery resources harvested by commercial and recreational fishermen in the United States.

National Marine Fisheries Service (1992). "Fishery Management Plan for Sharks of the Atlantic Ocean." National Oceanic and Atmospheric Administration, Department of Commerce, December 10.

The fishery management plan for Atlantic sharks.

National Marine Fisheries Service (1992). Marine Recreational Fishery Statistics Survey, Atlantic and Gulf Coasts, 1990-1991, Current Fisheries Statistics Number 9204, Fisheries Statistics Division, Silver Spring, MD, USDOC, NOAA, September.

This report covers the results of the MRFSS conducted in 1990 and 1991 on the Atlantic and Gulf Coasts.

National Marine Fisheries Service (1992). "Shrimp Trawl Bycatch Characterization, Sampling Protocol Manual for Data Collection." Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas, September.

Onboard data collection for the purpose of bycatch characterization will consist of sampling trawl catches taken from commercial shrimp fishery vessels operating in U.S. Gulf of Mexico and U.S. south Atlantic waters. Data relevant to species composition, abundance, and life history will be gathered from each tow. Sample size and allocation of samples by stratum have been included in the sampling design and are discussed in the National Marine Fisheries Service's "Shrimp Trawl Bycatch Research Requirements Document," (1991). The procedures outlined below for sampling trawl catches have been prepared by personnel at NMFS and are consistent with the Southeast Area Monitoring and Assessment Program's (SEAMAP) data management system. This protocol or similar data collection methods are recommended for use in all regional bycatch assessment programs to facilitate the accessibility and analysis of integrated data sets.

National Marine Fisheries Service (1992). "Status of Fishery Resources off the Southeastern United States for 1991." NOAA Technical Memorandum NMFS-SEFSC-306, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries

Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149, April, 75 pp.

A review of stock assessment techniques and fishery trends for important commercial and recreational fisheries in the southeastern region.

National Marine Fisheries Service (1992). "Stock Assessment and Fishery Evaluation for Reef Fish in the U.S. Gulf of Mexico." Southeast Regional Office, 9450 Koger Boulevard, St. Petersburg, FL 33702, March, 35 pp.

Reef fish SAFE report.

National Marine Fisheries Service (1992). "World Shrimp Culture." Vol 1 and Vol 2, Parts 1-3, NOAA Technical Memorandum NMFS-F/SPO-4, U.S. Department of Commerce, National Oceanic & Atmospheric Administration, Office of International Affairs, Silver Springs, Maryland, November.

The National Marine Fisheries Service, Office of International Affairs began monitoring world shrimp culture developments in 1983 as part of an effort to both assess the potential economic impact on the important U.S. commercial trawl fishery and to provide basic information to U.S. companies and academic researchers. The shrimp trawl fishery is one of the most important U.S. commercial fisheries. Shrimp landings exceeded \$0.5 billion in 1991 and play a key role especially in many Gulf of Mexico coastal communities. The massive increases in cultured shrimp harvests during the 1980's have had a major impact on world shrimp markets. The increases have played a major role in the decline of real (inflation adjusted) prices for shrimp. This book and previous assessments are an effort to provide the fishing community sufficient information to understand past trends and make economic projections based on likely future prospects for cultured harvests.

National Marine Fisheries Service (1993). "Fishery Conservation and Management; Foreign Fishing; Atlantic Sharks." 50 CFR Parts 204, 611, and 678, Federal Register, 68(78):21931-21949, National Oceanic and Atmospheric Administration, Department of Commerce, April, 26.

NMFS issues this final rule and interim final rule to implement the Fishery Management Plan for Sharks of the Atlantic Ocean.

National Marine Fisheries Service (1993). "Fishery Management Plan for Sharks of the Atlantic Ocean." National Oceanic and Atmospheric Administration, Department of Commerce, February 25.

The fishery management plan for Atlantic sharks.

National Marine Fisheries Service (1993). "Gulf of Mexico Shrimp Fishery Recruitment Overfishing Definition Workshop 2." Report to the Gulf of Mexico Fishery Management Council, Shrimp Stock Assessment Panel, Galveston Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, March, 12 pp.

This report summarizes the findings of a two day workshop and provides recommendations from the working group on the current definitions of overfishing for the brown, white, pink, and royal red shrimp stocks, changes

to current definitions of overfishing, and action that might be taken if overfishing levels are surpassed in any of these stocks.

National Marine Fisheries Service (1993). "Our Living Oceans." NOAA Tech. Memo. NMFS-F/SPO-15, December, 156 pp.

This report is a status review of U.S. living marine resources that have commercial, recreational, and ecological significance. The report is broken down into five distinct regions reflecting the Northeast Atlantic, Southeast Atlantic and Gulf of Mexico, Hawaii and the Pacific Islands, and Alaska.

National Marine Fisheries Service (1993). "Review of the Rock Shrimp Fishery 1981-1991." Report to the South Atlantic Fishery Management Council, Galveston Laboratory, Southeast Fisheries Science Center, NMFS, NOAA, March, 4 pp.

The report presents a summary of landings, value, and effort data for south Atlantic rock shrimp during the eleven year period from 1981 through 1991 and suggests possible recruitment overfishing levels that could be used for this species.

National Marine Fisheries Service (1993). "United States Trade of Edible Fishery Products, 1991-1992." Trade services Division, Office of Trade and Industry Services, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, June.

The value of U.S. exports of domestic edible seafood rose to \$3.36 billion in 1992, an increase of \$319 million over 1991. The U.S. imports of edible seafood were valued at \$5.7 billion in 1992. To calculate the trade deficit, the U.S. re-exports of foreign origin edible fish are included. The following table shows the exports, re-exports, imports, and the deficit. The u.S. trade deficit in the seafood trade in 1992 was \$2.2 billion, compared with \$2.5 billion in 1991.

National Marine Fisheries Service (1994). "Coral and Coral Reefs of the Gulf of Mexico and South Atlantic." Federal Register, 59(187):49377-49384.

Rules implementing Amendment 2 to the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic to control the harvest of wild live rock.

National Marine Fisheries Service (1994). "Atlantic Sharks." Federal Register, 50 CFR Part 678 as of Oct. 20.

NMFS issues this final rule to implement certain measures authorized by the Fishery Management Plan for Sharks of the Atlantic Ocean (FMP) that were part of an interim final rule. Final measures implemented by this rule: Clarify operation of vessels with a Federal commercial permit, establish a fishing year, consolidate the regulations for drift gillnets, require dealers to obtain a permit to purchase sharks, require dealer reports, establish recreational bag limits, establish quotas for commercial landings, and provide for commercial fishery closures when quotas are reached. The intended effect of this rule is to prevent overfishing of shark resources, encourage consistent Federal and state management of shark stocks, increase the benefits from shark resources to the nation while preventing waste, and standardize data reporting requirements among different fisheries to avoid confusion among fishermen with multiple permits.

National Marine Fisheries Service (1994). "Habitat Protection Accomplishments of the National Marine Fisheries Service." Habitat Conservation Division, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL.

Fiscal year 1994 report on the effectiveness of the southeastern region's habitat protection plan. The Habitat Conservation Division reviewed more than 53,262 projects proposing to alter fishery habitat between 1981 and 1993. Of the proposed 891,288 acres of wetland to be altered, the National Marine Fisheries Service recommended that 426,486 acres be conserved and that an additional 361,278 acres of mitigation be provided.

National Marine Fisheries Service (1995). "Atlantic Sharks." Federal Register, 50 CFR Part 678.

This is an unofficial compilation of Federal regulations prepared in the Southeast Regional Office of the National Marine Fisheries Service for the Information and Convenience of Interested Persons. It does not include changes to these regulations that may have occurred after the date indicated.

National Marine Fisheries Service (1995). "Atlantic Swordfish Fishery." Federal Register, 50 CFR Part 630.

This is an unofficial compilation of Federal regulations prepared in the Southeast Regional Office of the National Marine Fisheries Service for the Information and Convenience of Interested Persons. It does not include changes to these regulations that may have occurred after the date indicated.

National Marine Fisheries Service (1995). "Atlantic Tuna Fishery; Quotas and Permit Requirements." Federal Register, 50 CFR Part 285.

Proposed rule, public hearings, and request for comments concerning changes in TAC for Atlantic tunas.

National Marine Fisheries Service (1995). "Initial Regulatory Flexibility Act and Draft Regulatory Impact Review for Regulatory Adjustments for the 1995 Western Atlantic Tuna Fishery." 1315 East-West Highway, Silver Spring, Maryland, April.

A description of the western Atlantic tuna fishery and a qualitative analysis of proposed fishery management regulations designed to extend the fishing season, allocate quotas by category, reduce overcapitalization, and permitting changes.

National Marine Fisheries Service (1995). "Operational Guidelines Fishery Management Plan Process." Silver Spring, Maryland, March.

This document clarifies procedures necessary under the Magnuson Fishery Conservation and Management Act to simplify the development, review, and implementation of fishery management plans.

National Marine Fisheries Service (1995). "Status of the Fishery Resources off the Northeastern United States for 19947." NOAA Technical Memorandum NMFS-F/NEC-108, Northeast Fisheries Center, Conservation and Utilization Division, Woods Hole, Massachusetts, October, 140 pp.

This report describes trends in recreational and commercial fisheries in

the overview section and summarizes the general status of the major finfish and shellfish resources off the northeast coast of the United States from Cape Hatteras to Nova Scotia through 1993 in the species synopsis section. Many of the assessments are described in Laboratory Reference Documents at the Woods Hole Laboratory and may be obtained upon request. The most recent complete assessments for each stock are cited in the appropriate species synopsis.

National Marine Fisheries Service (1995). "Stock Assessment and Fishery Evaluation For Reef Fishes in the U.S. Gulf of Mexico." Southeast Regional Office, 9721 Executive Center Drive, St. Petersburg, FL, January, 41 pp.

The SAFE report for the reef fish species managed by the Gulf of Mexico Fishery Management Council.

National Marine Fisheries Service (1995). "A User s Guide to: SEFSC Computing Services. Southeast Fisheries Science Center, 75 Virginia Beach Drive Miami, FL, May.

The intent of the User s Guide is to provide a document that can be used to explain the computer services available at the Southeast Fisheries Science Center.

National Marine Fisheries Service (1996). "Atlantic Highly Migratory Species Fisheries; Consolidation of Regulations." National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 94 pp.

National Marine Fisheries Service proposes to consolidate four CFR parts containing regulations for the conservation and management of Atlantic highly migratory species (HMS) in the U.S. Exclusive Economic Zone (EEZ) into one CFR part. Atlantic HMS include Atlantic tunas, swordfish, billfishes, and sharks. The consolidation would reorganize the existing regulations in a more logical and cohesive order, eliminate duplicative and outdated provisions, and make editorial changes to achieve readability, clarity, and uniformity. A number of substantive changes are proposed to achieve consistency among common elements such as permits and reporting. The purpose of this proposed rule is to make the regulations more concise, better organized and, therefore, easier for the public to use. This proposed action is part of the President s Regulatory Reinvention Initiative.

National Marine Fisheries Service (1996). "Atlantic Highly Migratory Species Monitoring and Research Activities." National Oceanic and Atmospheric Administration, March, 39 pp.

A report required by the Atlantic Tunas Convention Act to identify current governmental and nongovernmental research and monitoring activities on Atlantic Bluefin tuna and other highly migratory species; describing personnel and budgetary resources allocated to such activities; and explaining how each activity contributes to the conservation and management of Atlantic bluefin tuna and other highly migratory species.

National Marine Fisheries Service (1996). "Atlantic Tuna Fishery; Annual Quotas and Effort Controls." Federal Register, 61(81), 50 CFR Part 285.

NMFS proposes to amend the regulations governing the Atlantic tuna fisheries to: set Atlantic tuna (ABT) fishing category quotas for the 1996 fishing year, revise allocations to monthly quota periods and establish the

effort control schedule in the ABT General category, allow the partial transfer of quotas among Purse seine category permit holders and amend landing requirements, and increase minimum sizes for Atlantic yellowfin and bigeye tunas. The proposed regulatory amendments are necessary to implement the 1994 recommendation of the International Commission for the Conservation of Atlantic Tunas (ICCAT) regarding fishing quotas for bluefin tuna, as required by the Atlantic Tunas Convention Act (ATCA), and to achieve domestic management objectives. NMFS will hold public hearings to receive comments from fishery participants and other members of the public regarding these proposed amendments.

National Marine Fisheries Service (1996). "High Seas Fishing Compliance Act; Initial Regulations; OMB Control Numbers." Federal Register, 61(57), 50 CFR Part 300.

NMFS issues an interim final rule to implement the High Seas Fishing Compliance Act of 1995 (HSFCA). The purpose of the HSFCA is to license U.S. vessels fishing on the high seas and to implement the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas.

National Marine Fisheries Service (1996). Magnuson Act Provisions; Essential Fish Habitat (EFH). In press, Federal Register, 50 CFR Part 600.

A call for public comments on the Magnuson-Stevens Act requirement to conserve and enhance essential fish habitat.

National Marine Fisheries Service (1996). The NMFS-Specific Plan to Meet the Goals and Objectives of the Recreational Fishery Resources Conservation Plan. Office of Interjurisdictional and Recreational Fisheries, Silver Spring, MD, 8 pp.

The President's executive order on recreational fisheries in support of the recreational fishery resources conservation plan and the plan to implement it.

National Marine Fisheries Service (1996). "Our Living Oceans." NOAA Tech. Memo. NMFS-F/SPO-19, February, 160 pp.

This report is a status review of U.S. living marine resources that have commercial, recreational, and ecological significance. The report is broken down into a national overview with two feature articles on Pacific Northwest Salmon and the Marine Mammal Protection Act and a section on living marine resources.

National Marine Fisheries Service (1996). "Our Living Oceans. The Economic Status of U.S. Fisheries, 1996." NOAA Tech. Memo. NMFS-F/SPO-22, December, 130 pp.

This report is an economic status review of U.S. living marine resources that have commercial, recreational, and ecological significance. Each regional report focusing on the commercial and recreational harvesting and processing sectors is presented along with a spotlight issue. The spotlight issues for Alaska groundfish and Gulf of Mexico shrimp concern bycatch issues and Hawaii and the Northeast regions concentrate on limited entry issues. A primer on economic theory and terms is presented in the beginning of the report.

National Marine Fisheries Service (1996). "U.S.-Chilean Fishery



Cooperation Talks." Briefing Book, Silver Spring, Maryland, March, 117 pp.

Briefing book for the U.S. - Chilean fishery cooperation talks.

National Marine Fisheries Service (1997). "Development of Guidelines for Providing Scientific Advice to Implement Precautionary Management." National Oceanic and Atmospheric Administration, Silver Spring, Maryland, December, 4 pp.

A team (6 to 10 individuals) with expertise in stock assessment and the development of management guidelines will be responsible for drafting the guidelines. The team will meet 3 to 4 times to discuss areas that need to be covered in the guidelines, to develop an outline for the guidelines, and to review the draft guidelines and make revisions. It is anticipated that a variety of analyses may be necessary and that team members may be tasked with conducting such analyses. The initial draft will be written by 2 or 3 of the team members with input, discussion and review by the entire team. The National Stock Assessment Workshop, to be held in February 1998, will provide a forum for discussion and collaboration among NMFS assessment scientists.

National Marine Fisheries Service (1997). Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Shrimp Fishery of the Gulf of Mexico; Amendment 9. Final Rule, National Oceanic and Atmospheric Administration, Silver Spring, MD.

NMFS issues this final rule to implement Amendment 9 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico (FMP). Amendment 9 requires, with limited exceptions, the use of certified bycatch reduction devices (BRDs) in shrimp trawls in the exclusive economic zone (EEZ) in the Gulf of Mexico shoreward of the 100 fathom (fm) (183 meter) depth contour west of 85° 30' W. long.; sets the bycatch reduction criterion for the certification for BRDs; and establishes an FMP framework procedure for modifying the bycatch reduction criterion, for establishing and modifying the BRD testing protocol and its specifications, and for certifying and decertifying BRDs. The intended effects are to reduce the unwanted bycatch mortality of juvenile red snapper and, to the extent practicable, not adversely affect the shrimp fishery in the Gulf of Mexico.

National Marine Fisheries Service (1997). Magnuson-Stevens Act Provisions; National Standard Guidelines. Federal Register, 62(149):41907-41920.

A call for public comments on NMFS proposed revisions to the guidelines for national standards 1 (optimum yield), 2 (scientific information), 4 (allocations), 5 (efficiency), and 7 (cost and benefits), and adds guidelines for new national standards 8 (communities), 9 (bycatch), and 10 (safety of life at sea).

National Marine Fisheries Service (1997). "Managing the Nation's Bycatch: Priorities, Programs, and Actions for the National Marine Fisheries Service." National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C., March, 211 pp.

This plan is the result of a series of workshops initiated by the fishing industry in 1992 to clearly articulate the NMFS objectives, priorities, and strategies regarding bycatch. Included are proposed national bycatch objectives, specific recommendations concerning data collection, evaluation and management actions necessary to attain the objectives, and a

comprehensive assessment of the state of bycatch in the nation's marine fisheries. The development of this plan has brought into sharp focus the fact that bycatch is indeed a multifaceted and complex set of problems that affect nearly all aspects of fishing operations. As a result, no single solution to the bycatch problem exists. Rather, fishermen, managers, scientists, conservationists, and other interest groups must work together to craft a balanced approach to addressing bycatch; one that will promote the sustainability of our nation's living marine resources.

National Marine Fisheries Service (1997). "Managing the Nation's Bycatch: Priorities, Programs, and Actions for the National Marine Fisheries Service." National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C., November, 225 pp.

This plan is the result of a series of workshops initiated by the fishing industry in 1992 to clearly articulate the NMFS objectives, priorities, and strategies regarding bycatch. Included are proposed national bycatch objectives, specific recommendations concerning data collection, evaluation and management actions necessary to attain the objectives, and a comprehensive assessment of the state of bycatch in the nation's marine fisheries. The development of this plan has brought into sharp focus the fact that bycatch is indeed a multifaceted and complex set of problems that affect nearly all aspects of fishing operations. As a result, no single solution to the bycatch problem exists. Rather, fishermen, managers, scientists, conservationists, and other interest groups must work together to craft a balanced approach to addressing bycatch; one that will promote the sustainability of our nation's living marine resources.

National Marine Fisheries Service (1997). "Operational Guidelines Fishery Management Plan Process." Silver Spring, Maryland, May.

Guidance in developing fishery management plans (FMP) that conform with the Magnuson Fishery Conservation and Management Act and its amendments to produce a clearer understanding of the laws affecting the FMP process, and to simplify and speed the flow of work directed to final implementation of an FMP.

National Marine Fisheries Service (1997). "Regulatory Flexibility Act." Office of Sustainable Fisheries, Silver Spring, Maryland, 9 pp.

Guidance in developing initial and final Regulatory Flexibility Act analyses (IRFA and FRFA) that conform with the Magnuson Fishery Conservation and Management Act and the Sustainable Fisheries Act to simplify and speed the flow of work directed to final implementation of an FMP.

National Marine Fisheries Service (1997). "Status of Fisheries of the United States." Draft Report to Congress, Office of Sustainable Fisheries, Silver Spring, Maryland, September, 75 pp.

The reauthorized Magnuson-Stevens Act requires the Secretary of Commerce to report to Congress annually on the status of fisheries within each Council's geographical area of authority and identify those fisheries that are overfished or are approaching a condition of being overfished based on the current overfishing definitions contained in the fishery management plans. Eighty-six species are listed as overfished with ten species approaching an overfished condition, 193 species as not overfished, and 448 species are listed as unknown.

National Marine Fisheries Service (1997). "Strategic Plan for Fisheries Research." National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Silver Spring, Maryland, October, 40 pp.

The scope of this document includes fisheries, habitat, protected species, and utilization research to address requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). This plan covers what NMFS does now and how to improve it. It relies primarily on the current NMFS budget and strives to maximize benefits.

National Marine Fisheries Service (1997). Telephone Survey Instrument. Versions A and B, Southeast Regional Office, Economics and Trade Analysis, January.

Telephone survey add-on for recreational valuation estimation in the southeastern region of the United States.

National Marine Fisheries Service (1998). Outline for Council Member Briefing. Draft for New Council Member Briefing Book. Office of Sustainable Fisheries, 1315 East West Highway, Silver Spring, MD, January.

Outline and copies of overhead projections for a briefing on fisheries economics for new council members.

National Marine Fisheries Service (1998). Southeastern United States Shrimp Trawl Bycatch Program. Draft report, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, October, 61 pp.

The NMFS and others have determined that a number of finfish resources in the Gulf of Mexico and south Atlantic are depleted for several reasons, including the application of too much fishing effort by commercial and recreational fishermen and the incidental bycatch of the shrimp trawl fleet. The ensuing debate about how best to restore the stocks to desirable levels involves numerous technological, political, biological, and economic factors. Among them are: 1) technological interaction in which shrimp gear inadvertently harvests finfish; 2) management interaction between the shrimp and other FMPs governing the harvest of finfish species; 3) competition between commercial and recreational fishermen and among fishermen with different gear types within each group; 4) economic trade-offs over time among various harvesting groups and between different groups of consumers; 5) the current uncertainty regarding whether or not the commercial management structure will allow for an ITQ or similar management system; 6) a lack of current biological information to determine the desirable size of some of the finfish stocks and future yields; and 7) whether or not effort controls will be placed on the recreational fishery. For all these reasons, the interaction between the shrimp and finfish fisheries of the U.S. Gulf of Mexico constitutes a management and economics problem that is controversial, challenging, and, as yet unresolved in the case of most southeast finfish stocks.

National Marine Fisheries Service (1998). Southeastern United States Shrimp Trawl Bycatch Program. Final Report to Congress, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, October, 69 pp.

The NMFS and others have determined that a number of finfish resources in the Gulf of Mexico and south Atlantic are depleted for several reasons, including the application of too much fishing effort by commercial and recreational fishermen and the incidental bycatch of the shrimp trawl fleet.

The ensuing debate about how best to restore the stocks to desirable levels involves numerous technological, political, biological, and economic factors. Among them are: 1) technological interaction in which shrimp gear inadvertently harvests finfish; 2) management interaction between the shrimp and other FMPs governing the harvest of finfish species; 3) competition between commercial and recreational fishermen and among fishermen with different gear types within each group; 4) economic trade-offs over time among various harvesting groups and between different groups of consumers; 5) the current uncertainty regarding whether or not the commercial management structure will allow for an ITQ or similar management system; 6) a lack of current biological information to determine the desirable size of some of the finfish stocks and future yields; and 7) whether or not effort controls will be placed on the recreational fishery. For all these reasons, the interaction between the shrimp and finfish fisheries of the U.S. Gulf of Mexico constitutes a management and economics problem that is controversial, challenging, and, as yet unresolved in the case of most southeast finfish stocks.

National Marine Fisheries Service (1998). Strategic Plan for Fisheries Research. National Oceanic and Atmospheric Administration, U.S. Department of Commerce, February, 58 pp.

This plan covers what we do now and how we expect to improve it. It relies primarily on the current NMFS budget and strives to maximize benefits.

National Marine Fisheries Service (1998). Fisheries Research Vessels: Planning for the Future. Draft, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, March, 12 pp.

The National Marine Fisheries Service research vessel fleet plan and its rationale.

National Marine Fisheries Service (1999). "Our Living Oceans." NOAA Tech. Memo. NMFS-F/SPO-41, June, 301 pp.

This report is a status review of U.S. living marine resources that have commercial, recreational, and ecological significance. The report is broken down into a national overview, a set of feature articles on the precautionary approach to fisheries management, New England groundfish, and Gulf of Mexico King mackerel, and a review of living marine resources in the five distinct regions reflecting the Northeast Atlantic, Southeast Atlantic and Gulf of Mexico, Hawaii and the Pacific Islands, and Alaska.

National Oceanic and Atmospheric Administration (1994). "Interpretation of the U.S. National Research Council's Report on An Assessment of Atlantic Bluefin Tuna." ICCAT Working Document, SCRS/94/151, U.S. Department of Commerce, National Marine Fisheries Service, Office of the Assistant Administrator for Fisheries, 1315 East-West Highway, Silver Spring, MD.

NOAA believes that the assessment methods used by the National Research Council have merit and should be pursued in future assessments.

National Oceanic and Atmospheric Administration (1995). "Florida Keys National Marine Sanctuary." Volumes 1 - 3, Sanctuaries and Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, 1305 East-West Highway, SSMC4, Silver Spring, MD.

Volume I describes the proposed Management Plan and Draft Environmental Impact Statement for the Florida Keys National Marine Sanctuary. Volume II describes the process used to develop the management alternatives and includes environmental and socioeconomic impact analyses of the alternatives. Volume III consists of the appendices, including the two acts that designate and implement the sanctuary.

National Oceanic and Atmospheric Administration (1997). "FOCI." U.S. Department of Commerce, 7600 Sand Point Way, N.E., Seattle, WA, 13 pp.

The Fisheries-Oceanography Coordinated Investigations (FOCI) program was established by the National Oceanic and Atmospheric Administration in 1984 to examine the physical and biological factors that affect the walleye pollock fishery in Alaska.

National Oceanic and Atmospheric Administration (1997). "NOAA Fisheries Strategic Plan." U.S. Department of Commerce, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD, May, 37 pp.

The strategic plan of the National Marine Fisheries Service to conserve and protect marine fishery resources.

National Recreational Fisheries Coordination Council (1997). Recreational Fishery Resources Conservation Plan. U.S. Government Printing Office, 16 pp.

This conservation plan provides the basis for the federal contribution to a strong partnership among Federal, State, and tribal governments and the recreational fisheries community.

National Research Council (1986). Proceedings of the Conference on Common Property Resource Management. Panel on Common Property Resource Management, Board on Science and Technology for International Development, Office of International Affairs. National Academy Press, Washington, D.C.

The Council's conference on Common Property Resource Management was undertaken to assess systematically differing institutional arrangements for the effective conservation and utilization of jointly managed resources. The members of the Panel on Common Property Resource Management, recognizing the global dimensions of the current environmental emergency, selected case studies drawn from four continents and a broad range of cultural and environmental settings. It is hoped that the background papers, case studies, and conclusions of the conference will contribute substantively to efforts to rehabilitate and manage the soils, water resources, forests, rangelands, agricultural lands, and other jointly held resources that constitute the global commons.

National Research Council (1990). "Decline of the Sea Turtles: Causes and Prevention." Draft Report, Committee on Sea Turtle Conservation, Board on Environmental Studies and Toxicology, Board on Biology, Commission on Life Sciences, National Academy Press, Washington, D.C.

This report presents scientific and technical information on the population biology, ecology, and reproductive behavior of five endangered or threatened species of sea turtles. It evaluates population declines, causes

of turtle mortality, and the effectiveness of past and current mitigation efforts, and recommends conservation measures to protect or increase turtle populations. The committee was not charged or constituted to address and did not analyze social and economic issues related to sea turtle conservation.

National Research Council (1990). "Decline of the Sea Turtles: Causes and Prevention." Committee on Sea Turtle Conservation, Board on Environmental Studies and Toxicology, Board on Biology, Commission on Life Sciences, National Academy Press, Washington, D.C.

This report presents scientific and technical information on the population biology, ecology, and reproductive behavior of five endangered or threatened species of sea turtles. It evaluates population declines, causes of turtle mortality, and the effectiveness of past and current mitigation efforts, and recommends conservation measures to protect or increase turtle populations. The committee was not charged or constituted to address and did not analyze social and economic issues related to sea turtle conservation.

National Research Council (1994). An Assessment of Atlantic Bluefin Tuna. National Academy Press, Washington, D.C.

The National Research Council's Ocean Studies Board formed the Committee to Review Atlantic Bluefin Tuna. The committee's charge was to conduct a technical review and evaluation of the scientific basis of U.S. management of fisheries for Atlantic bluefin tuna and address: (a) are current Standing Committees on Research and Statistics (SCRS) assessments of eastern and western Atlantic bluefin the most defensible interpretation of the available data, (b) are uncertainties in the assessments dealt with adequately, (c) what is the status of the Atlantic bluefin tuna relative to the convention's goal of managing tuna to achieve maximum sustainable yield, and (d) does the available information support treating bluefin tuna as separate eastern and western management units?

National Research Council (1997). Improving Fish Stock Assessments. Committee on Fish Stock Assessment Methods, Ocean Studies Board, Commission on Geosciences, Environment, and Resources, National Academy Press, Washington, D.C.

This report is in response to a National Marine Fisheries Service request to conduct a broad review of the methods used in the United States for stock assessments. Recommendations that will advance the state-of-the-art were made for data collection and assessment methods, models, harvest strategies, and new approaches that better account for incomplete and variable data and for environmental fluctuations on fisheries.

National Research Council (1998). Findings and Recommendations. Chapter 6 in Sharing the Fish: Toward a National Policy on IFQs. Draft Report to Congress, Washington, D.C.

This chapter summarizes the findings of a special panel assembled to determine the appropriateness of using Individual Fishery Quotas (IFQs) in the management of living marine resources. The panel determined that IFQs were an appropriate management approach under certain conditions in the fishery.

National Research Council (1999). Sharing the Fish: Toward a National Policy on Individual Fishing Quotas. National Academy Press, Washington, D.C.

A report to Congress on the findings of a special panel assembled to

determine the appropriateness of using Individual Fishery Quotas (IFQs) in the management of living marine resources. The panel determined that IFQs were an appropriate management approach under certain conditions in the fishery.

National Research Institute of Far Seas Fisheries (1998). Review of the Status of World High Seas Fisheries, particularly for Tuna and Tuna-like Fisheries. Draft report. FAO Technical Working Group on the Management of Fishing Capacity, Japan, March, 23 pp.

This paper is intended to review the situation of high seas resources and fisheries targeting them in the hope of contributing to the discussion at the Expert Meeting on Management of Fishing Capacity to be held in April this year. In assessing the degrees of fishing capacity, the starting point should be clarification of the present state of resources and fisheries. The fishery resources dealt with in this paper include tuna, bottom fishes, and salmon. This paper utilizes to the fullest extent the present knowledge available on the state of many of the high seas resources and fisheries shared by regional fisheries management organizations.

National Science and Technology Council (1998). Program Guide to Federally Funded Environment and Natural Resources R&D, Committee on Environment and Natural Resources, Washington, D.C., February, 87 pp.

The purpose of the program guide is to provide information on the types of research and development activities that are supported by Federal agencies in the area of environment and natural resources, the mechanisms used by agencies to select R&D recipients of Federal R&D dollars, and potential funding opportunities.

Nauman, Fayyaz A., Conrado M. Gempesaw, J. Richard Bacon, and Alberto Manalo (1995). Consumer Choice for Fresh Fish: Factors Affecting Purchase Decisions. Marine Resource Economics, 10(2):117-142.

A consumer survey of the northeastern United States was conducted to gather market information regarding the decision to purchase fresh hybrid striped bass, trout, and salmon. Logit techniques were used to model the experience, perceptions, preferences, and choices of consumers for seafood products based on a modified evoked set framework. Factors such as knowledge that the products are farm-raised, having previous experience with purchasing seafood along with the perception that seafood is healthful with good taste were found to significantly influence the consumer's decision to purchase these finfish products. The results of this study and the techniques used allow market researchers to objectively quantify the impact of experience, perceptions, and preferences of products on the ultimate decision of the consumer to purchase fresh hybrid striped bass, trout, and salmon products.

Nautiyal, Jagdish C. and Kenneth S. Fowler (1980). "Optimum Forest Rotation in an Imperfect Stumpage Market." Land Economics, 56(2):213-226.

This paper endeavors to show the effects of monopolistic forest ownership on the optimal rotation and demonstrates that the socially desirable rotation in a monopolistic situation is longer than that which maximizes the monopolist's present worth, but is shorter than the atomistic rotation that is usually seen as the optimal economic rotation by foresters.

Naval Facilities Engineering Command (1980). "Economic Analysis Handbook." NAVFAC P-442, Department of the Navy, 200 Stovall

Street, Alexandria, VA, July, 136 pp.

The purpose of this Economic Analysis Handbook is to provide official NAVFAC guidance for the preparation of economic analyses for proposed programs, projects, and activities and for program evaluation of ongoing activities.

Neal, Richard A. (1973). "Progress Toward Farming Shrimp in the United States." Marine Fisheries Review, 35 (3-4):67-70.

A review of the progress and problems in developing shrimp aquaculture in the United States. Primarily biological problems with maturation and growth of shrimp in pounds is discussed. Little economic information is provided at this early stage of development.

Needler, A.W.H. (1979). "Evolution of Canadian Fisheries Management Towards Economic Rationalization." J. Fish. Res. Board Can., 36:716-724.

The evolution of the regulation of fisheries in Canada is outlined as background for a discussion of their economic rationalization through restriction of entry. The objectives of fishery regulation are discussed and questions noted that must be answered if limitation of entry is to be beneficial and acceptable.

Neher, Philip A. (1974). "Notes on the Volterra-Quadratic Fishery." J. Econ. Theory, 8:39-49.

An analysis of the fishery must take into account the biological nature of fundamental capital, fish; it must recognize the common property feature of the open sea fishery; it must allow that the fundamental capital is the subject of exploitation. These properties can, however, be captured by a simple model outlined in this paper that is then used to examine some special cases and to discuss the control of optimal exploitation paths.

Neher, Philip A. (1992). "The Evolution of Property Rights Management in Marine Fisheries." Presented at The American Agricultural Economics Association Annual Meeting, Baltimore, Maryland.

This paper discusses the historical evolution of rights based fishing and the economic and political influences that lead to their development in various parts of the world.

Neher, Philip A. and Ragnar Arnason (1988). "Introduction." Marine Resource Economics, 5(4):285-287.

Introduction to a series of articles presented at the Rights Based Fishing conference in Reykjavik, Iceland in 1988.

Neher, Philip A., Ragnar Arnason, and Nina Mollet (eds.) (1989). Rights Based Fishing, Kluwer Academic Publishers, Boston.

Proceedings of a workshop on the scientific foundations for rights based fishing in Reykjavik, June 27 - July 1, 1988.

Nelson, Jon P. (1978). "Residential Choice, Hedonic Prices, and the Demand for Urban Air Quality." Journal of Urban Economics, 5:357-369.



This paper uses a two step estimation procedure to estimate structural demand and supply equations for urban air quality. In the first step, a hedonic price equation is estimated for residential property values for Washington, D.C. SMSA for 1970. In the second step, a set of marginal hedonic prices is generated. These prices and the quantity of clean air (reciprocal of air pollution) are used as endogenous variables in a simultaneous equation model. Empirical results indicate a price elasticity of demand between -1.2 and -1.4 and a unitary income elasticity.

Nelson, Forrest D. (1977). "Censored Regression Models with Unobserved, Stochastic Censoring Thresholds." Journal of Econometrics, 6:309-327.

The Tobit model is a useful tool for estimation of regression models with truncated or limited dependent variables, but it requires a threshold which is either a known constant or an observable and independent variable. The model presented here extends the Tobit model to the censored case where the threshold is an unobserved and not necessarily independent random variable. Maximum likelihood procedures can be employed for joint estimation of both the primary regression equation and the parameters of the distribution of that random threshold.

Nelson, Randy A. (1989). "On the Measurement of Capacity Utilization." The Journal of Industrial Economics, 37(3):273-286.

Capacity utilization (CU) is usually defined as the ratio of actual output to the output corresponding to (i) the minimum point on the SRATC curve, (ii) the point of tangency between the LRATC and SRATC curves. In practice, however, CU is often measured as the ratio of actual to the maximum potential output consistent with a given capital stock. This paper demonstrates how to estimate the theoretical measures of CU, and examines the correlation between the three measures of CU, and the McGraw-Hill estimates of CU, using data from a sample of U.S. privately owned electric utilities for 1961-83.

Nerlove, Marc and S. James Press (1973). Univariate and Multivariate Log-Linear and Logistic Models. Prepared by the Rand Corporation, Santa Monica, CA 90406 for The Economic Development Administration and the National Institutes of Health, December, 134 pp.

This report sets out a methodological technique not now widely used in economics for dealing with qualitative dependent variables. The theory presented here extends and integrates the general linear regression model, analysis of variance, and analysis of covariance for use with qualitative dependent variables that are both categorical and unordered. Empirical applications to several socioeconomic problems are also presented.

Nero and Associates, Inc. (1981). "Cost and Return Survey of Reef Fisheries, Gulf of Mexico and South Atlantic Coasts." Final report, Contract No. NA-80-6A-C-0051, NMFS, SEFC, Miami, FL.

This report presents the results of an economic survey of commercial reef fishing in the South Atlantic and Gulf of Mexico regions of the U.S. This contract called for the collection of data with analysis left to the SEFC, NMFS. This report summarizes the survey design and methodology, presents a discussion of the survey data and analytical procedures, and concludes with some observations and recommendations for future consideration.

Nettles, Cindy I., Robert E. Bayley, Christopher D. Jones, and Mike T. Judge

(1994). Cooperative Game Fish Tagging Program Annual Newsletter: 1992. NOAA Technical Memorandum NMFS-SEFSC-346, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida, April, 23 pp.

The Cooperative Game Fish Tagging Program is the focus of this report. It summarizes information concerning the numbers of fish tagged for sailfish, blue and white marlin, swordfish, bluefin and yellowfin tuna, and other species.

Newlin, Kim (1988). "Mackerel Fishery of the South Atlantic and Gulf of Mexico." Status of U.S. Fisheries Report, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida, July, 21 pp.

A status report for the coastal migratory pelagics fishery. It includes a discussion of the management plan objectives and how well existing management regulations are meeting plan goals.

Newton, Christopher (1998). Review of Issues for the Control and Reduction of Fishing Capacity on the High Seas. Document prepared for FAO, Technical Working Group on the Management of Fishing Capacity, La Jolla, CA, USA, April, 15-18, 31 pp.

It has been concluded that the industrial fishing fleet represents the greatest part of economic waste in fisheries. The actions required by states in exercising control over their fleet capacities are severe; the estimates are for a fleet reduction of between 41 and 47 percent. Although the 1995 UN Agreement does not include provisions for reducing fleet capacity, regional fishery organizations may be able to adjust limit reference points to lower catch levels to include excess capacity and its effect in undermining conservation and management measures. There is an urgent need to improve the transparency for monitoring fleet size, implementing an international standard measurement for fishing vessels, establish reporting of high seas catches in the FAO statistics, and encourage international attention to the special problem of flags of convenience.

Niami, Farhad, Walter R. Keithly, and Kenneth J. Roberts (1992). "An Economic Review of the Southeastern Shrimp Processing Industry." Draft report, Coastal Fisheries Institute and Office of Sea Grant Development, Center for Wetland Resources, Louisiana State University, Baton Rouge, LA.

The southeast shrimp processing industry has been examined from an economic perspective. Results show that while the number of plants decreased during the 1973-88 period, the production activities, as measured by total pounds, increased. Most of this increased activity was due to peeled product. Though processing activities in terms of pounds being processed has been increasing, the deflated value of these processing activities has exhibited no growth since the mid 1970's due to a sharp decline in the deflated price of all forms of processed shrimp; i.e., raw headless, peeled, breaded, and others.

Nichols, John P. and Wade L. Griffin (1975). "Trends in Catch-Effort Relationships with Economic Implications: Gulf of Mexico Shrimp Fishery." Marine Fisheries Review, 37(2):1-4.

This paper reviews the recent trends relating to catch and fishing effort in the Gulf of Mexico shrimp fishery. The scope of this report is limited to presenting some of the basic findings in a descriptive format using

simple time series and trends to illustrate the relationships developed. The analysis was limited to the years 1962 through 1971. However, most of the series have been extended to reflect conditions in 1972 and 1973. Detailed discussions of the basic research procedures and results will not be presented here as they are available elsewhere.

Nichols, John P. and Larry Johnston (1979). "The Influence of Alternative Pricing Methods on Ex-Vessel Shrimp Prices." DIR 79-1, SP-7, Departmental Information Report, The Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, August, 12 pp.

The relationship between ex-vessel pricing methods and interport price differentials for shrimp was examined. Ex-vessel prices were found to be significantly higher in ports using a pack-out method of establishing the value of landed shrimp. The size of differential varied by season and with price level.

Nichols, John P., Mary Gerlow, and A. Nelson Swartz (1980). "The Economics of Combination Swordfish Longlining and Shrimp Trawling in the Gulf of Mexico: Investment Requirements and Estimated Costs and Returns." DIR 80-1, SP-9, Staff Paper Series, Departmental Information Report, The Texas Agricultural Experiment Station, Texas A&M University System, College Station, Texas, December, 33 pp.

This report provides estimates of the economic aspects of swordfish longlining particularly as it relates to investment requirements and operating costs. These estimates are developed from interviews with vessel owners and captains who were active in the fishery during the 1979-80 season. Recent pressure on the shrimp trawling industry of Texas have caused shrimpers to consider alternative fishing opportunities. Among these, swordfish longlining was of particular interest in early 1980. The degree of fishing pressure that swordfish stocks can withstand is not known. Caution has been advised regarding rapid expansion of swordfish longlining even though the short run benefits to shrimpers may be favorable.

Nichols, John P., Wade L. Griffin, and Vito Blomo (1978). "Economic and Production Aspects of the Gulf of Mexico Shrimp Fishery." In Pushkar N. Kaul and Carl J. Sindermann (eds.) Drugs and Food from the Sea, Myth or Reality?, The University of Oklahoma Press, Norman, Oklahoma.

This paper describes the important trends in the Gulf of Mexico shrimp industry. Trends in production, imports, fishing effort, cost and returns, catch per unit effort, for 1962 to 1976 are presented and discussed. With production levels constant in the face of increasing fishing effort, increasing operating costs are squeezing profit margins even though prices are rising.

Nichols, John P., Melvin Cross, Vito Blomo, and Wade L. Griffin (1975). "Utilization of Finfishes Caught Incidental To Shrimp Trawling in the Western Gulf of Mexico, Part II: Evaluation of Costs." TAMU-SG-76-203, Department of Agricultural Economics, Texas Agricultural Experiment Station, Texas A&M University, College Station, TX, January, 42 pp.

This report presents estimates of the cost of operating several alternative systems for holding and landing finfish caught incidental to

shrimp trawling operations. Freezer units, brine immersion tanks, and onboard fish meal plants, an extra crew member, and a mothership concept are the systems evaluated. Break-even prices are estimated that would be necessary to cover operating costs and a 10 percent return on investment. Additionally, problems in traditional work patterns, crew incentives, and institutional arrangements are discussed. Comparison of estimated break-even prices with recent market prices indicate that none of the proposed systems are viable except under very restrictive conditions. The mothership or tender vessel concept shows the most economic potential but is plagued with problems of coordinating a large number of vessels in an industry where independence of operation is valued highly. The analytical model presented may be used to evaluate other systems not considered directly in this study.

Nichols, Scott (1982). "Impacts on Shrimp Yields of the 1981 Fishery Conservation Zone Closure off Texas." Marine Fisheries Review, 44(9-10):31-37.

A yield per recruit analysis and a simulation model of shrimp fishing show that an increase in brown shrimp yield was realized from closure of the Fishery Conservation Zone (FCZ) off Texas during May-July 1981. Yields were 11.7 million pounds greater (29 percent) than would have been expected with the FCZ open during May-August 1981. Some of the increase in yield was made at the expense of standing stock. Projections over the fishable lifespan of the shrimp indicate that yields will be increased 4 million pounds (7 percent) due to the FCZ closure.

Nichols, Scott (1986). "Stock Assessments for Brown, White, and Pink Shrimp in the U.S. Gulf of Mexico, 1960-1985." Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida, June.

This paper analyzes the 1960-1985 commercial catch statistics for Penaeus aztecus (brown shrimp), Penaeus setiferus (white shrimp), and Penaeus duorarum (pink shrimp) from the U.S. Gulf of Mexico shrimp fishery. This analysis is an update of the assessment (Nichols, 1984) presented at the Southeast Fisheries Center's Second Stock Assessment Workshop (Miami, May, 1984).

Nichols, Scott (1986). "Updated Yield-per-Recruit Information on the Tortugas Pink Shrimp Fishery." North American Journal of Fisheries Management, 6:339-343.

Portions of a 1979 analysis dealing with optimum size considerations in the Tortugas, Florida, pink shrimp (Penaeus duorarum) fishery are updated. The 1979 management advice remains essentially the same. The current target minimum size of 103 mm total length theoretically should produce a 14 to 20% gain, compared to unregulated conditions, in weight yields from shrimp recruiting through the closure area during the peak fishing season. Gains in dollar value (ex-vessel gross revenue) due to closure would be from 45 to 64% during the peak season. However, because of the natural protection already provided by untrawlable bottoms in some areas where small shrimp are abundant, these percentage gains probably are overestimates.

Nichols, S. (1990). "The Spatial and Temporal Distribution of the Bycatch of Red Snapper by the Shrimp Fishery in the Offshore Waters of the US Gulf of Mexico." Draft report, National Marine Fisheries Service, Mississippi Laboratories, Pascagoula Facility, P.O. Drawer 1207, Pascagoula, Miss. 39568-1207, September, 66 pp.

Much of the data relevant to potential seasonal and areal closures of the shrimp fishery to reduce bycatch of red snapper are collected in this document including observations made by biologists aboard commercial shrimp vessels, research trawl data, and results derived from commercial statistics on the distribution of shrimp effort and fishing mortality rate. In general, if a closure can be reasonably expected to reduce the amount of shrimping effort in the offshore waters of the Gulf, there is a good chance that the closure will effect some reduction in red snapper bycatch. If a closure simply causes effort to move around in time or space without decreasing the amount of effort, little bycatch reduction can be expected, and some closures might turn out to be counter productive.

Nichols, Scott (1993). "The 1993 Texas Closure - Results of SEAMAP Sampling." Report to the Gulf of Mexico Fishery Management Council, National Marine Fisheries Service, Mississippi Laboratories.

Increases in yield in pounds due to the closure were indicated for 1993 for both M values. Very low catch rates were observed in 1993, as was the case in 1992. Nevertheless, small shrimp again dominated the size composition sufficiently for the closure to generate an increase in yield.

Nichols, Scott (1993). "Shrimp Fleet Bycatch." Report to the Gulf of Mexico Fishery Management Council, July.

Hard copies of the overheads used in the presentation at the Council meeting. The presentation includes graphs of CPUE, catch rates, offshore shrimp effort, and red snapper bycatch estimates.

Nichols, Scott (1994). "Fish:Shrimp Ratios in the Gulf of Mexico." Report to the Gulf of Mexico Fishery Management Council, National Marine Fisheries Service, Mississippi Laboratories.

While the National Marine Fisheries Service recommends against using fish:shrimp ratios whenever possible as a means of determining total bycatch levels, an analysis of finfish to shrimp catch ratios over time is presented.

Nichols, Scott (1994). "The 1994 Texas Closure - Results of SEAMAP Sampling." Report to the Gulf of Mexico Fishery Management Council, National Marine Fisheries Service, Mississippi Laboratories.

Increases in yield in pounds due to closure were indicated for 1994 for M values of 0.15 and 0.28 per month. The 1994 year class was strong compared to the last 2 years with small shrimp dominating the size composition sufficiently for the closure to generate an increase in yield.

Nichols, Scott (1996). "An Update on Some Issues Relating to the Distribution of Red Snapper Bycatch." In Southeast Fisheries Science Center (1996). "Summary Report on the Status of Bycatch Reduction Device Development." National Marine Fisheries Service, Mississippi Laboratories, P.O. Drawer 1207, Pascagoula, Mississippi, March.

This paper updates the estimates of red snapper bycatch by the shrimp fishery in the offshore waters of the Gulf of Mexico through 1994, and presents spatial distribution information relevant to several matters that have arisen during debate on the status of red snapper stocks by the Council or its advisory committees.

Nichols, Scott and G.J. Pellegrin, Jr. (1992). "Revision and Update of Estimates of Shrimp Fleet Bycatch, 1972-1991." Draft report, National Marine Fisheries Service, Mississippi Laboratories, P.O. Drawer 1207, Pascagoula, Mississippi, August.

New estimates of shrimp fleet bycatch are provided, using the GLM methods described by Nichols et al. (1987, 1990). Estimates are updated through 1991. Estimates for 1991 are preliminary, based on preliminary estimates of shrimping effort. Estimates for all previous years have been revised, following discovery that many observer data stations used in previous estimations were not completely worked up, resulting in underestimates of finfish catch rates in previous analyses of this data base. New estimates by number for 24 taxa are included, as well as total sharks and total finfish by weight.

Nichols, S., A. Shah, and G. Pellegrin, Jr. (1987). "Estimates of Annual Shrimp Fleet Bycatch for Thirteen Finfish Species in the Offshore Waters of the Gulf of Mexico." Draft Report, NOAA, NMFS, SEFC, Mississippi Laboratory, Pascagoula, MS.

This paper presents estimates of annual bycatch levels for thirteen species for the offshore waters of the northern and western Gulf of Mexico.

Nichols, S., A. Shah, G. Pellegrin, Jr., and K. Mullin (1990). "Updated Estimates of Shrimp Fleet Bycatch in the Offshore Waters of the Gulf of Mexico, 1972-1989." Report to the Gulf of Mexico Fishery Management Council, NOAA, NMFS, SEFC, Mississippi Laboratory, Pascagoula, MS.

This paper presents updated and corrected estimates of annual bycatch levels for the offshore waters of the Gulf of Mexico. Qualitative or dummy variables are used to represent area, depth, season, year, and the data set in which the data were contained. The estimated coefficients and statistical significance of the model are not provided by the authors.

Nichols, Scott, James Nance, C. Phillip Goodyear, Arvind Shah, and John Watson (1995). Some Considerations in Determining Bycatch Reduction Requirements. Southeast Fisheries Science Center, National Marine Fisheries Service, April, 18 pp.

The paper sets 1982-86 as the base year class for future calculations of F for finfish bycatch levels in the shrimp fishery. The extended funnel and the fisheye are two identified effective gear options for bycatch reduction. In spite of the recognized need and the importance of forecasting future effort levels, the authors propose using a constant level of effort based on the 1982-86 average days fished in all future bycatch estimations for the shrimp fishery. Lastly, TED use is unlikely to have reduced red snapper F below the baseline value. Also, found in Southeast Fisheries Science Center (1996). "Summary Report on the Status of Bycatch Reduction Device Development."

Niskanen, William A. (1975). "Bureaucrats and Politicians." Journal of Law and Economics, (December):617-643.

A bilateral monopoly exists between an elementary bureau and its government review group. This market involves the exchange of some output for a budget rather than at a per unit price. In any such bilateral monopoly condition, output is indeterminate within a range without determining the conditions affecting the bargaining between the two parties. My model of

bureaucratic supply determines only the bureau's preferred output based on an assumption that the bureau acts to maximize its budget. The government's preferred output is determined from conventional majority rule models or from my special model of decisions by a "high demand" committee.

Two criticisms of this theory are (1) that budget maximization by bureaus is not obviously consistent with utility maximizing by bureaucrats and (2) that the theory does not develop the conditions for an equilibrium output between the output preferred by the bureau and the output preferred by the government. Based on these criticisms, modifications to the theory are outlined in this paper.

Nix, Harold L. and Muncho Kim (1982). "A Sociological Analysis of Georgia Commercial Shrimp Fishermen, 1976-77." Institute of Community and Area Development, The University of Georgia, Athens, Georgia, March, 182 pp.

This publication is both theoretical and practical. It is theoretical in that it provides a theoretical model for understanding the social behavior of an occupation. It is practical in that it describes the attitudes, behavior, and problems faced by Georgia shrimp fishermen as they approached an era of very rapid change. In addition, it is felt that this document will serve as a historical benchmark for additional studies and by which occupational change may be analyzed.

Nixon, Dennis W. (1994). Managing Marine Fisheries Through Individual Transferable Quotas. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Until recently, the traditional tools of the fishery manager (minimum sizes, closed seasons, etc.) were sufficient to ensure the health of our nation's open access fishery resources. However, the tremendous growth in harvesting capacity spurred by the passage of the Magnuson Act has created the need either to develop some new tools or radically improve the effectiveness of the existing methods. This paper will discuss the use of one new tool, the individual transferable quota (ITQ), and examine the advantages and disadvantages associated with its use in the context of the seven National Standards for fishery conservation and management in the Magnuson Act. Four major problem areas are considered. First, the nature of the property right is considered, with particular attention to the issue of initial allocation. Second, the difficulty in establishing the appropriate management unit is considered. Third, the problem of determining TAC with sufficient specificity for an ITQ system is examined. Finally, the issues of monitoring and enforcing the more complex ITQ system are considered. ITQs while having potential in some U.S. fisheries are no silver bullet for fishery managers.

Noetzel, Bruno G. (1977). "Revenues, Costs, and Returns from Vessel Operation in Major U.S. Fisheries." PB 265 275, National Marine Fisheries Service, Washington, D.C., February, 23 pp.

The proceeds from operation of fishing vessels in selected U.S. fisheries in the Atlantic, Pacific, and Gulf of Mexico are evaluated. The report covers the groundfish fisheries of New England and the entire Pacific coast (including halibut fishing), the Pacific salmon fisheries, the tuna fisheries (albacore and tropical tuna), the shrimp fishery in the Gulf of Mexico, and the crab fisheries in the Northeast Pacific and Bering Sea. These fisheries accounted for 65% by quantity and 68% by value of total U.S. food fish landings in 1974. A total of 297 vessel years of operation were analyzed. The purpose of the analysis is to provide an insight into the

earning capabilities of vessels operated in various U.S. fisheries during a period of time characterized by abruptly mounting prices of fuel and products made of oil derivatives, with a resulting general deterioration of the economic performance in fisheries in the United States and elsewhere.

Norse, Elliott A. (1993). Global Marine Biological Diversity, A Strategy for Building Conservation into Decision Making. Island Press, Washington, D.C.

This book presents the most up-to-date information, views, and recommendations on how to meet the challenge of conserving the living sea. The basic principles of marine conservation are presented for decision makers in governments, industries, and conservation organizations and for marine resource managers, students, and all others concerned with protecting our vital ocean resources. Unfortunately, the economic aspects of the problem are not well understood and are poorly presented. Solutions are not posed in terms of changes in management institutions to give user groups incentives to conserve the marine environment, but primarily as a list of necessary research and organizations needed to conduct the research. However, in its favor, the authors do emphasize the need for economic evaluation of proposed projects that will impact the marine environment.

North Pacific Fishery Management Council (1989). "Longline and Pot Gear Sablefish Management in the Gulf of Alaska and the Bering Sea/Aleutian Islands." Draft Supplemental Environmental Impact Statement and Regulatory Impact Review/Initial Regulatory Flexibility Analysis to the Groundfish Fishery Management Plans for the Gulf of Alaska and the Bering Sea/Aleutian Islands, P.O. Box 130136, Anchorage, Alaska, November.

Four alternative systems for management of sablefish longline fisheries off Alaska are being considered by the North Pacific Fishery Management Council. The alternatives are continued open access using traditional management measures, annual fishery allotments, individual fishery quotas, and license limitations.

North Pacific Fishery Management Council (1991). "Longline and Pot Gear Sablefish Management in the Gulf of Alaska and the Bering Sea/Aleutian Islands." Revised Supplement to the Draft Supplemental Environmental Impact Statement and Regulatory Impact Review/Initial Regulatory Flexibility Analysis to the Groundfish Fishery Management Plans for the Gulf of Alaska and the Bering Sea/Aleutian Islands, P.O. Box 130136, Anchorage, Alaska, May.

This document analyzes the status quo and four alternative individual fishing quota (IFQ) management programs for the longline and pot sable fish fishery in the EEZ off Alaska and presents a regulatory impact review (RIR).

North Pacific Fishery Management Council (1991). "Environmental Impact Statement, Regulatory Impact Review, Initial Regulatory Flexibility Analysis for Proposed Individual Fishing Quota Management Alternatives for the Halibut Fisheries in the Gulf of Alaska and Bering Sea/Aleutian Islands." Draft for public review, P.O. Box 130136, Anchorage, Alaska, July.

This EIS, combined with a RIR/IRFA, evaluates the potential environmental, economic, and social impacts of a proposed Individual Fishing Quota (IFQ) system for managing the halibut fisheries off Alaska. Such a system would involve changes to the regulations governing the halibut



fisheries (50 CFR, Section 301). The Council has gone on record as declaring the current open access, derby style fishery as unacceptable and has undertaken a lengthy exploration of alternative management systems. This document is designed to provide the public with an analysis of the likely effects and tradeoffs associated with an IFQ system. This includes rationale for consideration and rejection of other alternative management systems, such as license limitation and annual fishing allotments as well as detailed analysis of alternative forms of an IFQ system.

North Pacific Fishery Management Council (1991). "Draft Supplemental Environmental Impact Statement and Regulatory Impact Review/Initial Regulatory Flexibility Analysis of Proposed Inshore/Offshore Allocation Alternatives (Amendment 18/23) to the Fishery Management Plans for the Groundfish Fishery of the Bering Sea and Aleutian Islands and the Gulf of Alaska." Draft report prepared by the NPFMC Inshore/Offshore Analytical Team, September 19.

The Council has defined as a problem the risk of resource preemption by one industry sector upon another. Several management alternatives have been proposed by the industry and refined by the Council to address this problem. This analysis is designed to provide the public and the decision makers with an understanding of the trade offs; the costs and benefits of each alternative in addressing the problem. The effectiveness of these alternatives in successfully solving the preemption problem is presented in the analysis.

North Pacific Fishery Management Council (1992). "Final Supplemental Environmental Impact Statement/ Environmental Impact Statement for the Individual Fishing Quota Management Alternative for Fixed Gear Sablefish and Halibut Fisheries, Gulf of Alaska and Aleutian Islands." P.O. Box 130136, Anchorage, Alaska, September 15.

This package contains the supplemental environmental impact statement for the individual fishing quota (IFQ) management alternative for the sablefish fisheries off Alaska and the environmental impact statement for the IFQ management alternative for the halibut fisheries off Alaska. Both of these documents have previously undergone NEPA review, prior to the approval of an IFQ program for these fisheries. However, an additional, supplemental analysis to both of these documents is provided with this submission to solicit additional public comment on the potential impacts to the human environment of the IFQ program recommended by the North Pacific Fishery management Council.

North Pacific Fishery Management Council (1992). "Managing Sablefish Off Alaska: What's beyond the squall line?" P.O. Box 130136, Anchorage, Alaska.

A special report to help engage sablefish fishermen and processors in a discussion of limited access, individual fishing quotas, and future implications for the sablefish fishery.

North Pacific Fishery Management Council (1998). "Amendment 45 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area." P.O. Box 130136, Anchorage, Alaska.

This amendment would extend the allocation of 7.5 percent of the pollock total allowable catch in the Bering Sea and Aleutian Island to the Western Alaska Community Development Quota program on a permanent basis.

North Pacific Fishery Management Council (1998). "Amendment 51 to the Fishery Management Plan for Groundfish Fishery of the Bering Sea and Aleutian Islands Area." Draft, P.O. Box 130136, Anchorage, Alaska.

A 39/61 percent inshore/offshore pollock allocation split is established, set aside 2.5 percent of the pollock total allowable catch (TAC) for small catcher vessels, and prohibit catcher vessels delivering to the offshore component from fishing inside the Catcher Vessel Operational Area during the B season beginning on September 1. The Gulf of Alaska amendment would allocate 100 percent of the pollock TAC and 90 percent of the Pacific cod TAC to vessels catching pollock and Pacific cod for processing by the inshore component. An appendix contains a discussion of the impact of the inshore/offshore allocation on the Alaskan CDQ program.

North Pacific Fishery Management Council and National Marine Fisheries Service (1998). "Status Report on Baseline Information for the Inshore/Offshore 3 Analysis." P.O. Box 130136, Anchorage, Alaska, January, 75 pp.

Inshore/offshore allocation of the pollock TAC analysis of economic, social, biological, and regulatory context of management alternatives.

Northern Economics (1997). "Fleet Survey Project" Report prepared for Aleutians East Borough and North Pacific Fisheries Management Council in Association with U.S. Army Corps of Engineers, May, 33 pp.

A survey of the large commercial fishing vessels in western Alaska to address several questions related to potential benefits associated with the expansion of the harbor at Sand Point, Alaska.

Norton, Virgil, Terry Smith, and Ivar Strand (ed.) (1983). "Stripers, The Economic Value of the Atlantic Coast Commercial and Recreational Striped Bass Fisheries." UM-SG-TS-83-12, Maryland Sea Grant Publication, University of Maryland, College Park.

This is a snapshot of the 1979-80, commercial and recreational, North Atlantic striped bass fishery.

O Boyle, C. Annand, and L. Brander (1994). Individual Quotas in the Scotian Shelf Groundfishery off Nova Scotia, Canada. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Individual transferable quotas (ITQs) have been used as a method of implementing total allowable catches (TACs) on Canada's East Coast since the early 1980's. In the groundfish fishery, their first use was in 1982 as nontransferable enterprise allocations (EAs) in regulation of the large offshore companies. This was followed by implementation of EAs in the mid-shore fleet in 1988 and IQs in the <65' mobile fleets off western Newfoundland, again in 1988. The most recent implementation of IQs and the subject of this paper, is in the <65' mobile gear fleet off Nova Scotia, which targets the lucrative cod, haddock, and pollock stocks resident in the region. The Nova Scotia fleet grew dramatically in capacity during the late 1970's to mid-1980's to a level estimated to be four times that necessary to fish at the Departmental target of  $F_{0.1}$ . This precipitated a resource crisis in 1989 and stimulated a specially struck Task Force to examine the causes and recommend

solutions, one of the main ones being institution of IQs. An extensive consultative process with industry ensued to establish the quota allocation process, bycatch trading rules, appeal procedures, and sanctions for violators. In addition, a new user paid catch monitoring system was established as a central feature of enforcement. While it is too early to gauge the success of the IQ approach, it has received support of participants, but criticism from other sectors, particularly in relation to social consequences and enforcement problems. The effects of IQs will have to be carefully monitored to understand how this regulatory tool impacts the fleets as well as the communities that depend upon them.

O Boyle, R.N., A.F. Sinclair, and P.C.F. Hurley (1991). A Bioeconomic Model of an Age-Structured Groundfish Resource Exploited by a Multi-Gear Fishing Fleet. ICES Mar. Sci. Symp., 193:264-274.

A bioeconomic model of the Scotian Shelf groundfish fishery involving otter trawler and longliner fleets was constructed to examine the biological economic, and regulatory consequences of the interaction of these two fleets. Otter trawlers catch younger fish than longliners and the revenue-cost pictures are very different. The model allowed examination of the long-term equilibrium levels and short term transitory paths. The results of the simulation indicate that both yield and employment were superior for longliners. However, otter trawlers, although experiencing higher operating costs, could out compete longliners owing to higher sustained catch rates and thus revenue per unit cost. From a regulatory point of view, it was determined that, under the assumptions of this study, the fishery could be managed by regulating only trawler activity. The longliner fleet could be left essentially unregulated since it is not economical for it to overfish the stock. The results of this study have significant implications for the management of multispecies, multi-gear fisheries in which differential age effects of exploitation are present.

O'Brien, Kevin (19??). "How to Save the Manatee." Florida Angler.

Manatees are harmful to the marine environment by eating the sea grass and polluting the waters with nitrogenous waste. "Waterways are for boaters. They are not zoos."

O'Hop, Joe (1995). Letter to Nancie Parrack, Department of Environmental Protection, Florida Marine Research Institute, 100 Eighth Avenue, S.E., St. Petersburg, Florida, March 17.

King mackerel landings by quota group for 1991-92 to 1994-95, breakdowns by pound categories for the quota groups, and landings by the South Atlantic Fishery Management Council's proposed variation on subregional allocations.

O'Rourke, Desmond (1971). "Economic Potential of the California Trawl Fishery." American Journal of Agricultural Economics, 53(4):583-592.

This paper presents a technique for estimating the physical yield function of a fishery when detailed biological and environmental data are lacking. The physical yield function of the California trawl fishery is incorporated in an economic model to show the relationship between maximum sustainable physical yield of the fishery and maximum economic yield. Maximizing the economic benefit of the fishery to society would involve a drastic reduction in resource use at a catch level considerably below the biological maximum sustainable yield. Only through marginal cost pricing can resources be allocated efficiently to the fishery.

Oates, Wallace E. (1983). "Economic Incentives for Environmental Management: The Recent U.S. Experience." Background paper for the Organization for Economic Co-operation and Development, University of Maryland.

This paper describes and assesses the emissions trading and the regulation of BOD emissions into waterways in the state of Wisconsin.

Office of Habitat Conservation (1996). "NOAA Fisheries National Habitat Plan - 1997 and Beyond -." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland, December, 20 pp.

The mission statement and implementation plan for the objectives of the Office of Habitat Conservation.

Office of Habitat Protection (1994). "Habitat Protection Activity Report: 1991-1993." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

This report describes important marine habitat issues and gives examples of the accomplishments and activities of the Agency's Habitat Protection Program for 1991, 1992, and 1993.

Office of Intergovernmental and Recreational Fisheries (1997). "Final Supplemental Environmental Impact Statement and Regulatory Impact Review for a Regulatory Amendment for the Atlantic Coast Weakfish Fishery in the Exclusive Economic zone (EEZ)." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 8484 Georgia Avenue, Suite 425, Silver Spring, MD.

Five different alternatives are examined to regulate the harvest of weakfish in the EEZ.

Office of the Secretary (1986). "Natural Resource Damage Assessments." Federal Register, 51(86), Monday, May 5.

The proposed rule establishes simplified procedures for assessing damages to natural resources from a discharge of oil or release of a hazardous substance and compensable under either the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601 et seq., or under the Clean Water Act (CWA), 33 U.S.C. 1251 et seq. (also known as the Federal Water Pollution Control Act).

Office of Sustainable Fisheries (1998). "Guidelines for Regulatory Analysis of Fishery Management Actions." Regulatory Flexibility Act Workshop, Long Beach, CA, September 14 - 15, National Marine Fisheries Service, Silver Spring, MD, 21 pp.

The purpose of this document is to provide guidance on when preparation of a regulatory impact review (RIR) and regulatory flexibility act analyses (FRA analysis) are required and what these documents should contain.

Olesen, O.B., and N.C. Petersen (1996). A Presentation of GAMS for DEA. Computers Ops. Res., 23(4): 323-339.

The paper is concerned with a discussion of advantages and drawbacks

using standard versus special optimizers for solving DEA problems. The use of standard optimizers is recommended. It is argued that GAMS provides a highly appropriate framework for building and solving DEA models. The successive development of DEA models along with the flexible tools for model building and the large number of standard solvers available with GAMS are the basic arguments in favor of the use of GAMS rather than a specialized optimizer for DEA problems. A representation of the CCR model along with some of its extensions is included as a selection of GAMS statements; the GAMS statements provide a ready for use framework for DEA in GAMS.

Olsen, David A., Arthur E. Dammann, and Don Neal (1974). "A Vertical Longline for Red Snapper Fishing." Marine Fisheries Review, 36(1):7-9.

Tropical inshore fisheries are confronted with two basic problems. First, biological communities within the tropics tend to be diverse. Second, they rely on the small boat to harvest the interrelated fish stocks. The present report is based on the idea that to be effective, fisheries development must find ways of maximizing and diversifying the catching ability of the basic unit of gear, the small boat.

Olsen, James C. (1973). "Pandalid Shrimp Life History Research at Kachemak Bay, Alaska." Marine Fisheries Review, 35(3-4):62-64.

The current shrimp research activity in Kachemak Bay will provide insight into the life history, population dynamics, and behavior of pandalid shrimp in the Gulf of Alaska. The general objectives of the research on larval and postlarval shrimp are to increase knowledge about pandalid shrimp life history stages, behavior, and population dynamics; determine how fishing affects shrimp stocks; determine the causes of annual fluctuations in shrimp stock abundance; describe and quantify the characteristics and ecology of environments inhabited by shrimp; and increase the understanding of the role pandalid shrimp have in the organic production system of the North Pacific.

Olsen, M., Jr. (1965). The Logic of Collective Action. Cambridge: Harvard University Press, Chapters 1, 2, and 6.

The role of government in the economy is discussed in terms of sources of market failure, public ownership of resources, equity versus efficiency, and the sources of government failure.

Olsen, Trond E. (1989). "Capital Investments and Resource Extraction from Non-Identical Deposits." Journal of Environmental Economics and Management, 17:127-139.

Taking account of necessary investments in physical capital, we characterize the optimal investment and extraction program for exploiting several nonidentical deposits of an exhaustible resource. Under the given technology assumptions, capital investments will be concentrated up front if deposits are identical. In the case of nonidentical deposits, it may be optimal to have investments spread out over time. Moreover, the smallest deposit is depleted first.

Olsen, Trond E. and Gunnar Stensland (1989). "Optimal Sequencing of Resource Pools under Uncertainty." Journal of Environmental Economics and Management, 17:83-92.

This paper characterizes the optimal scheduling of extraction from two reserves under price and production uncertainty. An essential step in the

analysis is the characterization of the optimal "switching date" and the associated "flexibility value"; i.e., the value of the option to switch production from the first to the second reserve.

Omezzine, Abdallah, Lokman Zaibet, and Hamad Al-Oufi (1996). The Marketing System of Fresh Fish Products on the Masirah Island in the Sultanate of Oman. Marine Resource Economics, 11(3):203-210.

The overall objective of this investigation is to generate information needed for private and public decisions in the fish marketing system on Masirah Island, Oman. The primary area of inquiry relates to the field of market organization analysis. The market is described in terms of the number and nature of buyers and sellers and their size distribution. The methodology draws on comparisons and contrasts with norms of effective competition and efficient pricing systems. These norms include elements of market structure, conduct, and performance.

Onal, Hayri, Bruce A. McCarl, Wade L. Griffin, Gary Matlock, and Jerry Clark (1991). "A Bioeconomic Analysis of the Texas Shrimp Fishery and Its Optimal Management." American Agricultural Economics Association, 73(Nov.):1161-1170.

Overfishing in the Texas shrimp fishing industry by time period and fishing area is investigated. An optimal harvesting pattern is determined using a multiperiod mathematical programming model where prices, fishing effort, catch, and resource dynamics are treated endogenously. These results are then compared with actual effort. The comparison indicates substantial excess effort in spring and early summer, especially in the bays and shallow offshore areas. The peak fishing season also occurs later in the fall in optimal harvest pattern than in practice. The results indicate both producers and consumers gain from reduced fishing effort because of improved size composition of the harvest.

Opaluch, James J. (1981). "A Heuristic Discussion of Optimal Control: The First Order Conditions and Methods of Solution." No. 81-03, Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island 02881 Rhode Island Agricultural Experiment Station Contribution No. 2001.

Optimal control is important in the area of natural resource economics since the management of resources over time is a capital theoretic problem. This paper presents an heuristic discussion of optimal control. The first order conditions for optimal control are derived at a heuristic level. The transformation from a continuous-time to a discrete-time framework is demonstrated. The optimal control conditions are then derived from the discrete-time formulation. Numerical control problems are also discussed and phase diagrams are used to characterize solutions to optimal control problems.

Opaluch, James J. (1984). "The Use of Liability Rules in Controlling Hazardous Waste Accidents: Theory and Practice." Northeast Journal of Agricultural and Resource Economics, 13(2):210-217.

This paper first reviews strict liability as provided by environmental legislation, with particular emphasis on its role in hazardous pollution events. The discussion will be somewhat broader than hazardous waste management, in that it will include pollution by hazardous substances that may be valuable commodities prior to the pollution incident. Current legislation provides various forms of strict liability for hazardous pollution events that is shown to be consistent with common law doctrine on strict liability and may

be particularly useful given institutions provided by other legislation. The paper then constructs a brief conceptual framework for liability for pollution incidents, and presents some simulation results concerning perceptions of the probability of a hazardous pollution incident.

Opaluch, James J. (1987). "Marine Pollution and Environmental Damage Assessment: Introduction." Marine Resource Economics, 4:151-154.

An introduction to the results of a workshop on marine pollution and environmental damage assessment held in Narragansett, R.I. in June, 1986 by the association of Environmental and Resource Economists (AERE), U.S. Environmental Protection Agency (EPA), and National Oceanic and Atmospheric Administration.

Opaluch, James J. and Nancy E. Bockstael (1984). "Behavioral Modeling and Fisheries Management." Marine Resource Economics, 1(1):105-115.

Because of the extreme uncertainty in fisheries biology, efforts to determine a stock recruitment relationship have not been entirely successful. In the face of this uncertainty, this paper argues for a change in focus for fisheries economics from bioeconomic optimization toward goals that are more modest and more easily achievable. In particular, a satisficing approach to management is advocated, whereby efforts are made to reallocate fisheries, with no attempt to determine the optimum. To achieve such a solution efficiently, managers must accurately predict the response of fishermen to public policy. This paper reports on a study that develops a discrete choice model to predict fishermen's supply response. Fishermen are shown to respond to economic incentives of expected returns and variability of returns, but only after these incentives surpass a substantial threshold.

Opaluch, James J. and Thomas A. Grigalunas (1989). "OCS-Related Oil Spill Impacts on Natural Resources: An Economic Risk Analysis." Paper Prepared for the 1989 Oil Spill Conference, San Antonio, Texas, February 13-15, 22 pp.

Risk analyses of oil spills are important in the development of OCS leasing policy as well as other marine policies relating to oil. This paper explores the use of the Natural Resource Damage Assessment Model for Coastal and Marine Resources (NRDAM/CME) to provide risk analysis of oil spills related to OCS oil development. For the categories of natural resources included in the NRDAM/CME, the expected value of damages from large oil spills appears quite small relative to the value of oil developed. Expected damages range from \$300 thousand to \$19.7 million per billion barrels of oil developed. Ongoing research by the authors will refine these estimates by including (1) additional categories of damages, that will increase the damage estimates, and (2) oil spill cleanup and the effect of OCS production on reducing imports, that will reduce the estimated net costs of OCS development.

Opaluch, James J. and Richard M. Kashmanian (1983). "Assessing the Viability of Marketable Permit Systems: An Application in Hazardous Waste Management." Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island.

Marketable permits are assessed for control of hazardous emissions from jewelry manufacturers. First, potential efficiency benefits are calculated, as compared to the method proposed by EPA. Secondly, the distribution of benefits is examined to assess the political viability of marketable permits. Marketable permits are shown to result in savings of 60 percent. However,

there is likely to be industry opposition to the permit system because of the distribution of benefits, despite the fact that the industry benefits in the aggregate. This occurs because the largest firms, that are likely the most influential, are better off under EPA's technology forcing proposal.

Orbach, Michael K. (1997). "Limited Entry -- A Brief Overview." South Atlantic Update, South Atlantic Fisheries Management Council, One Southpark Circle, Suite 306, Charleston, SC, March, 2 pp.

A brief overview of limited entry or access from the perspective of an anthropologist.

Orbach, Michael K. (1992). "Effort Management and the Gulf of Mexico Red Snapper Fishery: A Discussion of Issues and Alternatives." Department of Sociology and Anthropology, East Carolina University, Greenville, North Carolina, June.

A series of workshops held to discuss effort limitation management measures with fishermen in the red snapper fishery.

Orbach, Michael K. (1977). Hunters, Seamen, and Entrepreneurs, The Tuna Seinermen of San Diego. University of California Press, Berkeley, CA.

A description of the culture of a distant water fishing community. The book is about the men who sail with the high seas tuna fleet out of San Diego, California, on the west coast of the United States. It is about their occupation, their lifestyle, and the communities where they and their families, friends, and associates live and work.

Orbach, Michael K. and Valerie R. Harper (eds.) (1979). "United States Fisheries Systems and Social Science: A Bibliography of Work and Directory of Researchers." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Resource Conservation and Management, Washington, D.C., August, 162 pp.

This volume consists of two documents, a bibliography of published, unpublished, and current research work among fishermen and in fishing communities in the United States, its territories and possessions, and a directory of the researchers who have performed this work or who are interested in these subjects.

Orbach, M.K., Jeffrey C. Johnson, and James Waters (1987). "Limited Entry Alternatives for the Florida Spiny Lobster Fishery: Preliminary Analysis." East Carolina University, Greenville, North Carolina, April, 1987.

A collection of papers that look at the sociology and economics of limited entry programs for the Florida spiny lobster fishery.

Orbach, M.K., J. Ginter, and R. Finch (1985). "Limited Entry and Fisheries Management Under the MFCMA." Draft report, National Marine Fisheries Service, Washington, D.C.

This paper explores the potential of limited entry under the MFCMA as a partial solution to the fishery management problem. The intent is to discuss limited entry in general as it applies to fisheries management and to clarify the concept and its potential application under the MFCMA.



Organization for Economic Cooperation and Development (1991). "Study on Economic Assistance to the Fishing Industry, General Survey and Country Chapters." Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, Feb., 103 pp.

Economic assistance in many countries takes two forms: assistance to harvesting and assistance to processing. Harvesting assistance is for social reasons and for the broader objective of alleviating specific obstacles. Processing assistance includes short term adjustment measures to alleviate adverse effects on the industry of cyclical fluctuations. Few countries in the survey admit to having real subsidies.

Organization for Economic Cooperation and Development (1992). "Workshop on Individual Quota Management." Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, August.

A set of papers presented at the workshop describing the existing individual transferable quota systems in place around the world.

Organization for Economic Cooperation and Development (1993). "Inventory of Assistance to the Fishing Industry and Management Systems." Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, July, 16 pp.

Country comments on restrictions to commodity trade, access restriction to fishing services, their free flow of labor, and management systems.

Organization for Economic Cooperation and Development (1994). "The Effects of Trade Liberalization on the Environment." Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, Feb., 6 pp.

It is likely that trade liberalization will have a small environmental impact in the fisheries sector. Environmental effects are much more likely to come about as a result of national or international management strategies. However, in the aftermath of the Uruguay Round's decision to incorporate an environmental assessment in future trade agreements, it will be necessary to develop a methodology which will permit the evaluation of trade liberalization on the environment.

Organization for Economic Cooperation and Development (1995). "The Quotient of Convenience: Estimation of the Cost Relative to Responsible Fishing." Ad Hoc Expert Group on Fisheries, Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, Sept., 21 pp.

The aim of this research project is to define the economic impact of public regulations protecting living marine resources in the fisheries activity.

Organization for Economic Cooperation and Development (1997). "Impact on Fisheries Resource Sustainability of Government Financial Transfers." Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, September, 13 pp.

The information required from Member countries to facilitate the submission of information on government financial transfers, levels of fishing capacity and activity, and fish stock status is described. To ease the resource implications for Member countries, a questionnaire approach is

proposed.

Organization for Economic Cooperation and Development (1997). "The Implications of Responsible Post-Harvest Practices on Responsible Fishing." Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, 7 pp.

OECD member countries comments on Spain s proposal on for future work on post-harvesting practices.

Organization for Economic Cooperation and Development (1997). "Spanish Proposal for OECD Fisheries Committee s 1997-98 Programme of Work." Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, March, 6 pp.

A proposal to conduct an analysis of problems linked to responsible trade.

Osborn, Maury (1997). Atlantic Cooperative Statistics Program, Technical Source Document Series III, Draft of Technical Recommendations, Office of Science and Technology, Division of Fisheries Statistics and Economics, National Marine Fisheries Service, Silver Spring, MD, August, 87 pp.

This document is intended to inform the public and other interested parties about the recommendations resulting from a series of technical workshops and where these issues fit into the overall scope of the program. It is also intended to provide and opportunity to submit comments, concerns and views on these issues.

Osburn, Hal R. and Mike G. Weixelman (1989). "Increasing Creel Interview Efficiency Through Early Survey Termination." Marine Fisheries review, 51(1):39-43.

Operational modifications based on recreational angler activity patterns can be successfully formulated to increase creel survey efficiency without a significant loss of information. This study was conducted to estimate the amount of Texas marine sport-boat angler interview and retained fish data (bay and Gulf) that would be missed both coast wide and within each bay system if surveys were terminated early when no angler interviews were conducted by a specified time. Using this method, less than 3 percent of the total interviews and retained fish would be missed coast wide by terminating surveys at 1400 hours on weekends and 1600 hours on weekdays throughout the survey year. This would result in the early termination of 14 percent of the weekend surveys and 23 percent of the weekday surveys, thus allowing an annual redirection of 440 work hours and \$6,063 in operating expenses.

Osburn, Hal R. and Maury O. Ferguson (1987). "Trends in Finfish Landings By Sport-Boat Fishermen in Texas Marine Waters, May 1974-May 1986." Management Data Series No. 119, Texas Parks and Wildlife Department, Coastal Fisheries Branch, 4200 Smith School Road, Austin, Texas.

A set of tables on landings of finfish by recreational fishermen in the Texas territorial sea.

Osburn, Hal R., Maury O. Ferguson, and Henry R. Maddux (1988). "Trends in Finfish Landings By Sport-Boat Fishermen in Texas Marine Waters, May 1974-May 1987." Management Data Series No. 150, Texas

Parks and Wildlife Department, Coastal Fisheries Branch, 4200  
Smith School Road, Austin, Texas.

A set of tables on landings of finfish by recreational fishermen in the Texas territorial sea.

Osterbind, Carter C. and Elise C. Jones (1955). "Florida's Commercial Fisheries, Markets Operations Outlook." Bureau of Economic and Business Research, College of Business Administration, University of Florida, Gainesville.

This study was designed to scrutinize the Florida producer's present operations, his markets, costs, and other economic characteristics of the industry. It is based on a field survey of Florida producers and data from the Commercial Fisheries Branch of the U.S. Fish and Wildlife Service.

Osterbind, Carter C. and Robert A. Pantier (1965). "Economic Study of the Shrimp Industry in the Gulf and South Atlantic States." Final report, Contract No. 14-17-008-118, The Bureau of Commercial Fisheries, Fish and Wildlife Service, United States Department of the Interior, Washington, D.C.

This reports the findings of a study to discover the nature of the economic problems confronting the shrimp fishery of the United States during the period from 1956 to 1959. Special attention is given to the problems existing in 1959.

Ostrom, Charles W. Jr. and John H. Aldrich (1978). "The Relationship Between Size and Stability in the Major Power International System." American Journal of Political Science, 22(4):743-771.

The balance of power literature is intermingled with hypotheses relating the number of actors to stability in the international system. In addition to the controversy in the theoretical literature, there is an extensive empirical literature in which we find support for a wide range of contradictory hypotheses. The purpose of this paper is to evaluate the leading hypotheses based on operationalizations of the key concepts that are consistent with the balance of power literature, a common data set, a coherent specification of the contending hypotheses, and the use of appropriate estimation techniques. A major factor in this test is that the dependent variable of each model is not a measure of the amount of war; instead, we estimate the probability of war through the use of the probit estimation technique. The results of the comparative evaluation indicate that the existing hypotheses are not able to account for the probability of war in the international system.

Otterstad, Oddmund, Jeremy Phillipson, and David Symes (1997). A Socio-Economic Data Base Framework for Fisheries Dependent Areas: Baseline Report. FAIR CT95 0070, European Social Science Fisheries Network, Universities of Trondheim and Hull, November, 40 pp.

The European Social Science Fisheries Network has undertaken to develop the framework for a comparable national social science data base. This would seek to make good the deficiencies in existing data sources for the socio-economic analysis of fisheries dependent regions and fishing based communities. This report provides a baseline analysis through: (a) an elaboration of key parameters surrounding the development of a socio-economic data base for fisheries dependent areas; (b) an initial analysis of statistical sources as part of an ongoing analysis of national statistical cultures; and (c) an elaboration of initial conceptions of and recommendations

for an appropriate data base framework and dependency indices.

Otwell, W. Steven, Jeffrey Bellairs, and Donald Sweat (1984). "Initial Development of a Deep-Sea Crab Fishery in the Gulf of Mexico." SGR-61, Gulf and South Atlantic Fisheries Development Foundation, Inc., Sea Grant Project No. R/GSAFDF-2, Grant No. NA80AA-D-00038, Sea Grant Report No. 61, Florida Sea Grant College Program, May, 29 pp.

The potential for initiating a deep sea crab fishery for golden crab in the Gulf of Mexico is studied. While the fishery is feasible, recommendations include many cautions unique to this deep sea crab species.

Otwell, W. Steven, Charles M. Adams, Frank J. Lawlor, III, and Southeastern Fisheries Association (1988). "Yellowfin Tuna: Fishing Gear, Production and Quality." A compilation of papers by: Florida Sea Grant College, Sea Grant Extension Program Staff in conjunction with Federal Saltonstall-Kennedy Funds, Project No. NA85-SC-H-06174, Grant No. NA86AA-D-SG068, Sea Grant Report No. 91, Florida Sea Grant College Program, June, 57 pp.

An economic overview of yellowfin tuna production and value trends, tuna fishing methods and gear in the Gulf of Mexico and south Atlantic, post-harvest handling considerations for fresh yellowfin tuna, and a tuna product quality code are presented and discussed in this collection of papers by the authors.

Owers, James (1974). Costs and Earnings of Alaskan Fishing Vessels - An Economic Survey. Alaska Commercial Fisheries Entry Commission, September, 40 pp.

This is the first large scale effort to examine the economic health of Alaska's commercial fisheries during the last year of unrestricted entry to use as a benchmark for evaluating the limited entry program in the future and to determine the gear levels that can harvest the fisheries in the state and provide a reasonable economic return to the fishermen participating. The results of the survey are presented in a series of fishery profiles.

Ozuna, Teofilo, Jr., Wade L. Griffin, Antonio B. Lamberte, John M. Ward (1997). An ITQ System for the Gulf of Mexico Shrimp Fishery. Draft report, Department of Agricultural Economics, Texas A&M University, College Station, Texas, 17 pp.

The prevailing belief in fisheries management is that ITQ systems will not work in an annual crop fishery with high variation in abundance. According to this logic, the Gulf of Mexico shrimp fishery is not an ideal candidate for an ITQ program. The large geographical area, large number of fishermen and landing sites, stock variability, and short life span of shrimp will make implementation and management of a successful ITQ program difficult, but not impossible. This study illustrated how an ITQ program with proper management regime, monitoring system, and method of setting an adjustable TAC, can make an ITQ program work even for the Gulf of Mexico shrimp fishery.

Ozuna, Teofilo, Jr., Wade L. Griffin, Antonio B. Lamberte, John M. Ward (1997). An ITQ System for the Gulf of Mexico Shrimp Fishery. Submitted to The Journal of Marine Resource Economics, Department of Agricultural Economics, Texas A&M University, College Station, Texas, 16 pp.

The prevailing belief in fisheries management is that ITQ systems will not work in an annual crop fishery with high variation in abundance. According to this logic, the Gulf of Mexico shrimp fishery is not an ideal candidate for an ITQ program. The large geographical area, large number of fishermen and landing sites, stock variability, and short life span of shrimp will make implementation and management of a successful ITQ program difficult, but not impossible. This study illustrated how an ITQ program with proper management regime, monitoring system, and method of setting an adjustable TAC, can make an ITQ program work even for the Gulf of Mexico shrimp fishery.

Pacific Fishery Management Council (1998). West Coast Fisheries Economic Data Plan. Draft, 2130 SW Fifth Avenue, Suite 224, Portland, OR, June.

Economic data is needed for fishery management. Current economic data falls short of the need. This plan specifies a program for the collection and dissemination of needed data. The plan covers all West Coast fisheries and includes interfaces with other data systems. The plan specifies the major high priority projects needed and guidelines for their implementation. The needed data and funding are described.

Pacific Fishery Management Council (1998). Draft Amendment 14 to the Pacific Coast Salmon Plan (1997). Draft, 2130 SW Fifth Avenue, Suite 224, Portland, OR, January.

This amendment makes the fishery management plan consistent with the Sustainable Fisheries Act of 1996 to reflect increased listings of salmon stocks under the Endangered Species Act and to include issues identified in amendment scoping sessions.

Padilla, Jose E. And Parzival Copes (1994). Bioeconomic Analysis of Management Options for Tropical Fisheries Using a Bicriteria Programming Model. Marine Resource Economics, 9(1):47-66.

A possible approach to the management of multispecies multigear fishery in a developing country was explored. The small pelagics fishery in central Philippines was analyzed in three stages. A dynamic pool model represented the dynamics of the stocks. The optimal allocation of catch across competing fleets was modeled having regard for the pursuit of two conflicting objectives, maximizing employment and fishing profits. Alternative management schemes were then explored. On the basis of this criteria, the optimal fleet size was a small fraction of the existing fleet size. Calculation of increased target yields through regulation of fishing mortality and selectivity showed that the increase in optimal fleet size would be moderate because the current level of exploitation is close to that producing the maximum yield-er-recruit. An agenda for exploration of further management alternatives appropriate to the social and economic policy objectives of a developing country is discussed.

Pagano, Amy P., William G. Boggess, Charles B. Moss, and John Holt (1993). "Technology Adoption Decisions Under Irreversibility and Uncertainty: An Ex Ante Approach." SP93-28, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL, December, 31 pp.

Uncertainty about costs and requirements for environmental compliance is an important determinant of dairy producers' investment behavior. Ex ante forecasting of how uncertainty and irreversibility are likely to affect producers' responsiveness to agricultural technologies has implications for the design of environmental policies. Empirical analysis focused on Texas

producers' propensity to adopt free stall dairy housing. Free stall investments offer advantages from both productivity augmentation and pollution abatement. Implications of this ex ante paradigm for policy design and implementation are discussed.

Palko, Barbara Jayne, Lee Trent, and Harold A. Brusher (1987).

"Abundance of Spanish Mackerel, Scomberomorus maculatus, in the Southeastern United States Based on Charterboat CPUE Data, 1982-85." Marine Fisheries Review, 49(2):67-77.

Catch per unit effort (CPUE) data for Spanish mackerel over a broad geographic area were obtained from charterboats. In 1982, a survey was initiated to obtain daily catch and effort data on fishes commonly caught by charterboats in the southeast United States. Boat effort and Spanish mackerel CPUE data obtained from this survey during 1982-85 were analyzed. The offshore fishing zone (>10 fathoms) received the highest amount of trolling and other fishing efforts; the nearshore fishing zone (<=10 fathoms) received the second highest trolling effort and lowest other fishing effort; the estuarine fishing zone received the lowest trolling effort and the second lowest other fishing effort. CPUE of Spanish mackerel by other fishing was much lower than trolling for most areas and years. CPUE was highest in the estuarine zone when compared with the nearshore and offshore zones. In the southeastern United States from North Carolina to Texas, the highest CPUE occurred in areas within the eastern Gulf of Mexico from Louisiana to southwest Florida each year. Seasonally CPUE of Spanish mackerel was high in the warmer months in Georgia, the Carolinas, and the northern Gulf of Mexico states and in the colder months in the southeastern areas of Florida. Significant differences in CPUE among years were detected only in North Carolina and Louisiana.

Palmason, S.R. (1993). "Supervision of the Utilization of Fishery Resources off Iceland." Paper presented at the Workshop on Enforcement Measures, Organization for Economic Co-Operation and Development, Directorate for Food, Agriculture and Fisheries, Committee for Fisheries, September 21-22.

This report explains the options open to the Icelandic authorities for supervising the utilization of fishery resources in Icelandic waters. Emphasis is laid on explaining the development and implementation of supervisory activities. In general, political opinions on such supervisory activities will be excluded and the current system will be considered as the most important external factor with regard to the formulation and implementation of such supervisory activities.

Palmer, Robert (1997). Background Document - King Mackerel. Draft, Florida Marine Fisheries Commission, 9 pp.

A description of the king mackerel fishery along the coast of Florida and a discussion of some economic and biological trends.

Panayotou, Theodore and Donna Panayotou (1986). "Occupational and Geographical Mobility In and Out of Thai Fisheries." FAO Fisheries Technical Paper 271, Food and Agriculture Organization of the United Nations, Rome.

Using the results of two surveys taken five years apart in a number of Thai fishing villages and employing different methods of analysis, the present study estimates the degree of mobility among fishing households and identifies and measures the relative significance of impediments to mobility. It is

found that fishermen are responsive to economic incentives and do move between occupations to take advantage of earning differentials. This mobility, however, is tempered by noneconomic factors such as age, location, religion, isolation, and occupational preference. Labor appears to be quite mobile between occupations but less so between locations.

Panzar, John C. and Robert D. Willig (1978). "On the Comparative Statics of a Competitive Industry with Inframarginal Firms." The American Economic Review, 68(3):474-478.

A simple analytical model of a competitive industry with a rising supply curve is developed by positing that firms may have diverse endowments of a fixed factor in inelastic supply. Thus, in equilibrium, there may be inframarginal firms earning economic rents that are imputed to the fixed factor. When there are inframarginal firms, only the input market measure of social benefits is accurate.

Paris, Quirino (1988). "Long-Run Comparative Statics Under Output and Land Price Uncertainty." American Journal of Agricultural Economics, 70(1):133-141.

Several authors have noticed that, in the uncertain short run, the supply function may slope downward and the input demand functions may slope upward. These possibilities prevent the setup of unambiguous tests of rational behavior. In this article, testable hypotheses for the competitive firm operating in a price uncertain environment are derived assuming a long run horizon.

Some of these hypotheses take the form of Slutsky type relations involving the relative input demand functions (the ratios of input to output quantities). Homogeneity restrictions involving input and output mean prices, in general, are absent under uncertainty. Conditions for restoring this homogeneity are also discussed. The main result is the rediscovery of the importance of relative quantities for the analysis of a long run equilibrium.

Park, Hoanjae (1996). Econometric Welfare Evaluation of Regulatory Fishing Restrictions: A Synthetic Inverse Demand System Approach. Ph.D. Dissertation, Department of Economics, North Carolina State University, Raleigh, N.C., 188 pp.

This dissertation develops an integrated inverse demand system, called the synthetic inverse demand system (SIDS) extending Barten's (1993) ordinary demand approach into the inverse demand approach. It further extends the static SIDS system dynamically by incorporating habit formation. The current study suggests four possible SIDS systems and selects the system according to the average information inaccuracy criterion. Then the study proposes and applies some tools of welfare measurement appropriate for the inverse demand approach. In addition, this dissertation tackles aggregation problems since, for fish, one may hesitate to accept the species as the relevant economic commodity.

Parker, Jack C. (ed.) (1972). Key to the Estuarine and Marine Fishes of Texas. Texas Agricultural Extension Service, Department of Wildlife and Fisheries Science, Texas A&M University, College station, Texas, May, 177 pp.

A guide to the estuarine and marine fishers of Texas.

Parks, Peter J. and Manuel Bonifaz (1994). Nonsustainable Use of Renewable Resources: Mangrove Deforestation and Mariculture in Ecuador. Marine

Resource Economics, 9(1):1-18.

The paper provides a conceptual model that examines (i) open access exploitation and (ii) mangrove deforestation as two potential causes for the scarcity of post larval shrimp inputs to shrimp mariculture in Ecuador. Results indicate that conversion of mangrove ecosystems to shrimp ponds may have obtained short term profit at the expense of long term productivity. Open access collection of post larval shrimp may also have contributed to dwindling stock levels. Specific policy recommendations are presented, and future empirical studies are proposed.

Parks, Wes (ed.) (1988). Tuna Newsletter. Southwest Fisheries Center, National Marine Fisheries Service, 8604 LaJolla Shores Dr, P.O. Box 271, LaJolla, California.

A series of articles on the U.S. tuna fishery including imports, South Pacific Tuna Act of 1988, eastern tropical Pacific tuna fishery review, development of a Gulf of Mexico and south Atlantic yellowfin tuna fishery, and recent developments in tuna fisheries.

Parrack, Nancie Cummings (1986). "A Review of Gulf of Mexico Red Snapper Age and Growth." CRD-86/87-2, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL, October, 69 pp.

This study develops growth information required to estimate the age frequency of length samples from Gulf of Mexico red snapper commercial landings and recreational catches.

Parrack, Nancie Cummings (1989). "Determining Age Frequency From Length Frequency." MSAP/89/2, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, 75 Virginia Beach Drive, Miami, FL, April, 27 pp.

This manuscript reviews methods for classifying length frequencies into age frequencies. Age length keys and information on growth derived from mark-release and/or hard part data are needed. Stochastic procedures, that use size at age data and incorporate information on the variation of size within an age category, were identified as alternative ageing methods appropriate for ageing king and Spanish mackerel. Information on growth required for application of the stochastic methods (size and variation of size at age) was reviewed for king and Spanish mackerel and growth results not reported to date in the literature summarized and presented. The methods reviewed here in addition to the existing database of age and growth data can be used to classify king and Spanish mackerel catch at length distributions available from the recreational and commercial fisheries into age densities.

Parrack, Nancie (1993). "Updated Fisheries Information for Greater Amberjack Through 1992." Contribution: MIA - 92/93-77, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida, August, 32 pp.

A preliminary assessment of the Atlantic and Gulf greater amberjack fishery assessment through 1991 was presented in March 1993. Those results are readdressed in this report. Three important concerns of that study were the ability of the population model used to accurately assess the condition of the resource, the current biostatistical sampling levels in place for the



Seriola fishery, and future research needed to improve the assessment method. Those concerns are readdressed in this report. In addition catch statistics and reported landings for the commercial and recreational fisheries, biostatistical length and weight samples, summary recreational catch per effort information and bag limit analyses from headboat catches are presented through 1992. For comparison purposes, the population model, SLM, applied to the Atlantic and Gulf greater amberjack fisheries previously by Parrack (1993) is used to summarize the trends in the greater amberjack population dynamics from the combined fisheries.

Parrack, Nancie Cummings (1994). "Mackerel Catch Per Unit of Effort Abundance Indices: Data Sources Available and Procedures Used in the 1990-1994 Analyses." Miami Laboratory Contribution No. MIA-93/94-48, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida.

Comprehensive analyses of mackerel stocks during a 12 year period, 1983-1994, reveal that the amount and the quality of information available for investigating abundance trends varied. The complexity level of the analyses performed also varied during the period. Stock abundance trend information available since 1990 underwent more extensive reviews and complex standardization analyses. This note identifies the catch per effort abundance indices used in analyses of king and Spanish mackerel stock size levels since 1990 and provides some background regarding the recent CPUE abundance estimation procedures.

Parrack, Nancie Cummings (1994). "Notes Regarding Procedures Used in the 1993 and 1994 Mackerel and Cobia Bag Limit Analyses: Addendum Report to Miami Laboratory Contribution No. MIA-93/94-43." Miami Laboratory Contribution No. MIA-93/94-45, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida.

This addendum report comments on procedures used in previous bag limit analyses of mackerel and cobia stocks in the southeastern United States. In particular the analyses conducted for the 1991, 1992, 1993, and 1994 mackerel stock assessment panel meetings are discussed. This note briefly discusses the general approach used in the 1992 and earlier studies and describes the basic data available for analysis.

Parrack, Nancie C. and David B. McClellan (1986). "Trends in Gulf of Mexico Red Snapper Population Dynamics, 1979-85." Contribution No. CRD-86/87-4, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, FL, October, 116 pp.

This report presents information that updates reported commercial catches (in weight) and estimated recreational catches (in number) of U.S. Gulf of Mexico red snapper resources since 1979. These annual age specific catches and abundance indices, independent from catches, were used to obtain initial estimates of stock sizes and fishing mortality rates of red snapper assuming an eastern and a western Gulf of Mexico stock. The results of these investigations indicate that red snapper stocks have declined since 1979 as predicted from VPA investigations.

Parsons, George R. (1987). "The Opportunity Costs of Residential Displacement Due to Coastal Land Use Restrictions: A Conceptual Framework." Marine Resource Economics, 4:111-122.

This article develops practical measures of the change in economic welfare due to coastal land use restrictions. The measures are practical because they may be derived from current market data at modest cost and may be interpreted in a manner that is useful for coastal policy.

Pascoe, Sean (1993). "ITQs in the Australian South East Fishery." Marine Resource Economics, 8(4):395-401.

This paper outlines the main challenges and successes that have occurred in Australia's south east fishery as a result of ITQ management.

Pascoe, Sean (1995). Modelling the UK Demersal Trawl Component of the English Channel. In, Bio-Economic Modelling in the EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 31-43.

A preliminary model of the demersal trawl component of the multispecies U.K. component of the English Channel fishery is presented. This encompasses two metiers (sub-fisheries) - two otter trawl metiers and three beam trawl metiers. The model is the first step in development of a more comprehensive model of the fishery as a whole. In the model, the fleet is segmented by region of origin, boat type and boat size. The fishing activity of fleet boat segment is segmented by area (metier) and season fished. Catches and landings of ten key species (plus one aggregated category of other species) are estimated for each fleet segment in each fishing activity, based on the effort allocation of each fleet segment. Prices and costs are endogenous in the model. The model is developed as an optimization model, with the objective function being the maximization of total gross margins in the fishery.

Pascoe, Sean, Tony Battaglione, and David Campbell (1992). "A Bioeconomic Model of the Southern Shark Fishery." ABARE Research Report 92.1, Project 9343.103, Australian Bureau of Agricultural and Resource Economics, GPO Box 1563, Canberra 2601, Australian.

The southern shark fishery has shown signs of being overexploited and overcapitalized for a number of years. To assess the relative benefits likely to accrue from alternative management options, a bioeconomic model of the fishery was developed. In this research report the bioeconomic model of the southern shark fishery is described. The results of the simulations of alternative management plans and their effect on the profitability of the fishery are presented to demonstrate how the model may be used. The sensitivity of the model to various biological and economic parameters is also evaluated.

Paterson, D.G. and J. Wilen (1977). "Depletion and Diplomacy: The North Pacific Seal Hunt, 1886-1910." Research in Economic History, 2:81-139.

This article analyzes the economic motives for and the consequences of the North Pacific Fur Seal Controversy between Canada and the United States in the late nineteenth century. Both nations were faced with a prisoner's dilemma situation in which it would have benefited both to refrain from harvesting large amounts and yet, without explicit agreement, neither could afford to do so alone. As a result the herd was brought from a size of close to 2 million down to 140,000 animals.

Paulik, G.J., A.S. Hourston, and P.A. Larkin (1967). "Exploitation of Multiple Stocks by a Common Fishery." J. Fish. Res. Board Can., 24:2527-2537.

A complete analytical solution is presented for the problem of finding the common rate of exploitation that maximizes total sustained yield from a mixture of stocks when each stock follows a Ricker reproduction curve. A computer program is described that solves this problem for up to 20 stocks varying in both reproductive potentials and absolute sizes. Some aspects of the management of Pacific salmon and fishing strategies are discussed in relation to the question of obtaining maximum yields when harvesting mixtures of stocks under various constraints.

Pauly, D. and G.I. Murphy (eds.) (1982). "Theory and Management of Tropical Fisheries." Proceedings of the ICLARM/CSIRO Workshop on the Theory and Management of Tropical Multispecies Stocks, 12-21 January 1981, Cronulla, Australia.

The specific objectives of the workshop were to review models that are presently in use or that have been proposed for stock assessment in the tropics, to define the data requirements of various stock assessment and management methods, to review current research on stock assessment in tropical waters, and to identify the major constraints for stock assessment and management in tropical waters, and to formulate a feasible plan of action to overcome these constraints.

Pawlyk, Perry W. and Kenneth J. Roberts (19??). "Forecasting U.S. Shrimp Prices: A Comparison of Three Different Models." Draft Report, Center for Wetland Resources, Louisiana State University, Baton Rouge, Louisiana.

The size composition of shrimp imports has changed in recent years with the development of pond raised shrimp. The impact of these imports on U.S. shrimp markets is concentrated in the 26 to 40 count size range since the shrimp are usually raised to these sizes. So aquaculture has changed the quantity ratios between sizes of shrimp that would occur if all shrimp were harvested from wild stocks. This research was undertaken to understand the nature of these price fluctuations. Two different techniques for price forecasting are discussed in this paper: (1) time series models and (2) econometric models.

Pawlyk, Perry W. and Kenneth J. Roberts (1986). "Products and Markets for Small Louisiana Shrimp." Marine Fisheries Review, 48(4):65-70.

Louisiana has long been known for its sometimes controversial harvest of small shrimp from its inshore waters. With the trend toward landings of smaller shrimp from the Gulf, the economics of the small shrimp processing and marketing industry is of increasing importance. The production of three shrimp products, raw head-on, peeled, and canned, was found to be dependent on small shrimp supply. Over 20 percent of the shrimp moving through Louisiana's processing plants was shipped out of the state for further processing. Most of these were small, head-on shrimp. Louisiana is an important supplier of small shrimp products and small shrimp for processors in other Gulf states.

Peacock, F.G. and D.A. MacFarlane (1986). "A Review of Quasi-Property Rights in the Herring Purse Seine Fishery of the Scotia-Fundy Region of Canada." In N. Mollett (ed.) Fishery Access Control Programs Worldwide, Proceedings of the Workshop on Management Options for the North Pacific Longline Fisheries, p 215-230, Univ. Alaska Sea Grant Rep. 86-4.

The management of the herring purse seine fishery of Scotia-Fundy region

of Canada is reviewed by the authors. The management history is presented with particular emphasis on the aspects of the fishery that lead to the adoption of individual transferable quotas and the problems that developed with that program.

Pearse, Peter H. (1979). "Introduction to the Symposium on Managing Fishing Effort." Journal of the Fisheries Research Board of Canada, 36(7):711-714.

The symposium was designed to bring together a small number of leading fishery economists and fishery administrators with experience in the field of fisheries management from Canada, the U.S., and elsewhere. Our purpose was to pool our knowledge about the current state of the art in economic rationalization of fisheries, to document and analyze the available experience, and to explore avenues of needed policy research.

Pearse, Peter H. (1982). Turning the Tide, a New Policy for Canada's Pacific fisheries. Final Report of the Commission on Pacific Fisheries Policy, Vancouver, September, 292 pp.

This report identifies opportunities for reorganizing the commercial fisheries to put an end to their chronic instability and poor economic performance and start them on a healthier course of development, for preserving and enhancing sportfishing opportunities, and for securing Indians' traditional access to fish. These are not just theoretical possibilities; they are attainable through established technologies and regulatory methods and at a cost that is modest relative to the benefits.

Pearse, Peter H. (1992). "From Open Access to Private Property: Recent Innovations in Fishing Rights as Instruments of Fisheries Policy." Ocean Development and International Law, 23:71-83.

As pressures on ocean fisheries have grown, pervasive evidence of overexploited resources and economic distress has revealed fundamental weaknesses in traditional regulatory policies. In their search for new management approaches, fishing nations have recently turned their attention to the nature of fishing rights, and the trend is clearly toward more well defined, exclusive property rights. In a remarkably short time the tradition of open access to ocean fisheries has waned; rights to most of the world's fish resources have been appropriated by coastal states, their governments have excluded everyone from access to the stocks except those who hold licenses, and increasingly, the rights of license holders are quantitatively specified. Experience so far suggests that strengthening the property rights of fishing enterprises is a promising means of improving the management of marine resources as well as the economic performance of fishing industries, and it portends profound changes in fishing regimes.

Pearse, Peter H. and James E. Wilen (1979). "Impact of Canada's Pacific Salmon Fleet Control Program." J. Fish. Res. Board Can., 36:764-769.

The available statistical data are analyzed to appraise the success of Canada's Pacific salmon fleet rationalization program, in terms of the extent to which it has prevented fishing costs from rising in pace with the value of the catch. It is found that while the fleet's revenues increased at about the same rate before and after the scheme was introduced in 1969, the real capital employed increased more slowly under the controls than earlier. The program has, nevertheless, failed in its purpose of preventing further expansion of redundant capital in the fleet. The reasons for this failure, and for certain

apparent shifts in the structure of the fleet, are discussed.

Pedersen, Ole-Petter (1994). "A Multispecies Model of a Fjord System." C.M. 1994/P:12, Theme Session on Multispecies Interactions of Importance to the Groundfish Abundance Fluctuations, International Council for the Exploration of the Sea, St. John's, Newfoundland, Canada, September.

A multispecies model is introduced, applying techniques previously described by T. Laevastu. A stable solution for a typical Norwegian fjord is obtained. A stabilizing technique assuring convergence is used. After equilibrium is obtained, the ecosystem is released, and this 'out of control' scenario is simulated. A fleet regime is used, modelled through Cobb-Douglas equations. In addition a seabird dynamical regime was allowed to interact with the aquatic system. We found, despite release of previous constraints, the biomass solution tends to exhibit stable behavior, though transients occurs in a narrow time period after disturbance is applied. The solution is then moved to another equilibrium. Disturbance is in the form of excessive fishery, temperature oscillations, and removal of biomass due to airborne predators. The biomass dynamics during the year oscillates in a stable way, expressing good annual dynamics.

Pedersen, Søren Anker (1994). "Multispecies Interactions on the Offshore West Greenland Shrimp Grounds." C.M. 1994/P:2, Theme Session on Multispecies Interactions of Importance to the Groundfish Abundance Fluctuations, International Council for the Exploration of the Sea, St. John's, Newfoundland, Canada, September. 26 pp.

The paper gives a description of the exploited fishery system on the offshore West Greenland shrimp grounds, including recent findings of fish community structure and trophic relationships. Based on the analysis of fish stomachs from the key fish species and estimates of fish abundance obtained from assessment surveys the total annual consumption of northern shrimp (*Pandalus borealis*) and juvenile redfish by predatory fish in 1991-1992 has been calculated. A preliminary attempt to integrate the interrelationships between the main species and the fishery is made using a balanced, steady state model.

Pellegrin, Gilmore J., Jr. (1982). "Fish Discards from the Southeastern United States Shrimp Fishery." In Food and Agriculture Organization of the United Nations and International Development Research Centre (1982). Fish ByCatch: Bonus from the Sea, Report of a Technical Consultation on Shrimp Bycatch Utilization held in Georgetown, Guyana, October 27-30, 1981. Ottawa, Ont., IDRC, 163 pp.

Magnitude and species composition of fish bycatch are described for the Gulf of Mexico and south Atlantic shrimp fleets. Bycatch estimates for the Gulf were 15 times those for the south Atlantic. Highest estimates occurred in the north-central and northwestern Gulf and in the south Atlantic off the North Carolina and Georgia coasts. Catch compositions varied at the species level; however, Sciaenidae was the dominant family for both the Gulf and the south Atlantic. Gulf fauna included estuarine dependent species in subtropical environs and estuarine independent species in tropical environs.

Pellegrin, Gilmore J., Jr., Shelby B. Drummond, and Robert S. Ford, Jr. (1985). "The Incidental Catch of Fish By the Northern Gulf of Mexico Shrimp Fleet." Draft report, Mississippi Laboratories,

Southeast Fisheries Center, National Marine Fisheries Service,  
NOAA, Pascagoula, MS 39568-1207.

The northern Gulf of Mexico shrimp fleet was monitored from 1972 to 1980 to estimate the magnitude and species composition of fish bycatch. The highest bycatch estimate occurred in the north central Gulf during the warm season inside of 18 m. The lowest estimate (3,944 mt) occurred in the eastern Gulf in the same depth zone and season. An estimated 576,028 mt of fish are caught incidentally by the northern Gulf shrimp fleet annually. The north central Gulf influenced the bycatch heavily; contributing 50.3% of the total. Sciaenids dominated, comprising 52.47% with Atlantic croaker, Micropogonias undulatus (33.6%); spot, Leiostomus xanthurus (7.64%); sand seatrout, Cynoscion arenarius (5.85%); and silver seatrout, Cynoscion nothus (2.99%) being the major species.

Penn, Erwin S. (1973). "Price Spreads of Fish Products Among Producers and Distributors." U.S. Department of Commerce, National Oceanic Atmospheric Administration, National marine Fisheries Service, Economic Research Division, File Manuscript No. 151, May, 29 pp.

The rapid increase of fish prices has recently caused public concern. To find the cause of the difference between the price the fisherman receives for his product and the ultimate price paid by the consumer, this report provides an analysis of how the consumer's dollar is distributed to four marketing levels: fisherman, processor, wholesaler, and retailer.

The difference or margin between selling and purchasing prices of each level and the share of the consumer's dollar by each level and each cost component are calculated for 14 fish products. The report also analyzes the costs and profits incurred by each marketing function and describes the major influences on margin differences.

The purpose of the study is to provide a systematic guide that individual firms in the fishery can use to examine their margins, costs, and profits for each fish product, and compare them with the figures presented in this study as national averages for the same product.

Penn, Erwin S. (1978). "Marketing Bill of U.S. Fish-Food Products and Its Components." Draft report, Office of Scientific and technical Services, National Marine Fisheries Service, Department of Commerce, Washington, D.C., 49 pp.

Based on the cost analyses of price margins of 18 fish products at four functional levels (harvesting, processing, wholesale, and retail), cost bills are estimated and expanded to include all edible fish products harvested, imported, distributed, and consumed in the United States during 1972-77. Distribution of fish products takes two other important channels (functional levels) -- eating places and other food service institutions -- besides retail stores to reach consumers. Detailed estimates for 1972-77 are made for the following: a cost bill at each functional level of every fishery, an outlay for each cost item at six functional levels of each fishery, annual consumer expenditure on each fish product, and per capita consumption of all edible fish in dollar value.

Penn, Erwin S. (1979). "Cost Analyses of Fish Price Margins, 1972-77, at Different Production and Distribution Levels." Draft report, Economic Analysis Group, Office of Policy and Planning, National Marine Fisheries Service, Department of Commerce, Washington, D.C., 38 pp.

Each price margin of a fish product is composed of costs and profits

that are analyzed to estimate value added for the purpose of comparing economic contributions and productivities between sectors of each fishery and among fisheries. Costs are also regrouped to distinguish fixed from variable so as to enable the demonstration of how the alteration of costs structures will affect differently profit, price, and production.

Penn, Erwin S. and Wenona J. Crews (1979). "Value Added, Margins, and Consumer Expenditures for Edible Fishery Products in the United States, 1976-78.

The presentation in value terms of the basic estimates in this study makes it possible to produce analogous figures that can be compared with gross national product value of other industries, and total and per capita expenditures for other food products.

Penn, J.W. and N. Caputi (1986). "Spawning Stock-Recruitment Relationships and Environmental Influences on the Tiger Prawn (*Penaeus esculentus*) Fishery in Exmouth Gulf, Western Australia." Aust. J. Mar. Freshw. Res., 37:491-505.

A stock-recruitment relationship (SRR) between the spring spawning stock levels and the following autumn recruitment has been established for *P. esculentus* in Exmouth Gulf. The basic SRR fits the data well with the exception of 2 out of the 14 years when particularly severe cyclones occurred. This has been taken into account by using multiple regression techniques to incorporate the amount of rainfall in January and February as variables representing indices of cyclone activity (multiple correlation of 0.97). A hypothesis for the observed positive and negative effects of cyclones on recruit survival has been presented.

The relationship between autumn recruitment and resultant spring spawning stock (RSR) later that year and the effects of fishing, measured in effective effort units, has also been established (multiple correlation of 0.94). An examination of the interaction between the SRR and RSR relationships has been reported which suggests that, under average environmental conditions and high levels of effort, recruitment will move towards a new lower equilibrium level. The robustness of the relationships with respect to assumptions involved and potential sources of bias in the variables used have been evaluated and discussed.

Pennoyer, Steven (1998). NMFS Bycatch Plan. Memorandum for Rolland A. Schmitt, Assistant Administrator for Fisheries from Administrator, Alaska Region.

A request to include retained incidental catch in the NMFS definition of bycatch. This would prevent the elimination of the bycatch problem by regulating the retention of incidentally caught fish by Management Councils.

Penson, John B., Jr., Ernest O. Tettey, and Wade L. Griffin (1987). "An Econometric Analysis of Net Investment in Gulf Shrimp Fishing Vessels." Technical Article No. TA-20803 of the Texas Agricultural Experiment Station, Texas A&M University System.

This study evaluated aggregate investment behavior by fishermen for steel, wooden, and fiberglass fishing vessels in the Gulf of Mexico shrimp fishery and examined the implications of changes in the cost of acquiring debt and equity capital on the industry's investment response. Macroeconomic policies that lead to high real interest rates depress real net investment in this fishery. While low real interest rates are desirable for stimulating investment activities in the general economy, they add to the

overcapitalization problem that currently exists in the Gulf shrimp fishing industry. The theoretical model of aggregate investment behavior is justified statistically in this study.

Penson, John B., Jr., Ernest O. Tettey, and Wade L. Griffin (1988). "An Econometric Analysis of Net Investment in Gulf Shrimp Fishing Vessels." Fisheries Bulletin, 86(1)151-156.

The purpose of this study is to estimate an econometric model of annual real net investment in fishing vessels in the Gulf of Mexico and to determine the sensitivity of investment decisions in the industry to fluctuations in the cost of equity and debt capital. This study begins by examining the individual factors that affect the expansion of the stock of steel, wood, and fiberglass vessels in the Gulf fleet. The effects of alternative macroeconomic policies on investment expenditure trends in the Gulf shrimp fishery are then studied. The final section of the paper presents some concluding remarks.

Perez Farfante, Isabel (19??). "A Key to the American Pacific Shrimps of the Genus Trachypenaeus (Decapoda, Penaeidae), With the Description of a New Species." Fishery Bulletin, 69(3):635-646.

Study of American Pacific members of the genus Trachypenaeus reveals that variation in armature of the telson includes not only movable spines, but also fixed spines and even no spines at all. It also confirms that the eighth somite bears two arthrobranchiae instead of one arthrobranchia and one pleurobranchia. A new species, Trachypenaeus fuscina, is described, the specific features of T. faoea Loesch and Avila are presented, and a key to the five members of the genus occurring in the region, together with their ranges is included.

Perez Farfante, Isabel (1970). "Diagnostic Characters of Juveniles of the Shrimps Penaeus aztecus, P. duorarum, and P. brasiliensis (Crustacea, Decapoda, Penaeidae)." U.S. Fish and Wildlife Service, Special Scientific Report-Fisheries No. 599, February, iii+26 pp., 25 Figs.

Illustrated tables are presented for the identification and sex determination of juveniles (with carapace lengths of 8 mm or more) of three grooved shrimps of the genus Penaeus occurring in various areas along the North American Atlantic coast, in the Gulf of Mexico, and in Bermuda. Included is an account of the development of the petasmata, thelyca, and appendices masculinae.

Perez, Lisandro and Philip G. Groth (19??). "Socio-Demographic Study of the Shrimp Fishery in A Tri-Parish Area of Louisiana." Cooperative Agreement No. 03-7-042-35132, National Marine Fisheries Service, National Oceanic and Atmospheric Administration and Center for Wetland Resources, Louisiana State University.

This report presents the findings of a study of the social and demographic aspects of the shrimp fishery in a tri-parish area of Terrebonne, Lafourche, and St. May, Louisiana. These three parishes were selected so as to coordinate this sociological study with the studies being carried out by economists and biologists in the same region. The basis for the multidisciplinary project is a mark-recapture experiment conducted by a team of biologists from the Center for Wetland Resources at Louisiana State University in cooperation with the National Marine Fisheries Service. The socio-demographic aspect of the study, presented here is intended to provide



information on the social and demographic setting of the mark-recapture experiment. Specifically, our goal was to analyze the existing body of data concerning three aspects of the fishery: (1) the demographic structure of the population residing in the tri-parish area; (2) the characteristics of "shrimping communities" and persons engaged in the fishery; (3) the social organization of the fishery - the norms and values that govern the patterns of interaction within the fishery. In addition, we were to identify areas in which additional data and research are needed to more fully understand the fishery.

Perkins, Garey B. (1984). "Value Added to Shrimp Processed in the Gulf of Mexico, 1982." Food and Fiber Center, Cooperative Extension Service, Mississippi State University, November, 24 pp.

This study assessed the value added through processing and consequently the economic contribution of shrimp harvested and processed in the Gulf of Mexico.

Pernetta, John C. and Danny L. Elder (19??). "Climate, Seal Level Rise and the Coastal Zone: Management and Planning for Global Changes." Paper prepared for the General Assembly of the International Union for the conservation of Nature and Natural Resources.

The current use and importance of coastal zones to human populations is outlined against a background of the present environmental problems that include habitat loss and degradation, resource depletion and increasing densities of population in coastal areas. The potential impacts of climatic change and sea level rise on coastal environments, resources and their use are discussed and the implications of the inadequacy of our present predictive capabilities for future planning are outlined. The current unsustainable patterns of coastal development and mismanagement of the use of coastal areas will accentuate the potential impacts of climate change and sea level rise. An urgent international need is for the development of a coordinated system for vulnerability assessment of coastal areas in order that priority areas for action can be identified in relation to their physical, biological, and human vulnerability to predicted changes.

Perra, Paul (1992). By-catch Reduction Devices as a Conservation Measure." Fisheries, 17(1):28-29.

A draft policy statement by the Executive Committee of the American Fisheries Society that states (1) Encourage state and federal agencies to promote the development, use, and implementation of bycatch reduction devices to conserve fish and wildlife; (2) Support the continuation and expansion of conservation engineering programs to reduce bycatch of undersize or nontarget species; (3) Request states and other entities conducting research on turtle and other excluder devices to develop and support programs to extensively field test all BRD designs that allow for juvenile finfish escapement; (4) encourage programs, through its membership, publications, and by other means, that demonstrate the usefulness of bycatch reduction devices to the commercial fishing industry; and (5) Support efforts to hold national and international conferences on conservation engineering to improve technology transfer between researchers and other groups developing bycatch reduction and other fish separator devices.

Perret, William S. (1987). "The U.S. Shrimp Fishery - Production and Management." Presented at Shrimp World III, Cancun, Mexico, November, 15 pp.

This paper presents a general overview of the shrimp fishery in the United States from a regional and state basis, by species composition, and by management regimes utilized to regulate this industry.

Perret, William S., James E. Weaver, Roy O. Williams, Patricia L. Johansen, Thomas D. McIlwain, Richard C. Raulerson, and Walter M. Tatum (1980). "Fishery Profiles of Red Drum and Spotted Seatrout." Fishery Profile No. 6, Gulf States Marine Fisheries Commission, April, 60 pp.

This profile of red drum and spotted sea trout includes a description of the resource and fishery, the present management system, and associated problems.

Peterson, George L. and Alan Randall (eds.) (1984). Valuation of Wildland Resource Benefits, Westview Press, Boulder CO.

This book is a collection of papers that applies economic theory and cost benefit analysis to the wildlands of North America. Wildlands provide a wide variety of services to people as well as serving as special kinds of places for recreational use and existence value. Legislation and administrative practice require that these public wildlands be managed and conserved in the public interest.

Phillips, Robert E. (1976). "A Study of Procedures for Development of Bio-Socio-Economic Models of the U.S. Gulf Coast Shrimping Industry for Use in Resource Management." Purchase Order No. 01-6-042-11202, U.S. Army Engineer District, Galveston, TX, funded by the National Marine Fisheries Service, Galveston, TX, November, 284 pp.

This report gives recommended procedures for the construction of bio-socio-economic models of the U.S. shrimping industry, with emphasis on the Gulf Coast shrimp fisheries. The kinds of models described are designed to aid in the formulation of optimal policies in public regulation of the shrimp resource. The focus in this report is on economic principles of the modeling problem, with biological and sociological aspects included as they relate to the economic analysis.

Picou, J. Steven, Christopher L. Dyer, and Mark A. Moberg (1992). "Bayou La Batre, Alabama: Socioeconomic Profile and the Social Impacts of Turtle Excluder Device Regulations." A final report prepared for the Bayou La Batre Chamber of Commerce by the Department of Sociology and Anthropology, University of South Alabama, Mobile, Alabama, January, 115 pp.

The primary objective of this research is an assessment of the social impacts of turtle excluder device regulations on the fishing community of Bayou La Batre, Alabama. Data for this research were collected from a stratified, random sample of households in the community and from all high school sophomores and juniors. The social impact model evaluated perceptions of patterns of stress, disruption, social change, and projected behavior changes. Career goals and social alienation were investigated for local high school students.

Picou, J. Steven, Duane A. Gill, Christopher L. Dyer, and Evans W. Curry (1992). "Disruption and Stress in an Alaskan Fishing Community: Initial and Continuing Impacts of the Valdez Oil Spill." Forthcoming: Industrial Crisis Quarterly.

Within the framework of the disaster research literature, this study analyses the initial (5 month) and continuing (18 month) community disruption and stress resulting from the Valdez oil spill. The research design includes data collected from both "impact" and "control" communities. A comparative analysis provides the basis for evaluating the social impacts of the spill in 1989 and 1990, while patterns of disruption and stress are also identified within the control community.

Pile, Anthony (1981). "Shrimp Industry; An Analysis and Account of the Shrimp Market in the United Kingdom." London Business School, Sussex Place, Regent's Park, London N.W., June, 37 pp.

The question of growth in the shrimp industry is addressed using the markets in the U.K. as examples. The shrimp industry is described in part I and the U.K. market is described in part II with projects for the future provided.

Pindyck, Robert S. (1982). "Jointly Produced Exhaustible Resources." Journal of Environmental Economics and Management, 9:291-303.

Natural resources are often produced jointly from composite ores that in turn are extracted from fixed reserve endowments. In this paper market behavior is examined for such resources and it is shown how the price of each resource will depend on its demand, and the demands and storage costs for the other resources present in the ore. The measurement of resource scarcity is discussed and the effects of uncertainty over future resource demands are examined. It is shown that the competitive market will still extract, produce, and store at socially optimal rates if firms are risk neutral and the average cost of storage is constant. Policy implications are noted, particularly with reference to government stockpiling programs.

Pindyck, Robert S. (1984). "On Monopoly Power in Extractive Resource Markets." Energy Laboratory Working Paper No. MIT-EL 84-008WP, Center for Energy Policy Research, MIT Energy Laboratory, May.

Potential monopoly power in extractive resource markets is reduced by the depletability of reserves. This paper examines the dependence of monopoly power on resource rent, and on uncertainty over future reserve levels. A model is developed that treats reserves as inventories that fluctuate stochastically over time as a result of exploration, development, and production activities. Solutions of the model illustrate how output and monopoly power vary with the elasticity of demand, rent as a fraction of price, and the variance of reserve fluctuations. It is shown that uncertainty over future reserves can speed up production, and by reducing resource rent, restore part of the monopoly power otherwise lost because of depletion. Antitrust implications are also discussed.

Pindyck, Robert S. (1984). "The Measurement of Monopoly Power in Dynamic Markets." Sloan School of Management Working Paper No. 1540-84.

In markets where price and output are determined intertemporally, the standard Lerner index is a biased and sometimes misleading measure of actual or potential monopoly power. This paper shows how the Lerner index can be modified to provide a meaningful instantaneous measure of monopoly power applicable to dynamic markets, and discusses the aggregation of that instantaneous measure across time. The importance of accounting for intertemporal constraints in antitrust and related applications is illustrated by the analysis of four examples: an exhaustible resource, the "learning

curve," costs of adjustment, and dynamic adjustment of demand. An analogous index of monopsony power applicable to dynamic markets is also suggested.

Pindyck, Robert S. (1984). "Uncertainty in the Theory of Renewable Resource Markets." Review of Economic Studies, 51:289-303.

The natural growth rate of most renewable resource stocks is in part stochastic. This paper examines the implications of such ecological uncertainty for competitive equilibrium in a market with property rights. We show that stochastic fluctuations add a risk premium to the rate of return required to keep a unit of stock in situ, and we examine the effects of fluctuations on resource rent. Examples are used to show that extraction can increase, decrease, or be left unchanged as the variance of the fluctuations increases, depending on the extent of market "self-correction". Regulatory implications are also discussed.

Placenti, Vincenzo, Gianfranco Rizzo, and Massimo Spagnolo (1995). Bio-Economic Fishing Effort Optimization in Mediterranean Fisheries. In, Bio-Economic Modelling in the EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 68-91.

The objective is the development of a bioeconomic model for optimal management of fishing effort in some regions of the Mediterranean area. A catch-effort model, specifically built for multispecies and multi-gear fisheries, has been developed using time series data of catch and fishing effort. The three catch-effort models have been tested on three homogeneous sets of data for Italian, Spanish, and French fisheries using logistic and biological models. In the Italian and Spanish cases, both logistic dynamic exponential models and biological Schnute model exhibit satisfactory capabilities in describing catch and effort data, while Schaefer model represents larger errors with respect to the previous applications to the Italian fishery. In the French case, the best results have been obtained by the exponential model, while the Schaefer model failed in some species-areas combinations. Cost and revenues are evaluated by an economic submodel. The proposed optimal distributions of fishing effort, obtained by solving a nonlinear constrained optimization problem by numerical techniques, show that it is possible to achieve relevant benefits on both economic and biological sites adopting articulate but realistic strategies for fishing effort reduction and redistribution.

Plan Development Team (1990). "The Potential of Marine Fishery Reserves for Reef Fish Management in the U.S. Southern Atlantic." NOAA Technical Memorandum NMFS-SEFC-261, 40 pp.

Marine fishery reserves (MFRs), areas with no consumptive usage, are recommended as a viable option for management of reef fisheries in the U.S. southern Atlantic region. MFRs are designed to protect reef fish stocks and habitat from all consumptive exploitation within specified geographical areas for the primary purpose of ensuring the persistence of reef fish stocks and fisheries. Fishery reserves are intended to protect older and larger fishes. This will benefit reef fisheries by protecting critical spawning stock biomass, intra-specific genetic diversity, population age structure, recruitment supply, and ecosystem balance while maintaining reef fish fisheries. The MFR concept is easily understandable by the general public and possibly more easily accepted than some other management strategies. Fishery reserves provide some insurance against management and recruitment failures, simplify enforcement, and have equitable impact among fishery users. Data collection needs solely for management are reduced and management occurs

without complete information and understanding about every species and interaction. Use of fishery reserves will establish U.S. leadership in producing model strategies for cooperative international reef resource management in the Caribbean. Large resident fishes that wander out of reserves can help maintain certain trophy fisheries. MFR sites with natural species equilibrium will allow measurement of age, growth, and natural mortality for fisheries purposes and will provide a basis for other educational, economic, and scientific benefits. Because there is no fishing within MFRs, impacts of hook and release mortality are eliminated and the temptation for incidental poaching is reduced. A mixed management strategy is recommended where 20% of the shelf is MFR while the remaining 80% is managed for optimal yield by any of several traditional options. Coordinated fishery reserve efforts in state waters would enhance the benefits of MFRs. The short term impacts on total harvest caused by placing fishing habitat into fishing reserves should be compensated by long term fishery benefits.

Platt, Jonathan L. (1988). "Estimating the Impact of Bag Limits on Charterboat Anglers; Theory, Purpose, and Variable Definition." Draft Report, Southeast Fisheries Center, National Marine Fisheries Service, Miami, Florida.

This paper deals with the analysis of proposed regulatory actions direct at Gulf of Mexico reef fish. It develops a theoretical framework for estimating costs and benefits of proposed regulations to control the harvest in recreational reef fish fisheries.

Platt, Jonathan L. (1988). "Visitation Modeling - Travel Cost Method Model Aggregation Theory and Variable Development." Draft Report, Southeast Fisheries Center, National Marine Fisheries Service, Miami, Florida.

A review of travel cost methodology.

Platt, Jonathan L. (1989). "Estimating the Economic Impacts of Hypothetical Grouper Bag Limits in the Destin/Panama City, Florida Charterboat Fishery." NOAA Technical Memorandum, NMFS-SEFC-227, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, May, 72 pp.

This study measures the short run economic impacts of hypothetical reef fish bag limits upon the charterboat industry in the Panama City and Destin Ports of northwestern Florida using a 1985 survey of charterboat anglers conducted by Arndorfer and Bockstael (1986) using a travel cost demand model. Estimates of both recreational demand (annual number of trips) and recreational value (annual consumer surplus) are developed.

Platt, Jonathan L. (1991). "The Marine Recreational Fishery Statistics Survey, A Comparative Analysis of Effort and Participation Estimates in the Southeastern U.S.; 1979-1988." NOAA Technical Memorandum, NMFS-SEFC-269, March, 41 pp.

Although the Marine Recreational Fishery Statistics Survey measures catch, effort, and participation, the focus of this report is on effort and participation estimation. While estimates of effort and participation are used in many disciplines, they are critical for aggregation purposes in the field of recreational economics. Recreational economic models often focus upon the average angler or trip. To calculate total economic impacts from these models for a state or subregion, the impacts from the average angler or trip must be expanded by the appropriate estimate of subregional anglers or

trips. State or subregional estimates of anglers or trips are therefore a necessary component of the overall equation. The economic impacts for the average angler or trip are often relatively small when compared to the aggregated estimates of effort or participation, therefore trip and angler estimates often drive the total impact estimate. As a result, it is very important to obtain accurate estimates of trips and anglers.

Platt, Jonathan L. (1991). "Utilizing the Marine Recreational Fishery Statistics Survey for Recreational Economic Modeling: Problems and Suggestions." NOAA Technical Memorandum, NMFS-SEFC-276, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, March, 51 pp.

This paper reviews the data collected by the National Marine Fisheries Service Marine Recreational Fishery Statistics Survey in terms of its applicability to recreational economic modeling and suggests modifications to the survey to specifically address recreational economic needs.

Platt, Jonathan L. (1991). "Recreational Databases in the Southeast: Applicable to Economic Modeling." NOAA Technical Memorandum, NMFS-SEFC-282, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, April, 61 pp.

A list of saltwater fisheries related recreational economic data bases for the southeastern region of the U.S. is presented. The data bases are divided into groups reflecting the categories corresponding to (1) estimation of angler recreational values and (2) analysis of the profitability of marketed components of the marine recreational fishing sector; e.g. charter and party/head boat industries.

Platt, Jonathan L. (1991). "Qualitative Analyses of Red Snapper Management Alternatives: Recreation Sector." Draft Report, Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Blvd., St. Petersburg, FL.

The recreational sector has been broken down into three primary red snapper oriented fishing modes: private boat, head/party boat, and charter boat (shoreline mode is not a significant mode for this species due to the need to access reefs). The private boat sector represents self captained boat based fishing activity by anglers owning or renting boats. Head/party and charter boats reflect the "for hire" recreational fishing sector where anglers hire the services of a captain and boat. Head boats represent those crafts (regardless of size) where price is figured on a per head basis. Charter boat prices are figured on a per trip basis regardless of the size of the fishing party. For each red snapper management alternative, a qualitative discussion shall be presented for each of these subsectors of the overall recreational sector.

Plourde, Charles (1970). "Optimal Exploitation of a Replenishable Natural Resource." Thesis, University of Minnesota, August, 81 pp.

This dissertation deals with the economic problem of managing stocks of replenishable natural resources in situations where the product that is derived from the resource is of commercial value and where use of the resource is not privately owned. Two basic models are developed to describe the economy and to identify the problems of resource utilization; costless

production and then a two good market with labor costs. Quotas and taxes are studied as two possible management measures to achieve social welfare optimality. Lastly, maximum sustained yield conservation measures are found to have little economic merit.

Plourde, Charles (1970). "A Simple Model of Replenishable Natural Resource Exploitation." American Economic Review, 6:518-23.

This paper's purpose is to consider maximum sustained yield programs of replenishable natural resource exploitation and to question the validity of these programs in satisfying social goals.

Plourde, Charles (1979). "Diagrammatic Representations of the Exploitation of Replenishable Natural Resources: Dynamic Iterations." Journal of Environmental Economics and Management, 6:119-126.

Geometric representations of two dynamic models of replenishable natural resource harvesting are provided. A well-known simple model is presented where the only cost of production is the opportunity foregone. That is, present consumption implies a reduction in future consumption possibilities. Diagrams show the iterations of an optimal program. A four-quadrant diagram is used to illustrate a short run equilibrium and the dynamics that will lead to a long run solution on the bionomic transformation curve.

Plourde, Charles and Richard Bodell (1984). "Uncertainty in Fisheries Economics: The Role of the Discount Rate." Marine Resource Economics, 1(2):155-170.

Standard models of management of a single species fishery generally assume that the biomass is of known size and that it is generated by a well specified deterministic growth law. In reality the biomass is of uncertain size and usually subject to random growth. Several authors have addressed the problem of random growth assuming a known initial biomass and have shown that lowering the planning discount rate proportional to the variance is an optimal planning procedure assuming small perturbations. In this paper, we assume that the growth function is nonrandom but dependent upon a biomass stock of unknown size. We shall show that a planner should raise the discount rate relative to the certainty equivalent case by an amount related to society's distaste for risk to manage the biomass optimally over time. As is to be expected, the optimal steady state biomass will be less than would occur in a situation of certainty.

Plourde, Charles and J. Barry Smith (1989). "Crop Sharing in the Fishery and Industry Equilibrium." Marine Resource Economics, 6(3):179-193.

This article presents a model of commercial fishing in a stochastic environment that focuses on the labor-employment contract. In a partial equilibrium context, the authors show that when boat owners and crew members are risk averse, crop sharing is the optimal contract, and the resultant labor employment level will be greater than with a suboptimal wage contract. Industry effects and steady state resource growth limitations are introduced into a market equilibrium model. In this extended model, market equilibria will also involve sharing contracts. These will result in greater employment, which comes at the expense of reduced resource stocks and higher than necessary harvesting costs. The article also examines how industry regulation such as licensing, quotas, and subsidies will differ if the prevailing contract is crop sharing as compared with a wage. Despite the fact that crop

sharing contracts are privately optimal in a regulated setting, they may not be socially optimal.

Plourde, Charles and David Yeung (1989). "Harvesting of a Transboundary Replenishable Fish Stock: A Noncooperative Game Solution." Marine Resource Economics, 6(1):57-70.

In this study we use a N-person differential game structure to represent a renewable resource industry in which the decision agents are few in number and noncooperative (as would be the case, for example, in international fishing wars). As an illustration we assume an environment similar to that presented by Levhari and Mirman (1980) to derive a set of tractable strategies. Although there is no guarantee that the stock size would always be positive with human harvesting in the Levhari and Mirman case, our model provides growth dynamics that rule out negative stocks. Explicit solutions of equilibrium game strategies and a steady state level of stock are derived. Finally, we demonstrate that in situations when stock size enters the production function, combined maximization such as an international treaty is more "conservative" than individual maximization.

Podesta, Guillermo P., Joan A. Browder, and John J. Hoey (1991). "Exploring the Association Between Swordfish Catch Rates and Thermal Fronts on a Portion of the U.S. Longline Grounds in the Western North Atlantic." ICCAT Working Document, SCRS/91/-45, University of Miami, Rosenstiel School of Marine and Atmospheric Science, 4600 Rickenbacker Cswy., Miami, FL, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL, National Fisheries Institute, 1525 Wilson Blvd., Suite 500, Arlington, VA.

Associations between ocean surface thermal fronts and the swordfish catch rates of U.S. longline vessels were explored. The study area was the western North Atlantic off the United States, extending from 32° N to 45° N and from 76° W to 63° W. To locate and describe fronts, we used three variables computed from satellite derived sea surface temperature (SST): horizontal gradient, distance to nearest thermal surface front, and frontal density. Most of the fishing effort analyzed occurred along the edge of the continental shelf, where there was a high frequency of frontal presence. Very high catch per unit effort (CPUE) occurred more frequently in the vicinity of fronts than would be expected by chance. The high CPUE variability that could not be explained by our frontal parameters suggested other, unmeasured factors also influenced catch rates.

Poffenberger, John R. (1981). "Economic Feasibility of the Marine Turtle Excluder Device." A report submitted in fulfillment of a project statement for the Marine Mammals and Endangered Species Program, NMFS, SEFC, 75 Virginia Beach Drive, Miami, Florida, August, 8 pp.

This report evaluates the economic feasibility of the Turtle Excluder Device developed during 1980.

Poffenberger, John R. (1982). "An Analysis of Fishery Economic Data Relating to Commercial Mackerel Fisheries." NMFS-SEFC-101, NOAA Technical Memorandum, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL, March, 35 pp.



Production functions and cost functions are integrated into a model of the coastal migratory pelagics fishery. However, the lack of adequate data and the need for biological parameters severely restricts the development of the model.

Poffenberger, John R. (1982). "Economic Status of the Offshore Shrimp Fishery in the Gulf of Mexico." NOAA Technical Memorandum, NMFS-SEFC-99, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida, March, 18 pp.

The purpose of this report is to present some basic indicators of the offshore shrimp fishery in the Gulf of Mexico on prices, production, and vessel costs and revenue that may provide some insight into the economic status of the fleet during 1991. A secondary purpose of the report is to present a general prognosis for the economic viability of the fishery during 1982.

Poffenberger, John R. (1982). "Estimated Impacts of Texas Closure Regulation on Ex-Vessel Prices and Value, 1981 and 1982." NOAA Technical Memorandum, NMFS-SEFC-111, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida, December, 34 pp.

This report presents analytical findings regarding the Texas closure's effects on ex-vessel price and value. The primary purpose of this research is to empirically estimate the magnitude of the price change resulting from the estimated change in landings due to the closure regulation. The estimated change in price is used to provide empirical estimates of the amount that the ex-vessel value has changed as a result of the regulation. The report also provides the estimated effects of the 1981 closure regulation for the twelve month period beginning in May and ending in April, 1982.

Poffenberger, John R. (198?). "Estimated Impacts on Ex-Vessel Brown Shrimp Prices and Value as a Result of the Texas Closure Regulation." Draft report, Southeast Fisheries Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida.

Estimates of the effect on shrimp prices as a result of changes in offshore landings due to the Texas Closure regulation are presented. Also, the change in ex-vessel value (or gross revenue) to the brown shrimp fishery resulting from the closure regulation is calculated.

Poffenberger, John R. (1982). "Estimated Impacts on Ex-Vessel Brown Shrimp Prices and Value as a Result of the Texas Closure Regulation." Marine Fisheries Review, 44(9-10):38-43.

Estimates of the effect on shrimp prices as a result of changes in offshore landings due to the Texas Closure regulation are presented. Also, the change in ex-vessel value (or gross revenue) to the brown shrimp fishery resulting from the closure regulation is calculated.

Poffenberger, John R. (1983). "Review of the 1982 Shrimp Fishery in the Gulf of Mexico." Draft report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Miami, Florida, May, 7 pp.

The penaeid shrimp resources in the Gulf of Mexico provided 423 million dollars in gross income to shrimp fishermen that represented about 70 percent of the ex-vessel value reported for all fisheries in the Gulf in 1982. In addition to the ex-vessel value generated by the shrimp resources, this report summarizes four other aspects of the fishery; landings, prices, productivity and harvesting costs. Although landings were down substantially from 1981, the economic condition of the harvesting sector was good during 1982. The outlook for 1983 suggests a similar situation, albeit significant variations in domestic landings could alter that outlook.

Poffenberger, John R. (1984). "Estimating the Effects of King Mackerel Bag Limits on Charter Boat Captains and Anglers: A Project Outline." Draft report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Miami, Florida, October, 19 pp.

A project proposal to obtain recreational fishing values for king mackerel from charterboat survey data. The proposal outlines travel cost and contingent valuation methods in relation to the king mackerel recreational fishery in northern Florida. The objectives of the proposed study are to determine if the demand for charter boat operations is affected by changes in the number of fish an angler can keep, to measure this relationship empirically, to determine which survey method is best suited for estimating a demand curve for charter boat operations, and the effects of bag limit restrictions on these curves.

Poffenberger, John R. (1985). "Operational and Financial Characteristics of Reef-Fish Vessels in the South Atlantic and Gulf of Mexico Areas." North American Journal of Fisheries Management, 5:379-388.

Cost and revenue data collected from reef fish fishermen in the southeastern United States provided a comprehensive financial and operational profile of commercial fishing vessels during 1980-1981. Analysis of variance test showed that significant differences existed between vessels operated in the south Atlantic areas versus vessels operated in the eastern Gulf of Mexico, although the financial characteristics of these vessels were not significantly different. On the contrary, the financial characteristics of vessels using bottom longlines were significantly different than vessels equipped with the traditional handline fishing gear. Owner operated vessels also had significantly better financial performance than firm operated vessels. Returns to labor, management, and owner's equity showed considerably larger returns for longline equipped and owner operated vessels compared to handline equipped and firm operated vessels. The former two groups of vessels also were comparatively more efficient based on three measures of vessel efficiency. Lastly, risk analyses were performed for several operational and financial characteristics of these vessels, and they showed little or no difference in risk between vessels equipped with longlines compared to vessels using handlines. Comparisons of risk, however, did indicate that owner operated vessels were operated less conservatively than vessels operated by nonowners. Errors in data collection, inappropriate use of statistical procedures, and understanding the concept of risk abound in this analysis.

Poffenberger, John R. (1986). "Economic Impacts of the Texas Closure, 1981-1985." A report prepared for the Gulf of Mexico Fishery Management Council, Economics and Statistics Office, Southeast Fisheries Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, December, 63 pp.

The impact of the Texas Closure on the western Gulf of Mexico in terms of trips, catches, revenues, domestic supplies at Texas ports, and employment in coastal counties of Texas is analyzed. No discernable effects are found in a descriptive analysis of the shrimp landings files.

Poffenberger, John R. (1986). "Estimated Impacts of Texas Closure Regulation on Ex-Vessel Prices and Value, 1984-1985." NOAA Technical Memorandum NMFS-SEFC-184, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Economics and Statistics Office, 75 Virginia Beach Drive, Miami, FL, October, 12 pp.

A federal regulation closes the fishery conservation zone (FCZ) in the Gulf of Mexico off the coast of Texas to fishing for brown shrimp beginning in late May until the middle of July when the area is reopened to commercial fishing. The objective of this regulation is to essentially eliminate fishing mortality on brown shrimp during a period of rapid growth in their life cycles. Analyses are performed to estimate the effects of these regulations on the amount of shrimp caught and landed and the value of the catch. The effects on catch are estimated in Nichols (1986) and his estimates are used to estimate the effects of the closure on ex-vessel prices and value. According to Nichols, the closure during May through mid July, 1984 resulted in an increase of 1.4 million pounds of brown shrimp. This increase in landings is estimated to have resulted in an increase in total revenue to the fishery of about \$18.7 million. Preliminary estimates for the May to mid July, 1985 closure are also provided that indicate a range of impacts from a loss of \$5.2 million to a gain of \$756 thousand.

Poffenberger, John R. (1987). "An Economic Assessment of the Fisheries for King and Spanish Mackerel." Economics and Statistics Office, Southeast Fisheries Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, FL.

This economic assessment provides (1) a description of the economic conditions in the king and Spanish mackerel fisheries in the southeastern United States and (2) estimates of the effects of existing regulations on these fisheries. These two species are important to both recreational and commercial fishermen and it is important to describe the conditions in both of these fisheries.

Poffenberger, John R. (1987). "Economic Impacts of the Texas Closure, 1985-1986." A report prepared for the Gulf of Mexico Fishery Management Council, Economics and Statistics Office, Southeast Fisheries Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, FL.

The impact of the Texas Closure on the shrimp fishery of the Gulf of Mexico is discussed in this report. The net effect of the modified area closure in 1986 is estimated to be an increase of \$190 thousand compared to the net effect if the FCZ had been closed out to 200 nautical miles. The 1985 closure resulted in a loss of \$170 thousand.

Poffenberger, John R. (1987). "Shrimp Management in the Southeastern United States." Draft report, National Marine Fisheries Service, Southeast Fisheries Center, Miami, FL.

The impacts of the shrimp fishery management plan for the Gulf of Mexico and the proposed plan for the south Atlantic are reviewed for 1981 to 1985.

The management strategies in these two areas are the same. Area closures have been implemented in the Gulf of Mexico and are being considered in the south Atlantic region. The motivation for these closures is, however, different for the Gulf and south Atlantic regions. The purpose of the closure in the Gulf is to increase total revenue to the fishery on an annual basis. The closure in the south Atlantic is being developed to provide better recruitment to the fishery in years when environmental conditions are expected to severely reduce recruitment the following year.

Poffenberger, John R. (1996). Comments on Shrimp Amendment 9 Regulatory Impact Review. Letter to Brad Brown, Director, National Marine Fisheries Service, Southeast Fisheries Center, Miami, FL.

Comments on the regulatory impact review of proposed bycatch reduction management regulations contain in shrimp amendment 9.

Poggie, John J., Jr., Robert B. Pollnac, and C. Van Dusen (1996). "Intracultural Variability in the Cognition of Danger Among Southern New England Fishers." Marine Resource Economics, 11(1):23-30.

The costs of the dangers of commercial fishing are very high, yet fishing vessel safety regulations are frequently met with lack of enthusiasm or even rejection by fisheries. Why would fishers reject regulations designed to increase their safety? There is a strong possibility that some of the rejection is the result of lack of cognitive sharing and communication between originators of the regulations and the fishers for whom the regulations are designed. This paper examines the pattern of cognition about danger of the occupation among fishers and relates these patterns to sociocultural differences in two southern New England ports. The intent of the study is to help bridge the gap between regulators and users by providing culturally appropriate information that can be used to design more effective policy, training, and enforcement programs.

Poggie, John J., Jr., Robert B. Pollnac, and Miguel Fierro (1988). "Factors Influencing the Success of Fishermen's Cooperatives in Ecuador." Marine Resource Economics, 5(3):231-242.

The fishermen's cooperative is viewed by many as the ideal type of organization for use in improving the welfare of fishermen in development projects (cf. Meynell, 1984; Jentoft, 1986). Major development agencies such as the Food and Agriculture Organization of the United Nations and the World Bank also advocate their use. For example, a review of World Bank fishery projects between 1976 and 1981 indicated that 53% involved fishermen's cooperatives (Pollnac, 1985). Judging from the relatively high failure rate that appears to exist for this type of organization, however, it is clear that their development is a difficult matter.

The success of fishermen's cooperatives depends on a large number of factors as evidenced by the numerous variables identified in the literature for local organizations in general (Esman and Uphoff, 1984) and fishermen's organizations in particular (Poggie, 1980a; Meynell, 1984; Pollnac, 1988). Pollnac (1985) identified no fewer than 21 important determinants of success for fishermen's organizations, some of which are clusters of variables. It appears, however, that there may be several important dimensions that underlie the reported concomitants of the success and failure of fishermen's organizations. As a means of furthering our understanding of these basic dimensions, this study analyzes a number of items reported in the literature to be associated with the success and failure of this type of organization.

Polinsky, A. Mitchell and Steven Shavell (1975). "The Air Pollution and Property Value Debate." The Review of Economics and Statistics, 57(1):100-104.

After summarizing the debate over what constitutes a correct interpretation of econometric studies of the relationship between air pollution and property values (Anderson and Crocker, Freeman), a model of residential location and land rent determination that accounts for the influence of air pollution is developed as a point of departure for a critical discussion the debate. The regression studies cannot be used for predictive purposes except to the extent that the city is small and there is mobility among cities and that the assignment model cannot be used for prediction in the way that has been suggested.

Polinsky, A. Mitchell and Steven Shavell (1976). "Amenities and Property Values in a Model of an Urban Area." Journal of Public Economics, 5:119-129.

The dependence of property values on a schedule of amenities is examined in the case of a small and open city and in the case of a closed city. Questions concerned with the predictability and interpretation of changes in equilibrium property values following an improvement in amenities are considered in these cases. The problem of identifying the implicit demand for amenities from a single equilibrium rent schedule is also addressed.

Pollack, Susan (1988). "Swordfish Management: The Ineffective Debate Over Regulation of this Valuable Species is as Wide-Ranging and Stormy as the Waters in Which It Swims." National Fisherman, January, 4 pp.

A discussion of swordfish regulations and the management process.

Pollack, Susan (1995). A Bycatch Success Story. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

The Nordmore grate used in New England shrimp (Pandalus borealis) trawls greatly reduces finfish bycatch and without any loss in shrimp harvest rates according to an NMFS study.

Pollack, Susan (1995). New England Groundfish Discards. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

New England groundfish fishermen who face dwindling stocks from over fishing are also discarding juvenile fish from their nets. Proposed solutions to this problem are to increase the minimum mesh size, reduced minimum fish size, and the use of diamond mesh nets that allow for increased fish escapement.

Pollack, Susan (1995). A Promising Collaboration. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

A discussion of harbor porpoise bycatch in the Maine gillnet fishery and possible solutions is presented. An experiment using pingers attached to the net to drive off or warn porpoises is being developed to test its ability to reduce bycatch levels.

Pollak, Robert A. (1969). "Conditional Demand Functions and Consumption Theory." Quarterly Journal of Economics, 10:60-78.

A conditional demand function that expresses demand for a food as a function of its own price, the prices of some (but not all) other goods, total expenditure on these goods, and the quantities of the remaining goods is introduced in this paper. Conditional demand functions while related to ordinary demand functions are directly relevant to the analysis of consumer behavior in the short run, when fixed commitments prevent instantaneous adjustment to the long run equilibrium and to the study of consumer behavior under rationing.

Pollak, Robert A. (1995). "Regulating Risks." Journal of Economic Literature, 33(1):179-191.

A review of two books on risk and its regulation. The results of the two books are discussed in terms of risk assessment, the scientific component of risk regulation. The article concludes by discussing whether the proposals for practical reform are likely to create institutions that engender enough trust to succeed.

Pollak, Robert A. and Michael L. Wachter (1975). "The Relevance of the Household Production Function and Its Implications for the Allocation of Time." Journal of Political Economy, 83(2):255-277.

This paper provides a critique of the household production function approach and its application to the allocation of time. It is argued that many applications of the model, especially those making use of implicit "commodity prices," require that the households' technology exhibit constant returns and no joint production; otherwise, implicit commodity prices depend on the household's preferences as well as on its technology and the prices of market goods. Furthermore, joint production is pervasive in situations involving the allocation of time. In situations where household production theory does not provide a satisfactory framework for analysis, the paper suggests alternative approaches.

Pollard, Jon (1994). "Limited Entry Fishing Rights: Property Implications." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, General Council, Alaska Region.

This paper discusses the concept of property in relation to individual transferable quotas (ITQs). While considered intangible property, limited entry fishing rights are not considered private property by the courts. Therefore, compensation is not necessarily required if the government revokes or takes these rights. The courts note that the licensing agencies ordinarily retain the statutory authority to regulate uses of public lands and waterways in the public interest.

Pollock, David E. (1986). Review of the Fishery for and Biology of the Cape Rock Lobster Jasus lalandii with Notes on Larval Recruitment. Can. J. Fish. Aquat. Sci., 43:2107-2117.

The South African fishery for the rock lobster Jasus lalandii currently yields about 3800 metric tons (8.4 million animals) of which more than 90% are males. Males grow much faster than females, and a size limit which is fairly large in relation to the size and age at maturity protects females from exploitation for most of their life spans, thereby ensuring a high level of larval production from the population. Exploitation rates in the fishery are controlled by means of quotas on fishing companies, as well as catch limits on individual fishing grounds. Quotas are reassessed annually to maintain instantaneous fishing mortality rates of approximately 0.3 on all grounds.

Catch rates on most grounds have been increasing since area catch limits were introduced in 1980, and seasonal averages now vary between 3 and 12 kg per trap-day. Although annual indices of puerulus larval recruitment are not available, and the stock-recruitment relationship is unknown, it appears that relatively stable yields can be maintained despite fluctuations in puerulus recruitment. Density dependent regulatory mechanisms operative in juvenile and young adult stages tend to dampen large variations in the numbers of adults entering the fishable size range each year. Variations in puerulus recruitment are likely to result from changes in the paths and velocities of extensive offshore currents which eventually return larvae toward the coast of South Africa after many months of pelagic existence.

Pompe, Jeffrey and Charles E. Rockwood (1993). "A Cooperative Management Solution to a Fishery Commons." Marine fisheries Review, 55(4):14-18.

A common property resource with open access, such as a fishery, will be used to excess when faced with sufficient demand. This will lead to an excessive amount of effort on the part of the fishery, resulting in a depletion of the stock. This paper discusses the development of a property rights regime for the Atlantic calico scallop, Argopecten gibbus, fishery of Florida. The management solution of the Calico Scallop Conservation Association (CSCA) provides an example of the assignment of property rights to a common property resource without resorting to governmental intervention. In this particular fishery, self regulation limited early harvesting is uneconomic; there may be other fisheries in which self regulation could be economically efficient and biologically appropriate. While this solution may not be applicable to all common property resources, for those cases that may be similar, the example of the CSCA provides valuable information that may be helpful in establishing a more efficient use of the resource. Some types of government facilitation may also be useful.

Pontecorvo, Giulio (1988). "The State of Worldwide Fishery Statistics: A Modest Proposal." Marine Resource Economics, 5(2):79-81.

Pontecorvo laments the lack of economics input in the management of marine fishery resources and proposes a data collection scheme that will meet minimum management requirements and needs.

Pontecorvo, Giulio (1989). "Reply to Comments by Francis T. Christy, Jr. and Michael Robinson and John Gulland on "The State of Worldwide Fishery Statistics: A Modest Proposal"." Marine Resource Economics, 6(1):87-88.

Pontecorvo takes issue with the comments of the authors on data collection needs versus management of fisheries.

Pontecorvo, Giulio (1989). "Canadian, Mexican, and U.S. Fisheries: Recent Develops." Marine Fisheries Review, 51(1):18-22.

The paper reviews the landings and value of fishery landings for the Canadian, Mexican, and U.S. fisheries after the adoption of 200 mile limit legislation in those countries. The available information on technological change and productivity in fisheries is presented and discussed.

Pooley, Samuel G. (1993). Economics and Hawaii s Marine Fisheries. Marine Fisheries Review, 55(2):93-101.

This paper reviews economic research conducted on Hawaii s marine

fisheries over the past ten years. The fisheries development and fisheries management context for this research is also considered. The paper finds that new approaches are required for marine fisheries research in Hawaii: A wider scope to include other marine resource and coastal zone issues, and increased and closer collaboration between research and the fishing community.

Pooley, Sam (ed.) (1996). NMFS Guidelines on Limited Access Programs. Draft report, Limited Access Working Group, National Marine Fisheries Service, Limited Access Planning Branch, Juneau, Alaska, May.

Advice and recommendations to NMFS fishery managers and the regional fishery management councils on the development and implementation of limited access programs is provided. Important touchstones are identified that fishery managers should consider in developing or revising limited access programs.

Pooley, Sam (ed.) (1997). Issues and Options in Designing and Implementing Limited Access Programs in Marine Fisheries. Draft report, NMFS Limited Access Working Group, National Marine Fisheries Service, Southwest Fisheries Science Center Honolulu Laboratory, 2570 Dole St., Honolulu, Hawaii, August, 94 pp.

Advice and recommendations to NMFS fishery managers and the regional fishery management councils on the development and implementation of limited access programs is provided. Important principles are identified that fishery managers should consider in developing or revising limited access programs.

Pooley, Sam (1998). Issues and Options in Designing and Implementing Limited Access Programs in Marine Fisheries. NOAA-TM-NMFS-SWFSC-252, NMFS Limited Access Working Group, National Marine Fisheries Service, Southwest Fisheries Science Center Honolulu Laboratory, 2570 Dole St., Honolulu, Hawaii, May, 73 pp.

Advice and recommendations to NMFS fishery managers and the regional fishery management councils on the development and implementation of limited access programs is provided. Important principles are identified that fishery managers should consider in developing or revising limited access programs.

Pooley, Samuel G., Samuel F. Herrick, Jr., Dale E. Squires, Cynthia J. Thomson, and G. W. Silverthorne (1991). Southwest Fisheries Science Center and Southwest Region Economics Research Plan, 1990-95. Administrative Report H-91-07, Southwest Fisheries Science Center, National Marine Fisheries Service, May, 12 pp.

This report identifies priorities for the 1990-95 period in the collaborative economics research efforts of the Southwest Fisheries Science Center and Southwest Region economists under the jointly administered socioeconomic research fund. The plan first identifies the major research priorities and topics and then sketches out proposed economics research activities for the next five years.

Pope, Rulon D. and Arne Hallam (1988). "Separability Testing in Production Economics." American Journal of Agricultural Economics, 70(1): 142-152.

The implications of separability in production are examined using duality. Restrictions on the profit function implied by separability of the production function, and vice versa, are derived in a simple way. These restrictions are then calculated for commonly used classes of functional



forms. Then the method is used to test separability of the profit function using experimental production data. The hypothesis that the profit function was separable (plant nutrients from spacing unit costs) could not be rejected. This implies that an aggregate price index for nutrients is appropriate.

Pope, Rulon D. and Rod F. Ziemer (1984). "Stochastic Efficiency, Normality, and Sampling Errors in Agricultural Risk Analysis." American Journal of Agricultural Economics, 66(1):31-40.

This paper examines the power of tests for efficiency. The relationship between sample size, parameter values, and the family of probability distributions is stressed. Some findings are that the probability of correctly ranking distributions is frequently very low regardless of sample size. It is generally lowest as distributional parameters (such as the means) of the two distributions being compared are of similar magnitudes. Further, the empirical distribution function performs extremely well as compared to maximum likelihood estimators.

Porter, Gareth (1997). "The Euro-African Fishing Agreements: Subsidizing Overfishing in African Waters." Visiting Scholar, Center for International Environmental Law, Washington, D.C., March.

The fishing agreements between the European Union (EU) and African countries are striking examples of subsidized access to foreign fishing grounds. These agreements have permitted the EU to redeploy large numbers of fishing vessels from EU fishing grounds to those of African countries. The Euro-African fishing agreements show how the subsidization of fishing access can be devastating to fishery resources.

Porter, Gareth (1997). "The Euro-African Fishing Agreements: Subsidizing Overfishing in African Waters." In World Wildlife Fund s Subsidies and Depletion of World Fisheries, WWF s Endangered Seas Campaign, 1250 Twenty-Fourth St., NW, Washington, D.C., 136 pp.

The fishing agreements between the European Union (EU) and African countries are striking examples of subsidized access to foreign fishing grounds. These agreements have permitted the EU to redeploy large numbers of fishing vessels from EU fishing grounds to those of African countries. The Euro-African fishing agreements show how the subsidization of fishing access can be devastating to fishery resources.

Porter, Gareth (1997). "Fisheries Subsidies, Overfishing and Trade." Visiting Scholar, Center for International Environmental Law, Washington, D.C., 88 pp.

Although subsidies have been a major issue in international trade negotiations for decades because of their trade distorting effects, only in the past decade have their negative impacts on the environment been widely recognized. Reducing subsidies is one of the few trade and environment issues where the objectives of trade liberalization and environmental protection are clearly complementary rather than being in tension with one another. Fishery subsidies specifically may be the most environmentally destructive natural resource subsidies of all. This paper provides an analytical framework for international consideration of the issue of fisheries subsidies, trade, and the environment. The first section views nature resource subsidies in economic theory and examines the mechanisms by which these subsidies contribute to environmental degradation. The second section shows how

fisheries subsidies affect fish stocks from a theoretical perspective, analyzes the different types of subsidies to the fish harvesting sector and discusses the problem of estimating global fisheries subsidies. Case studies of fisheries subsidies, their impacts on overcapacity and overfishing, and an examination of the impact of fisheries subsidies on global trade in fish products and the treatment of such subsidies in the existing trade regime are provided. Finally, three possible approaches to creating new international norms governing subsidies that support fishing overcapacity are discussed.

Porter, Gareth (1997). "The Role of Trade Policies in the Fishing Sector, Fisheries Subsidies, Overfishing and Trade." Visiting Scholar, Center for International Environmental Law, Washington, D.C., 55 pp.

Although subsidies have been a major issue in international trade negotiations for decades because of their trade distorting effects, only in the past decade have their negative impacts on the environment been widely recognized. Reducing subsidies is one of the few trade and environment issues where the objectives of trade liberalization and environmental protection are clearly complementary rather than being in tension with one another. Fishery subsidies specifically may be the most environmentally destructive natural resource subsidies of all. This paper provides an analytical framework for international consideration of the issue of fisheries subsidies, trade, and the environment. The first section views nature resource subsidies in economic theory and examines the mechanisms by which these subsidies contribute to environmental degradation. The second section shows how fisheries subsidies affect fish stocks from a theoretical perspective, analyzes the different types of subsidies to the fish harvesting sector and discusses the problem of estimating global fisheries subsidies. Three case studies of fishery subsidies and their impacts on overcapacity and overfishing are provided. Finally, three possible approaches to creating new international norms governing subsidies that support fishing overcapacity are discussed.

Porter, Gareth (1998). "Estimating Overcapacity in the Global Fishing Fleet." World Wildlife Fund, Washington, D.C., 20 pp.

It is useful to have a general view of how serious the overcapacity problem is on average worldwide. This paper suggests that the evidence indicates a much higher level of overcapacity than has been previously recognized. The Garcia and Newton estimate of 30% excess capacity in world fisheries is approximately 1/5 the actual level of total excess capacity in the world fisheries of 150%.

Porter, Gareth (1999). "Op." World Wildlife Fund, Washington, D.C.

The role of subsidies in international trade and on domestic and global fisheries and fishing capacity.

Portney, Paul R. (1994). "The Contingent Valuation Debate: Why Economists Should Care." Journal of Economic Perspectives, 8(4):3-17.

The authors aim is to provide an overview of the contingent value method and the debate surrounding it. He also suggests why this debate should matter to economists, both professionally and in their roles as citizens and consumers. Whether the economics profession likes it or not, it seems inevitable that contingent valuation methods are going to play a role in public policy formulation.

Powers, Joseph E. (1982). "The Relationship Between Average Size and Fishing Effort for Blue and White Marlin in the Atlantic Ocean." SEFC/SAW/BSS/7, National Marine Fisheries Service, Southeast Fisheries Center, Virginia Beach Drive, Miami, FL 33149, August.

Assessments of the status of stocks of blue marlin (Makaira nigricans) and white marlin (Tetrapterus albidus) have been performed by Farber and Conser (1982) for the Atlantic Ocean using the data base collated by the International Commission for the Conservation of Atlantic Tunas (ICCAT). These analyses used production models relating yield to effort. Average size data are available from both the Japanese longline fishery and from the recreational fishery. Trends of average size are analyzed in this study and related to fishing effort. The results of these analyses are compared to the production model results assuming single Atlantic wide stocks of blue and white marlin.

Powers, Joseph E. (Chairman) (1994). "Report of the Shark Evaluation Workshop." National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL 33149, March, 47 pp.

In conducting this evaluation of large coastal shark groups, the committee found that for many species considered, shark abundance in waters off the U.S. Atlantic and Gulf of Mexico coasts is depressed due to fishing removals. Catch rate information indicates that the abundance of many of the species and species groups could have declined by about 50 to 75% from the early 1970's to the mid 1980's. The downward trend in available CPUE observations probably accurately reflects further shark abundance decreases since 1986 when shark catches dramatically increased until the 1993 quota was adopted. Recovery of this resource to levels of the 1970's will be slow (perhaps 30 years or more in some cases), due to the relatively low intrinsic rates of increase exhibited by most shark species. Measuring recovery or decline under a TAC implemented in 1993, even with precise abundance indices, may not be possible for a decade or more. Given the information available, increases in the TAC for sharks were considered risk prone with respect to promoting stock recovery. In fact, considering the reproductive profiles of sharks and the general insufficiency of fishery data upon which to base analyses, any TAC might be considered risk prone relative to stock recovery of large coastals. To increase the probability of recovery, the single most important measure, supplemental to controlling the annual harvest level, that might be implemented is a closure of nursery grounds to directed fishing during the pupping season. The greatest impediments to improving shark stock assessments continue to be the general lack of species and size specific catch (landed and discarded) and effort data, as well as only limited fishery independent measures of shark abundance and productivity.

Powers, Joe (1995). "Untitled." Draft memorandum to Tony Lamberte, National Marine Fisheries Service, Southeast Fisheries Science Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, FL.

Projections of U.S. Gulf of Mexico king mackerel yield, stock size, number of eggs (spawning production) and Spawning potential ratio (SPR) for the 1993/94 through 2012/13 fishing years.

Powers, Joseph E., C. Phillip Goodyear, and Gerald P. Scott (1987). "The Potential Effect of Shrimp Fleet Bycatch on Fisheries Production of Selected Fish Stocks in the Gulf of Mexico." National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Coastal Resources Division, Contribution Number

CRD-87/88-06, 75 Virginia Beach Drive, Miami, FL 33149, November.

Despite the uncertainties in the data, the analysis of Nichols et al. (1987) attached, and herein indicate there is potential for increased fishery production of red snappers and mackerels by reduction of bycatch. It appears that the potential is largest for red snapper, where reduction in bycatch might increase yield by as much as 90 percent. The potential for percentage increase in Spanish mackerel yield in reducing bycatch is less than that for red snapper; the potential is even less for king mackerel.

Pritchard, David L., Ellie R. Roche, and Frederick C. Sutter (1995). "Marine Fisheries Initiative Program." 1994 Annual Report, Cooperative Programs Division, Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL, January, 40 pp.

The annual report presents major findings from studies conducted with MARFIN funds and presents a summary of the analyses presented at the annual conference. Bycatch, reef fish, and coastal and oceanic pelagic fish research is highlighted. The report also contains a summary of fiscal year 1994 projects and an annotated bibliography of completed research.

Prochaska, F.J. (1978). "Prices, Marketing Margins, and Structural Change in the King Mackerel Marketing System." Southern Journal of Agricultural Economics, July, pp.105-109.

This article determines the functional relationship between the marketing margin and market prices, volume marketed, change in market structure, and the cost of marketing services for King mackerel in Florida. A price dependent, single equation demand model based on monthly data is estimated and used to derive a marketing margin equation. All the usual problems of simultaneity are evident in the analysis of mackerel price.

Prochaska, F.J. (1978). "Theoretical and Empirical Considerations for Estimating Capacity and Capacity Utilization in Commercial Fisheries." American Journal of Agricultural Economics, 60(5):1020-1025.

The purpose of this paper is to address the question of capacity with particular reference to the development of fishery management plans. The discussion is divided into three parts. First, the theoretical construct of capacity will be examined. The second part is a discussion of methodological problems in empirical measurement. The final section contains a review of measures of capacity used in a sample of fishery management plans.

Prochaska, F.J. (1984). "Principle Types of Uncertainty in Seafood Processing and Marketing." Marine Resource Economics, 1(1):51-66.

Uncertainty in the processing and marketing sector arise in the sales of final products, the procurement of seafood supplies, and the operation of the marketing firm or processing plant. Major uncertainties in marketing and processing seafoods are associate with inferior market price and quantity data, time delays between procurement of raw product and sales of final products, breakdown in market signals between market levels, product image changes, and export sales. Major supply related uncertainties are associated with variations in environmental and biological factors, factors determining type and quantity of fishing effort, government regulations, and foreign supply factors. Uncertainties internal to the operation of processing and marketing firms are encountered through storage-related activities, new

technology, government regulations, and new product and market development activities. Uncertainties associated with foreign trade appear to be of extreme importance because of the relative growth and size of foreign markets.

Prochaska, F.J. (198?). "Shrimp Imports...Impact On The Domestic Industry." Marine Log, Florida Sea Grant.

Impacts of shrimp imports on the domestic shrimp fishery. The report cites that a 10 cent per pound increase in ex-vessel prices results in the entry of 171 new boats and vessels into the Gulf of Mexico fishery. With new entrants offsetting income gains to existing fishing craft in the fleet.

Prochaska, F.J. (1985). "Shrimp Mariculture and Imports: Effects on U.S. Markets and Research Needs." Draft report, Department of Food and Resource Economics, University of Florida, Gainesville, FL.

A discussion of the impacts of maricultured shrimp on shrimp import levels and the shrimp industry. Much work remains to be done to quantify the impacts of shrimp mariculture on the domestic price for shrimp products.

Prochaska, Fred J. and Charles M. Adams (1984). "Analysis of U.S. Shrimp Prices at Ex-Vessel, Wholesale, and Retail Market Levels." Draft report, Department of Food and Resource Economics, University of Florida, Gainesville, FL.

Previously no research has been conducted to determine price relationships between market levels. Thus, differential market impacts of various price determinants and restrictive policy measures such as tariffs and quotas could not be analyzed at various market levels and for other market dimensions, such as markets defined by product size classes. The goal of the research reported in this paper was to provide information on which differential impacts can be estimated. The format of the present paper is to (1) review trends in prices, margins, and market shares for 21-25 and 31-40 count raw, headless shrimp, (2) determine direction of price flows and existence of asymmetric price response between ex-vessel, wholesale, and retail market levels, and (3) determine factors affecting prices for the two size classes at the three market levels.

Prochaska, Fred J. and Chris O. Andrew (1974). "Shrimp Processing in the Southeast: Supply Problems and Structural Change." Southern Journal of Agricultural Economics, July:247-252.

A growing deficit in shrimp landings relative to processing needs in the southeast region of the United States concerns both industry and government officials. Structural changes in the shrimp industry are encouraged by the growing supply deficit. The shrimp supply situation and resulting industry organization changes are the primary concerns of this paper.

Prochaska, Fred J. and James C. Cato (1975). "Cost and Returns for Northern Gulf of Mexico Commercial Red Snapper - Grouper Vessels by Vessel Size, 1974." SUSF-SG-75-006, Marine Advisory Bulletin, Department of Food and Resource Economics, Florida Agricultural Experiment Station, Florida Sea Grant Program, University of Florida, Gainesville, FL, December, 8 pp.

Cost and returns data provide a basis to which individual fishing firms can compare their own operations to determine any needed change in their business management or fishing practices. This data set is collected from

interviews with boat owners and captains representing ten commercial vessels operating from Florida ports. The budget analysis reported is the average for two vessel size groups: 42-47 feet in length (small) and 57-69 feet in length (large).

Prochaska, Fred J. and James C. Cato (1975). "Northwest Florida Gulf Coast Red Snapper - Grouper Party Boat Operations, An Economic Analysis, 1974." SUSF-SG-75-007, Marine Advisory Bulletin, Department of Food and Resource Economics, Florida Agricultural Experiment Station, Florida Sea Grant Program, University of Florida, Gainesville, FL, December, 9 pp.

The purposes of this Bulletin are to present estimates of (1) the average number of fishermen per boat on a yearly basis, (2) expenditures by fishermen (or revenues to boat owners), and (3) costs of operating party boats. The analysis is based on data collected through personal interviews with the owners of seven boats. Boats included in the survey ranged from 65 to 85 feet and have a carrying capacity ranging up to over 50 fishermen per boat. These boats are also often referred to as "Day Boats," "Head Boats," or "Drift Boats." The data do not include smaller charter boats which usually carry 6 to 10 fishermen and are chartered by individuals or on a small group basis. The boats included in the study have their home ports along the north Florida Gulf Coast.

Prochaska, Fred J. and James C. Cato (1980). "Economic Considerations in the Management of the Florida Spiny Lobster Fishery." Fisheries, 5(4):53-37.

This paper discusses how conceptual economic ideas pertaining to the management of the fishery may be applied and to relay empirical results from economic models that have been estimated for the Florida spiny lobster industry.

Prochaska, Fred J. and James C. Cato (1981). "Economic Conditions in the Gulf of Mexico Shrimp Industry: 1960-1981." Staff Paper 180, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida 32611.

This paper is designed to review the historical economic conditions contributing to the severe 1980-1981 financial situation. Historical movements in landings, values and prices are reviewed. The number of boats and vessels that have entered the fishery are noted and the relationship of this entry pattern to price movements is analyzed. Prices are discussed with respect to consumer demand and imports. In addition, the possible actions that can be taken to prevent a long term reoccurring situation are presented.

Prochaska, Fred J. and Walter R. Keithly (1984). "Market Impacts of U.S. Shrimp Imports." Draft report, Department of Food and Resource Economics, University of Florida, Gainesville, FL.

Imported shrimp accounted for over one half of the annual shrimp consumption in the U.S. through 1981. This relatively large proportion of the total market is alleged to cause serious financial problems for the domestic shrimp fishing sector by lowering prices, especially during periods of declining U.S. demand for shrimp. Tariffs and quotas have repeatedly been suggested by shrimp fishermen and their representatives as a solution to the fishermen's problems with the latest organized effort in the early 1980's. Since that time increased world shrimp supplies, principally from mariculture,

have caused new concerns for the U.S. shrimp fishing industry. Imports increased dramatically since 1981 reaching a high of 421 million pounds (heads off) in 1983 that accounts for over 70 percent of the supply of shrimp in the U.S. Opposition to tariffs and quotas comes from three sources. Consumers feel shrimp available for consumption would be reduced and would be available only at considerably higher prices. Marketing and processing firms contend that the cost of operations would be increased due to a reduction in volume of shrimp for processing and marketing. Finally, industry analysis hypothesize that increased ex-vessel prices due to reduced imports will be at best a short run solution to the low or negative economic returns due to the expected increased entry into the fishery associated with the increased prices.

Prochaska, Fred J. and Walter R. Keithly (1984). "Market Impacts of U.S. Shrimp Imports." In Proceedings of the Workshop on Shrimp and Prawn Markets. International Institute of Fisheries Economics and Trade and the South Carolina Wildlife and Marine Resources Department, Charleston, South Carolina, July 26-27.

The domestic import demand for shrimp and world supply of shrimp to U.S. buyers is analyzed via a simultaneous model to determine principal factors affecting the import market. Import price, quantity, and tax revenue effects of proposed tariffs and/or quotas will then be analyzed. Finally an ex-vessel domestic shrimp price equation is developed to determine the effect of a set of economic factors on ex-vessel shrimp prices. Estimated changes in import quantities demanded under the second objective are incorporated in the ex-vessel model to estimate the effects of the proposed tariffs and quotas on ex-vessel prices.

Prochaska, Fred J. and Walter R. Keithly (1984). "Market Impacts of U.S. Shrimp Imports." In Proceedings of the Workshop on Shrimp and Prawn Markets, International Institute of Fisheries Economics and Trade, Oregon State University, International Institute of Fisheries Economics, Corvallis, OR.

The domestic import demand for shrimp and world supply of shrimp to U.S. buyers is analyzed via a simultaneous model to determine principal factors affecting the import market. Import price, quantity, and tax revenue effects of proposed tariffs and/or quotas will then be analyzed. Finally an ex-vessel domestic shrimp price equation is developed to determine the effect of a set of economic factors on ex-vessel shrimp prices. Estimated changes in import quantities demanded under the second objective are incorporated in the ex-vessel model to estimate the effects of the proposed tariffs and quotas on ex-vessel prices.

Prochaska, Fred J. and Walter R. Keithly, Jr. (1986). "Production Costs and Revenues in the Florida Oyster Industry." Sea Grant Project No. R/LR-E-8, Grant Number NA80AA-D-00038, Report Number 87, Florida Sea Grant College, Sea Grant Extension Program, University of Florida, Gainesville, FL, July, 16 pp.

The purpose of this study was to collect information concerning the production practices and associated costs and revenues of the oystermen in Franklin County for the year starting September, 1982 and ending in August, 1983. A total of twenty-five questionnaires were completed through personal interviews.

Prochaska, Fred J. and Paul D. Landrum (1981). "Spiny Lobster, Stone Crab and Secondary Fishery Costs and Revenues in the Florida Keys, 1978-79 Season." Florida Sea Grant College, Report Number 42,

University of Florida, Gainesville, FL, May, 35 pp.

The objective of study was to analyze production, costs and revenues for the multiple species fisheries in which spiny lobster fishermen in the Florida Keys participate. Results of the analyses provide (1) individual fishermen a base with which they can compare their own lobster operations to determine if any changes in their fishing practices were warranted, (2) analysis of the profitability of fishery alternatives to lobster fishing, (3) an economic base on which alternative fishery management programs can be analyzed, and (4) economic information to support industries such as credit institutions, boat builders, etc.

Prochaska, Fred J. and Joel S. Williams (1976). "Economic Analysis of Cost and Returns in the Spiny Lobster Fishery by Boat and Vessel Size." Florida Sea Grant Publication, SUSF-SG-76-004, University of Florida, Gainesville, Fl, July, 18 pp.

An economic survey of 25 Florida Keys lobster boat and vessel captains was conducted during the fall of 1974 to obtain cost, production, and returns data for the 1973-74 season. This study provides (1) individual fishing firms a base with which they can compare their own operations to determine if any change in their fishing practices is warranted, (2) economic information on sales and purchases that may be used as an indication of the economic contribution made by the lobster fishery to the area economy, and (3) and economic basis for determining the economic consequences of alternative management programs that might be considered by the industry and regulatory agencies. To accomplish these objectives, production practices and costs and returns are analyzed on an industry average basis and by four boat and vessel size classes. This bulletin reports on information pertaining to the first objective of the overall study.

Prochaska, Fred J. and Joel S. Williams (1978). "An Economic Analysis of Spiny Lobster Production by Individual Firms at Optimum Stock Levels." Southern Journal of Agricultural Economics, December:93-100.

This analysis provides information for decision making for individual lobster firms and to provide estimates of production relationships for use in the analysis of aggregate industry level management programs that might be imposed at current or optimum stock levels using an estimated production relationship for the 1973-1974 stock level.

Prochaska, Fred J., R. Allen Morris, and James C. Cato (1977). "An Economic Analysis of King Mackerel Production by Hook-and-Line on the Florida Atlantic Coast." Food and Resource Economics Department, University of Florida, Gainesville, FL.

The objectives of this bulletin are to (1) provide individual fishing firms basic economic information with which they can compare their own operations and (2) provide economic information to support industries such as credit institutions for the king mackerel fishery. To accomplish these objectives, production practices and cost and returns were analyzed on an industry average basis. Ranges in individual estimates are presented in addition to the industry averages. Individual fishermen can compare their operations to the average and range for specific cost and returns items to determine where changes in their own practices may be profitable.

Prochaska, Fred J., Mauro Suazo, and Walter R. Keithly (1983). "World Shrimp Production Trends and the U.S. Import Market." Draft



report, Tropical and Subtropical Fisheries Tech. Conf. Proceedings.

This paper (1) reviews world shrimp production trends in total and by major producers, (2) investigates U.S. shrimp supply sources and trends, (3) analyzes the U.S. market for imported shrimp, and (4) draws implications with respect to future conditions in the U.S. shrimp market.

Protected Species Management Branch (1995). "Shrimp Fishery Biological Opinion Emergency Response Plan." Weekly Report, Week 17 through 29 April, Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive N., St. Petersburg, FL, May, 6 pp.

Because of continued elevated levels of sea turtle strandings in NMFS statistical Zones 20 and 18, emergency restrictions were filed with the Federal Register on April 27, 1995, which became effective at 12:01 a.m., April 30, 1995. The restrictions apply to shrimp trawling in Gulf of Mexico offshore waters out to 10 nautical miles, along two sections of the Texas and Louisiana coasts. While TED requirements remain in effect, the use of soft TEDs, bottom opening TEDs, try nets without top opening hard TEDs, and flaps that completely cover the escape opening on top opening hard TEDs are prohibited. In essence, the only type of TED that can be used in the restricted areas is a top opening hard TED with a flap that does not cover the escape opening. The restrictions will remain in effect for 30 days.

Protected Species Management Branch (1996). "Kemp's ridley Sea Turtle (Lepidochelys kempii) Status Report." Final Report of the Marine Turtle Expert Working Group, Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive N., St. Petersburg, FL, June, 49 pp.

A stock assessment report that makes recommendations for future research of this marine turtle species and concludes that the stock is recovering under present management regulations.

Protected Species Management Branch (1996). "Status of the Loggerhead Turtle Population (Caretta caretta) in the Western North Atlantic." Final Report of the Marine Turtle Expert Working Group, Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive N., St. Petersburg, FL, July, 50 pp.

A stock assessment report that makes recommendations for future research of this marine turtle species and concludes that the stock is recovering under present management regulations.

Prytherch, Herbert F. (1978). "A Survey Designed for the Collection and Analysis of Data for the Reef Fish Program." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Technical Information Management Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida, October, 30 pp.

The purpose of this survey is to collect data on the reef fish fishery (primarily snapper and grouper) throughout the South Atlantic and Gulf area so that a catch-effort data system would emerge, which would provide information concerning species and number of individual fish, effort expended, gear type and quantity, area and depth of capture, and prices received by fishermen.

Purvis, Amy, William G. Boggess, Charles B. Moss, and John Holt (1995).  
Technology Adoption Decisions Under Irreversibility and Uncertainty: An  
Ex Ante Approach. American Journal of Agricultural Economics,  
77(3):541-551.

Empirical results demonstrate that uncertainty about costs and requirements for environmental compliance is an important determinant of dairy producers investment behavior. Ex ante forecasting of how uncertainty and irreversibility are likely to affect producers responsiveness to agricultural technologies has implications for the design of environmental policies. Simulation modeling methods are described. The empirical analysis focuses on Texas producers propensity to adopt free stall dairy housing. Free stall investments offer advantages for both productivity augmentation and pollution abatement, yet uncertainty and irreversibility are obstacles to adoption. Implications of this ex ante paradigm for policy design and implementation are discussed.

Queirolo, Lewis, E. (1988). Measuring the Economic Implications of Prohibited Species By-Catch Mortality, Including Loss of Reproductive Potential, in Nonselective Multispecies Commercial Fisheries. NOAA Technical Memorandum NMFS F/NWC-131, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 7600 Sand Point Way, N.E., Seattle, WA, March, 97 pp.

The objective of this analysis is the development of a methodological approach that would permit a more complete evaluation of the physical and economic consequences of prohibited species by-catch (PSC) losses, such as occur in the harvest of groundfish. The empirical results demonstrate the presence of substantial latent losses associated with salmon PSC reproductive potential foregone and confirm the presence of the hypothesized long run adverse economic impacts on directed salmon fisheries associated with a single season s PSC interception. Similar impacts are expected for Pacific halibut, king crab, and Tanner crab, although substantial research on the biological impacts of PSC losses on these species remains to be done.

Queirolo, Lewis E. and Richard S. Johnston (1989). "Research in Global Groundfish Markets: An Exercise in International Cooperation." Marine Fisheries Review, 51(1):28-32.

This paper explores the idea that extended fisheries jurisdiction has spawned new international relationships in the commercial and public sectors. In addition, it has also provided incentives to cooperate internationally in research activity. Fear of the cost of disclosing information to potential foreign competitors appears to be overshadowed by the recognition of potential benefits from new insights to be gained through shared research experience.

Queirolo, Lewis E., L.W. Fritz, P.A. Livingston, M.R. Loefflad, D.A. Colpo, and Y.L. deReynier (1995). "Bycatch, Utilization, and Discards in the Commercial Groundfish Fisheries of the Gulf of Alaska, Eastern Bering Sea, and Aleutian Islands." U.S. Department of Commerce, NOAA Tech. Memo., NMFS-AFSC-58, 148 pp.

This report documents reported catch, bycatch, utilization, and discard data and attempts to identify patterns and trends in the commercial groundfish fisheries of the Gulf of Alaska (GOA), eastern Bering Sea, and Aleutian Islands (BSAI) (areas which currently make up the United States Exclusive Economic Zone off Alaska). The report identifies existing data sources and examines the historical catch record, as well as current domestic groundfish

fisheries in these areas.

Quirk, James P. and Vernon L. Smith (1970). "Dynamic Economic Models of Fishing." In A. Scott (ed.) Economics of Fisheries Management, A Symposium, A symposium held at the University of British Columbia, March 24 to 25, 1969.

Our principle objective is to incorporate the externality and growth characteristics of a fishery into a dynamic model of general equilibrium and to compare such a competitive model with a model of optimal fishing over time. For the latter we employ in a straightforward manner the Pontryagin Maximum Principle.

Rafferty, James and Leo Gaudin (1994). "Fresh Prices at Fulton Fish Market, January - April 1994." United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 201 Varick Street, Room 731, New York, New York.

Monthly, wholesale, spot fish prices at the Fulton Fish Market by size category.

Ragozin, David L. and Gardner Brown, Jr. (1985). "Harvest Policies and Nonmarket Valuation in a Predator-Prey System." Journal of Environmental Economics and Management, 12:155-168.

Although prey may not have commercial value, their economic value can be ascertained in a predator-prey model if the predator has a harvest value. The economic optimal (recovery) path of the predator and prey are carefully described when growth is quadratic in the predator (prey) and linear in prey (predator). Parameter values, in part, resembling Pacific halibut are used to provide numerical illustrations.

Rainer, David (1997). "Snapper Ban Has Industry Reeling." Mobil Press, Alabama, November 13.

Closure of snapper fisher disaster to charter boat industry in Gulf of Mexico. Andy Kemmerer said Did I want to do it? Absolutely not.

Raizin, Myles (1989). "Available Data from the 1986 King Mackerel Economic Costs and Returns Survey." NOAA Technical Memorandum NMFS-SEFC-228, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, June, 11 pp.

Cost and revenue data for vessels operating in the 1986 king mackerel fishery was assembled in response to a request from the Gulf of Mexico Fishery Management Council. The data set is described and summarized profiles are presented.

Raizin, Myles (1994). "Control Date Discussion." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Northeast Regional Office, Gloucester, MA.

The discussion paper deals with the intent, content, and impact of control dates in fisheries.

Raizin, Myles (1994). "Summary." Position Paper presented at the

Limited Access Workshop, Seattle, Washington, November 1-3.  
National Marine Fisheries Service, Northeast Regional Office,  
Gloucester, MA.

Summary of northeastern region limited access programs including  
groundfish, American lobsters, and surf clams.

Raizin, Myles and Lloyd Regier (1986). "Impact of U.S. Wholesale Demand  
for Canned Sardines on Market Accessibility of Potential Gulf of  
Mexico Products." Marine Fisheries Review, 48(1):32-36.

Significant resources of small fish that are potentially marketable in  
the form of canned sardines are available from Gulf of Mexico waters. To  
determine the potential for entry into the established U.S. canned sardine  
market, three product groups that comprise the market are analyzed at the  
wholesale level to determine their demand characteristics. Results indicate  
that opportunities for entry exist, especially for products that are similar  
to imports in terms of package and quality.

Raizin, Myles and Lloyd Regier (1986). "Economic Aspects of the  
Japanese Kamaboko Industry." Marine Fisheries Review, 48(4):60-  
64.

The newest and most promising seafood technology impacting U.S. markets  
in recent years is an ancient Japanese fish paste process that yields a final  
product called kamaboko, a fish protein gel that is flavored and formed to  
suit the tastes and preferences of consumers. Many varieties of kamaboko have  
been developed for the Japanese market and since 1976 several forms of  
kamaboko have been exported from Japan to the United States including: A  
lobster tail analog, scallop analog, shrimp analog, and crab analog. In this  
paper we discuss various economic aspects of trade, marketing, and production  
that affect the kamaboko industry of Japan and impact the U.S. market for  
Japanese kamaboko.

Randall, Alan (1993). "Passive-Use Values and Contingent Valuation-  
Valid for Damage Assessment." Choices, 2nd Quarter: 12-15.

The pro argument for the use of contingent valuation to determine  
passive use values.

Randall, Alan (1994). "A Difficulty with the Travel Cost Method." Land  
Economics, 70(1): 88-96.

Instead of observable prices of recreational visits, travel cost method  
(TCM) researchers are obliged to substitute researcher assigned visitation  
cost estimates. I argue that visitation costs are inherently subjective, but  
are ordinarily measurable so long as the cost increases with distance traveled.  
It follows that traditional TCM yields only ordinarily measurable welfare  
estimates. The household production function formulation of TCM resolves  
this problem only by imposing severe and untestable analytical restrictions.  
TCM cannot serve as a stand-alone technique for estimating recreation  
benefits; rather it must be calibrated using information generated with  
fundamentally different methods.

Randall, Alan and Emery N. Castle (1985). "Land Resources and Land  
Markets." Chapter 13 in Kneese, Allen V. and James L. Sweeney  
(ed.). Handbook of Natural Resource and Energy Economics, Vol.  
II, Elsevier Science Publishers B.V.

This chapter is concerned with the economics of land as a multiple use factor input in the production process.

Rao, Potluri and Roger LeRoy Miller (1971). Applied Econometrics. Footnote 2, page 17. Wadsworth Publishing Company, Belmont, California.

The calculation of percentage change when  $y$  is decreasing at the point  $y_{t-1}$  is presented.

Raulerson, Richard (1998). "Supplement to the Economic Analysis of Amendment 9 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters." Final report, Southeast Regional Office and the Southeast Fisheries Center, National Marine Fisheries Service, 9450 Koger Blvd., St. Petersburg, FL.

Supplemental analysis of proposed regulations to reduce bycatch of red snapper in the Gulf of Mexico shrimp fishery. Badly flawed and misleading summary of excellent economic analyses concerning shrimp and red snapper fisheries. Corrections provided by OMB included at end of report.

Raulerson, Richard, John Ward, and Jon Platt (1990). "Stock Assessment and Fishery Evaluation Report for the Coastal Migratory Pelagics Fishery." Draft report, Southeast Regional Office and the Southeast Fisheries Center, National Marine Fisheries Service, 9450 Koger Blvd., St. Petersburg, FL.

A review of the best available data for the Coastal Migratory Pelagic Fishery Management Plan.

Rausser, Gordon C. (1982). "Political Economic Markets: PERTS and PESTS in Food and Agriculture." American Journal of Agricultural Economics, 65(2):821-833.

Political economic seeking transfers and political economic resource transactions are discussed in a rent seeking versus rent generating context. The authors conclude that policies resulting from PEST activities in a second best world can increase, leave unchanged, or decrease the size of the pie.

Read, Andrew G. and Eugene H. Buck (1997). Commercial Fishing: Economic Aid and Capacity Reduction. Environmental and Natural Resources Policy Division, Congressional Research Service, The Library of Congress, April, 31 pp.

Both experience and economic models show that, in the absence of enforceable access or catch restrictions, competition among commercial fishermen results in an expansion of fishing capacity and effort beyond the sustainable limits of the fish population being pursued. Although sometimes conceived as a means for easing financial hardship caused by reduced landings of fish, capacity reduction is more often viewed as a measure to realign effort and eventually increase sustainable catch levels. Unlike economic aid, however, capacity reduction aims to provide long-term benefits to those choosing, or able, to remain within the industry and may thus indirectly confer benefits to some of the communities that these fisheries support.

Ready, Richard C. (1990). "Ex-Vessel Demand Models." Draft report in Kearney/Centaur (1990). "Evaluation and Demonstration of Valuation Methodologies Applicable to Sport and Commercial Fisheries." Draft report, Alexandria, VA.

Commercial/Recreational allocation decisions should be made with full knowledge of the benefits and costs to all affected user groups. The user groups that have received most of the attention in debates over allocation are the sport fishers and the commercial fishers. One user group that has not received much attention is the consumers of commercially caught fish. Americans are eating more fish each year. Changes in commercial allocations have impacts on consumers that should be accounted for. This section explores some of the issues that arise when attempting to estimate the benefits that accrue to the consumers of commercially caught fish. Specifically, techniques are described that allow estimation of the consumer surplus associated with changes in harvest, using data on ex-vessel landings and prices that is already available for many fisheries.

Redfield, Michael L. (1971). Costs and Profitability in the Commercial Fishing Industry: The Insurance Dilemma. WSG-MP 71-4, Washington Sea Grant Program, Division of Marine Resources, University of Washington, November, 59 pp.

Any solution to the problems of high insurance costs must include limited entry. Any decline in fixed costs would increase entry into the fishery and further exacerbate the dissipation of rent that exists in any open access or common property resource.

Reed, William J. (1984). "The Effects of the Risk of Fire on the Optimal Rotation of a Forest." Journal of Environmental Economics and Management, 11:180-190.

The effects of the risk of fire or other unpredictable catastrophe on the optimal rotation period of a forest stand are investigated. It is demonstrated that when fires occur in a time independent Poisson process, and cause total destruction, the policy effect of the fire risk is equivalent to adding a premium to the discount rate that would be operative in a risk free environment. Other cases are also investigated and in each a modified form of the Faustmann formula is derived and a "marginal" economic interpretation given.

Reef fish Stock Assessment Panel (1997). October 1997 Report of the Reef Fish Stock Assessment Panel. Gulf of Mexico Fishery Management Council, 3018 U.S. Highway 301 North, Suite 1000, Tampa, Florida, October, 38 pp.

A review of the stock assessments prepared by the National Marine Fisheries service, Southeast Fisheries Science Center on Gag and red snapper and a review of summary biological data on gray triggerfish. A recommended range of allowable biological catch (ABC) and framework measures required to attain management goals is also made.

Reese, Gladys B. (ed.) (1992). "1991 MARFIN Annual Report: Small Pelagics (Butterfish, Coastal Herrings and Associated Species), Shrimp Trawl Bycatch Reduction, TED Technology Transfer." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Mississippi Laboratories, Pascagoula, MS, March, 258 pp.

This report encompasses the 1991 Annual Reports for the Small Pelagics, Shrimp Trawl Bycatch Reduction, and TED Technology Transfer projects. These projects are funded in part by MARFIN, and the 1991 Annual Reports have been combined and presented as the 1991 MARFIN Annual Report.

Regev, U., and A.P. Gutierrez, S.J. Schreiber, and D. Zilberman (1998).  
Biological and Economic Foundations of Renewable Resource  
Exploitation. Ecological Economics, 26:227-242.

A physiologically based population dynamics model of a renewable resource is used as the basis to develop a model of human harvesting. The model incorporates developing technology and the effects of market forces on the sustainability of common property resources. The bases of the model are analogies between the economics of resource harvesting and allocation by firms and adapted organisms in nature. Specifically, the paper makes the following points: (1) it shows how economic and ecological theories may be unified; (2) it punctuates the importance of time frame in the two systems (evolutionary versus market); (3) it shows, contrary to prevailing economic wisdom, how discount rates on resource use can be catastrophic when synergized by progress in harvesting technology; (5) it suggests that increases in efficiency of utilization of the harvest encourages higher levels of resource exploitation; and (6) it shows the effects of environmental degradation on consumer and resource dynamics. The model leads to global implications on the relationship between economic growth and the ability of modern societies to maintain the environment at a sustainable level.

Reggio, Villere C. Jr. (1989). "Petroleum Structures as Artificial Reefs: a Compendium." Fourth International Conference on Artificial Habitats for Fisheries Rigs-to-Reefs Special Session, Miami, Florida, November 4, 1987. Published by U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Regional Office, New Orleans, August, 176 pp.

These proceedings are published to share information with anyone interested in the potential, limitations, and concerns of making permitted reefs from petroleum structures. The presented papers address some of the physical, biological, socioeconomic, technological, and legal aspects of capturing the fisheries potential of producing petroleum platforms and of converting obsolete oil and gas structures to reefs. The range of views and experiences presented at the conference is hereby recorded as submitted by the authors or panel moderators and prepared for publication by MMS.

Reid, Walter V. and Mark C. Trexler (1991). Drowning the National Heritage: Climate Change and U.S. Coastal Biodiversity. World Resources Institute, June, 48 pp.

The authors point out that curbing the rate and magnitude of global warming would do more to conserve coastal biodiversity than any after the fact measure could. But they also identify policy shifts that would help coastal ecosystems and species survive the warming that is already in store.

Reinhard, Stijn and Geert Thijssen (1998). Resource Use Efficiency of Dutch Dairy Farms: A Parametric Distance Function Approach. Paper presented at the American Agricultural Economics Association Annual Meeting in Salt Lake City, Agricultural Economics Research Institute, P.O. Box 29703, 2502LS The Hague, The Netherlands, May, 14 pp.

The objective of this paper is to define and to estimate a resource use efficiency measure using a panel of Dutch dairy farms. Resource use efficiency reflects observed to maximum revenue, including the non-positive revenue of bad outputs. It can be decomposed into technical and environmental efficiency. Our parametric output distance function allows the characteristics of non-point source pollution. Shadow prices of the undesirable output (nitrogen surplus per hectare) are found to be positive for

all observations, due to the materials balance definition of nitrogen surplus. Intensive farms are found to be slightly more resource use efficient than extensive farms.

Reise, Elizabeth M. (1989). "Income Dependency of Married Women: 1972 and 1982." Draft report, Department of Economics, University of Rhode Island, Kingston, RI.

The hypothesis is tested that women's dependency on their husbands income has decreased as labor force participation has increased between 1972 and 1982. The remaining dependency is solely a function unequal wage paid to men and women.

Reisenweber, John W. (1997). Individual Transferable Quotas in the Pacific Halibut Fishery, Applications to the Magnuson Act. Thesis, Oregon State University, Corvallis, OR, April, 107 pp.

ITQ regulations in the Pacific halibut fishery will provide some benefit to the severely overcapitalized halibut fishery. However, the ITQ program may threaten resource sustainability by providing fishermen with an incentive to exceed their quota and high-grade their catch. In addition, the quota consolidation, job loss, and costs that will result from the new system will raise several ethical concerns regarding the ideas of social equity, efficiency, and stewardship. Based on traditional conservation ethics as well as more modern ideas, the envirocentric ethical approach to quota management can be used to address some of these environmental and ethical problems.

Renaud, Maurice, Gregg Gitschlag, Edward Klima, Arvind Shah, Dennis Koi, and James Nance (1992). "Loss of Shrimp by Turtle Excluder Devices (TEDs) in Coastal Waters of the United States from North Carolina through Texas: March 1988 through August 1990." Draft report, NMFS, SEFC, Galveston Laboratory, Galveston, TX, 71 pp.

Fishing areas, time of day and duration of tows were controlled by the captain of each vessel to simulate commercial conditions. A statistically significant mean loss in shrimp catch per unit effort of 0.39 - 0.17 lb/hr (5.1%) was experienced by all TED equipped nets combined, compared to standard nets. Analyzed separately, nets equipped with Georgia TEDs (with and without funnels) exhibited a reduction in shrimp CPUE of 3.6% and 13.6% respectively, compared to standard nets. There was no significant difference in shrimp CPUE between standard nets and nets equipped with Super Shooter TEDs with a funnel.

Renaud, Maurice, Gregg Gitschlag, Edward Klima, Arvind Shah, Dennis Koi, and James Nance (1993). "Loss of Shrimp by Turtle Excluder Devices (TEDs) in Coastal Waters of the United States from North Carolina through Texas: March 1988 through August 1990." Fishery Bulletin, 91:129-137.

Observers from the National Marine Fisheries Service collected information on catch rates of shrimp aboard commercial shrimp vessels during March 1988 to August 1990. Comparisons were made between nets equipped with Turtle Excluder Devices (TEDs) and standard shrimp nets. Three types of TEDs were tested: Georgia TEDs with and without accelerator funnels and Super Shooter TEDs with funnels.

Fishing area, time of day, and duration of tows were controlled by the captain of each vessel to simulate commercial conditions. A statistically significant ( $P < 0.05$ ) mean loss in shrimp catch per unit effort (CPUE) of 0.24 lb/h (3.6%) and 0.93 lb/h (13.6%) was exhibited by nets equipped with Georgia TEDs (with and without funnels, respectively) compared with standard



nets. There was no significant difference in shrimp CPUE between standard nets and nets equipped with Super Shooter TEDs with a funnel.

Renaud, Maurice, Gregg Gitschlag, Edward Klima, Arvind Shah, Dennis Koi, and James Nance (1991). "Evaluation of the Impacts of Turtle Excluder Devices (TEDs) on Shrimp Catch Rates in Coastal Waters of the United States Along the Gulf of Mexico and Atlantic, September 1989 through August 1990." National Marine Fisheries Service, Galveston Laboratory, 4700 Ave. U, Galveston, TX 77551.

Trained NMFS observers collected information from September 1989 to August 1990 on catch rates of shrimp and finfish from commercial shrimp vessels voluntarily participating in this study. Data were compared between TED equipped nets and standard shrimp nets using multivariate paired t-tests. Yield was modeled to determine what impact various levels of shrimp loss would have on the overall population.

Renaud, Maurice, Gregg Gitschlag, Edward Klima, Arvind Shah, James Nance, Charles Caillouet, Zoula Zein-Eldin, Dennis Koi, and Frank Patella (1990). "Evaluation of the Impacts of Turtle Excluder Devices (TEDs) on Shrimp Catch Rates in the Gulf of Mexico and South Atlantic, March 1988 through July 1989." NOAA Technical Memorandum, NMFS-SEFC-254, National Marine Fisheries Service, Galveston Laboratory, 4700 Ave. U, Galveston, TX 77551.

Trained NMFS observers collected information from March 1988 to July 1989 on catch rates of shrimp and finfish from commercial shrimp vessels voluntarily participating in this study. Data were compared between TED equipped nets and standard shrimp nets using multivariate paired t-tests. Yield was modeled to determine what impact various levels of shrimp loss would have on the overall population.

Research Support & Training Branch (1995). Modelling with Explanatory Variables. SAS/ETS Applications Seminar, Information Services Division, Economics Research Service, United States Department of Agriculture, 30 pp.

Notes for a seminar on ARIMA and transfer function models.

Resosudarmo, Budy P. (1995). The Construction of a Bioeconomic Model of the Indonesian Flying Fish Fishery. Marine Resource Economics, 10(4):357-372.

The high price of flying fish eggs in Japan encourages South Sulawesi fishermen in Indonesia to harvest increasing quantities of eggs every year. Similarly, the increasing local demand for flying fish encourages Indonesian fishermen to use gill nets to catch more fish. As a consequence of this increasing quantity of eggs harvested and fish caught, Indonesia has become concerned about the over exploitation of the flying fish population.

Thus far policy suggestions concerning the management of the flying fish fishery have been based on a static biological model, since the data needed to construct a dynamic bioeconomic model are very limited. This paper presents a method for constructing a dynamic bioeconomic model of the Indonesian flying fish fishery with very limited data on the fish population. A calibration technique is developed to build the dynamic biological model.

Resource Economics Consultants (1994). "Estimation of Gulf of Mexico Shrimp Fishing Costs and Returns." Final report prepared for U.S. Department of Commerce, NOAA, National Marine Fisheries Service,

9450 Koger Boulevard, St. Petersburg, FL by Resource Economics Consultants, 108 Mile Drive, College Station, TX, May.

The overall objective of the project was to estimate Gulf of Mexico shrimp fishing craft costs and returns for use in assessing the impacts of fishery management regulations. The final contract report is attached to Ward, J.M. (1994) "Economic Analysis of Finfish Bycatch in the Gulf of Mexico Shrimp Fishery."

Restrepo, Victor R. (1990). "Some Possible Biases in Swordfish VPAs due to Sexually Dimorphic Growth." ICCAT Working Document, SCRS/90/, Cooperative Institute for Marine and Atmospheric Studies, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida.

The purpose of this study is to identify possible biases in the UPA methodology applied to swordfish that can result from using the Gompertz curve (both sexes combined) to age the catch of a swordfish population hypothesized to exhibit sexually dimorphic growth. For analysis, hypothetical populations of swordfish were simulated using trends in recruitment and mortality loosely based on the 1989 ICCAT assessment. The range of dimorphic growth hypotheses defined was based on the analysis of Berkeley and Houde and that of Erhardt.

Restrepo, Victor R. and Christopher M. Legault (1997). "A Stochastic Implementation of an Age-Structured Production Model." ICCAT Working Document, SCRS/97/59, Cooperative Institute for Marine and Atmospheric Studies, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida.

An aged structured production model (ASPM) has been used in past assessments of the International Commission for the Conservation of Atlantic Tunas, particularly for albacore tuna in the southern Atlantic, and for bluefin tuna in the western Atlantic. That model is sometimes preferable to traditional biomass-based surplus production models because it can accommodate age-structured indices of relative abundance. The ASPM estimates a deterministic stock-recruitment relationship, a property that may result in inconsistencies between the estimated level of recruitment and the observed level of catches for recent cohorts. In this work, we relax the deterministic assumption by incorporating stochasticity in recruitment around the deterministic predictions as a first-order, autoregressive time-series process. We use data for western Atlantic bluefin tuna to contrast the deterministic and stochastic model fits, and examine the differences that would result in management advice based on projections with either model. Includes an application to Gulf of Mexico Spanish Mackerel as a case study.

Restrepo, Victor R. and Joseph E. Powers (1990). "A Comparison of Three Methods for Handling the "Plus" Group in Virtual Population Analysis in the Presence of Ageing Errors." ICCAT Working Document, SCRS/90/, Cooperative Institute for Marine and Atmospheric Studies, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida and U.S. Department of Commerce, National Oceanic and

Atmospheric Administration, National Marine Fisheries Service,  
Southeast Fisheries Center, 75 Virginia Beach Drive, Miami,  
Florida.

The usefulness of virtual population analysis (VPA) for estimating mortality and population size independently of fishing effort data has led to detailed analyses of the quality of the estimates given various sources of error in the inputs. For the most part, these studies have dealt with the possible consequences of using erroneous inputs or inputs characterized by some degree of uncertainty. Largely ignored in the literature is the problem of biases due specifically to systematic errors in ageing. In this study, we use simulation analysis to examine the performance of three methods to handle the plus group. The analyses that follow are focused on the effects that systematic ageing errors may have on the conclusions drawn from the VPAs. The simulations are loosely based on swordfish (Xiphias gladius) data from the North Atlantic.

Restrepo, Victor R., Joseph E. Powers, and Steven C. Turner (1990). "Incorporating Uncertainty in VPA Results Via Simulation." ICCAT Working Document, SCRS/90/, Cooperative Institute for Marine and Atmospheric Studies, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida.

Simulation methods are employed to allow incorporation of uncertainty in input parameters to the ADAPT VPA methodology. Empirical probability distributions describing the VPA results are developed using Monte Carlo techniques. The methodology described allows for incorporation of uncertainty parameters that are either internal or external to the ADAPT methodology.

Restrepo, V.R., G.P. Scott, and J.E. Powers (1991). "Analysis of North Atlantic Swordfish Catch-At-Age Data Under Alternative Hypotheses About Growth and Sex Ratio." ICCAT Working Document, SCRS/91/47, CIMAS, University of Miami, 4600 Rickenbacker Causeway, Miami, FL, and NMFS, Southeast Fisheries Center, 75 Virginia Beach Dr., Miami, FL.

Information about differences in sex ratio at size and possible sexual dimorphism in growth have raised questions regarding likely biases that may be incurred during swordfish stock assessments. In this study, the 1978-89 catch at length data is separated into sexes and converted into catch at age using three growth curves (two sex specific ones and the one used in the 1990 assessment). The U.S. and Spain CPUE data were treated similarly to derive age specific indices of abundance for each sex-growth curve combination. Virtual population analyses (VPAs) were carried out on the resulting data sets to better understand how trends in population size and fishing mortality may differ depending on the growth hypothesis used.

Rettig, R. Bruce (1984). "License Limitation in the United States and Canada: An Assessment." North American Journal of Fisheries Management, 4(3):231-248.

License limitation is finding increasing acceptance. Reasons for growth in license control include its relationship to other management measures and its similarity to other forms of public regulation in North American. Experiences with license control in several areas of the United States and

Canada are reviewed and evaluated in terms of the conservation objectives, economic efficiency, equity, and administrative/political feasibility. These programs are seen as diverse both in their design and the success achieved. Further use of license control is expected, requiring better information on consequences for multipurpose and multispecies fisheries. Although fishermen are extensively involved in the design of license limitation programs, new techniques for obtaining the views of fishermen are needed.

Rettig, R. Bruce (1990). "Multiple Objectives in Fishery Allocation Decisions." Draft report in Kearney/Centaur (1990). "Evaluation and Demonstration of Valuation Methodologies Applicable to Sport and Commercial Fisheries." Draft report, Alexandria, VA.

What are the economic consequences of policies that allocate fishing opportunities between recreational and commercial fishing fleets? Too many answers to this complex and difficult question are simple, understandable, and wrong. The debate over the appropriate use of input-output analysis and its relationship with the calculation of net economic benefits was a central part of national debates about public investments that took place in the 1960's and 1970's. The conclusion of this paper is that this is an unsettled question, but one worth serious investigation.

Rettig, R. Bruce and Jay J.C. Ginter (eds.) (1978). Limited Entry as a Fishery Management Tool. University of Washington Press, Seattle.

This book is the report of the workshop and conference whose objective was to consider whether limited entry programs might contribute to better management of the commercial fisheries of the United States and, if so, where, when, and how they could be employed.

Rettig, R. Bruce and Walter Keithly (1998). "Draft Chapter on the Concept of Subsidies." Draft, Congressional report on the Role of Subsidies in Developing Excess Capacity, June, 30 pp.

An explanation of the definition used to describe subsidies that increase capacity in U.S. domestic fisheries. A subsidy is essentially a government action (inaction) that modifies (by increasing or decreasing) the potential profits earned by the firm in either the short or long run. A classification scheme for American subsidies is developed and compared to the definition adopted by the World Trade Organization.

Reyer, Anthony J., Donald W. Field, Jennifer E. Cassells, Charles E. Alexander, and Cynthia L. Holland (1988). "The Distribution and Areal Extent of Coastal Wetlands in Estuaries of the Gulf of Mexico." National Oceanic and Atmospheric Administration, Rockville, MD 20852, November, 19 pp.

This paper is a preliminary report describing the areal extent and distribution of coastal wetlands in the six states, 157 counties, 23 estuarine drainage areas (EDA) of the U.S. portion of the Gulf of Mexico. The wetlands data are based entirely on an evaluation of National Wetland Inventory (NWI) maps produced by the U.S. Fish and Wildlife Service. Currently, data have been completed for the wetlands of the New England region and an atlas has been published entitled, National Estuarine Inventory Data Atlas; Vol. 3: Coastal Wetlands of the New England Region.

Rhodes, Ray (1980). "Preliminary Economic Analysis of the South Atlantic States' Shrimp Fishery: Current Trends and Outlook." Report prepared at the request of the South Atlantic Fishery

Management Council by Marine Resources Division, S.C. Wildlife and Marine Resources Department, Charleston, S.C., May, 12 pp.

The paper is a review of the 1979 shrimp season for the south Atlantic fishery with a prediction that a long term decline in the economic productivity of commercial shrimp harvesting in the south Atlantic states could be expected.

Rhodes, Raymond J. and Valvy N. Grant (1992). "Mail Survey of the U.S. Seafood Wholesale Market Channel with an Emphasis on Whole Farmed Marine Shrimp." Marine Resources Division, Office of Fisheries Management, Technical Report Number 79, November, 68 pp.

The objectives of this research were to describe existing marine shrimp preferences in the wholesale market channel and to identify critical product attributes in the wholesale market when selling heads-on marine shrimp. Use and preference data were collected on U.S. seafood wholesalers, distributors, and others based on a 1989 mail survey.

Rhodes, Raymond, Kenneth Backman, and Greg Hawkins (1997). Socio-Demographic Assessment of Commercial Reef Fishermen in the South Atlantic Region. MARFIN No. NA57FF0059, Office of Fisheries Management, Marine Resources Division, SC Department of Natural Resources, P.O. Box 12559, Charleston, SC 29422-2559, and the Strom Thurmond Institute, Clemson University, Box 345130, Clemson, SC 29634-5130, February, 176 pp.

The south Atlantic snapper grouper fishery exhibits economic characteristics and problems common to other commercial marine fisheries. Fishermen involved in this fishery also have socio-demographic characteristics as well as cultural and social problems that need investigation. Because there was a lack of up to date relevant social and cultural data, this project sought to provide selected socio-demographic data on commercial reef fishermen needed in supporting and evaluating management actions, especially by the South Atlantic Fishery Management Council. The research was comprised of two components, qualitative and quantitative. Primary data were collected via focus groups, ethnographic interviews, and a self-administered survey mailed to inactive and active commercial reef fishermen in the south Atlantic. In general, the qualitative findings suggest that frustration among snapper grouper fishermen is mounting. However, most are likely to continue their way of life.

Rhodes, Raymond J., K. McGovern-Hopkins, and C.L. Browdy (1992). "Preliminary Financial Feasibility Analysis of an Independent Marine Shrimp Hatchery Located in South Carolina." Technical Report Number 80, Marine Resources Division, South Carolina Wildlife and Marine Resources Department, December, 11 pp.

Prospective aquaculturists, investors, and perhaps lending institutions will desire information on financial feasibility of a commercial post larval production facility located in South Carolina. Although several economic studies have analyzed maturation and/or hatchery systems for penaeid shrimp (e.g. Johns et al., 1981), no studies have analyzed the financial feasibility of penaeid larviculture in South Carolina. The objective of this report is to present a preliminary projection to costs and income generated by an independent commercial hatchery operating in coastal South Carolina with enough capacity to produce some of the postlarvae needed by South Carolina farmers; about 45 million postlarvae during a 8-10 week period in 1992 (Rhodes, 1992). Annual income statements and cash flows have been projected to estimate accounting profitability, return on equity capital, and net

present value.

Rhodes, Raymond J., Wayne Waltz, and Robert Wiggers (1996). Economic Assessment of Commercial Reef Fishermen in the South Atlantic Region. Office of Fisheries Management, Division of Marine Resources, S.C. Department of Natural Resources, Post Office Box 12559, Charleston, SC 29422-2559, January, 49 pp.

The goal of this project was to collect primary economic data on federally permitted commercial reef (snapper-grouper) fishermen in the south Atlantic region. The lack of economic data has been a significant problem in the evaluation of current and proposed fishery management plans developed by the South Atlantic Fisheries Management Council. Researchers surveyed federal snapper-grouper permit holders with home ports in Georgia, South Carolina, North Carolina, and the east coast of Florida. Data collected through personal interviews during 1994 included vessel characteristics, annual fixed expenses, typical trip revenues and expenses, and incremental costs associated with switching to and from commercial reef fishing. Economic data collected in this survey will be useful in developing economic models to simulate incremental private sector benefits, costs, and distributional effects on commercial snapper-grouper fishermen associated with proposed regulatory actions in this Region by the South Atlantic Fisheries Management Council and other regulatory agencies.

Rice, Jake and Laura Richards (1994). "Partnerships and Roles - The Pacific Canadian Rockfish Fishery." C.M. 1994/T:42, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September.

The rockfish (Sebastes) fishery in the Canadian Pacific is used to explore the reasons why traditional fisheries management fails to maintain sustainable fisheries. Alternatively, a close partnership with fishermen approach to fisheries management has improved the fishery, but lead to unforeseen problems.

Rice, Kenneth (1979). An Investigation of the Spanish Mackerel, Scomberomorus Maculatus (Mitchill), Along the Texas Coast. Management Data Series Number 3, Coastal Fisheries Branch, Texas Parks and Wildlife Department, 11 pp.

During June-September 1978, the Texas Parks and Wildlife Department in cooperation with the Gulf and South Atlantic Fisheries Development Foundation attempted to determine the commercial harvest potential of Spanish mackerel along the Texas coast using a modified purse seine, gill net, and troll lines. Spanish mackerel life history data were also obtained. Few fish were located; rough seas and turbid water prevented extensive sampling with either the net or the purse seine. Most Spanish mackerel were observed in or near passes. The incidental catch of other game species in the modified purse seine was minor; the incidental catch was composed mainly of bait fish on which the mackerel were feeding. A total of 208 fish were tagged for growth and migration studies. Stomach analyses indicated that bumper (Chloroscombrus chrysurus) was the most common food item eaten by Spanish mackerel. During August and September, 72% of the 58 fish examined had developing or ripe gonads.

Richards, Laura J. and Jeff Fargo (1994). "Comparing Data Collected By Observers and Skippers in the British Columbia Trawl Fishery."

C.M. 1994/T:8, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 7 pp.

Groundfish catch and effort data for the west coast of Canada have been based primarily on unverified skipper logbooks. In 1992, a voluntary observer program was conducted for the multispecies trawl fishery operating in one area. In this paper, we relate observer records to skipper logbooks for comparable tows and for tows on unobserved vessels fishing simultaneously over three time periods. One hypothesis we considered is that skippers would behave differently when observers were present. In particular, vessels without observers would target a different species mix than vessels with observers. There are strong economic incentives to land preferred species in excess of trip quotas. Furthermore, trips with observers accounted for only 5-12% of the total number of tows. We found reasonable agreement in species composition between observer records and logbooks from observed and unobserved tows in most cases. Thus, we could not support the hypothesis. However, observers recorded consistently lower values for total catch and higher values for effort than were reported in logbooks. As much as 9% of the effort from observed tows was not reported on logbooks. More stringent regulations apply to fishing areas where fewer observed trips have been conducted. The reliability of logbooks from these areas remains unknown.

Richards, R. Anne and David G. Deuel (1987). "Atlantic Striped Bass: Stock Status and the Recreational Fishery." Marine Fisheries Review, 49(2):58-66.

The striped bass, Morone saxatilis, has long been a prized sport fish for anglers along the U.S. Atlantic coast. Between 1960 and 1970, the estimated recreational harvest of striped bass nearly doubled while the number of striped bass anglers increased by almost two thirds. However, since the mid to late 1970's, commercial and recreational harvests of striped bass have decreased to their lowest levels on record. These declines are due primarily to poor production of juveniles by the Chesapeake stock. Although stringent management measures have been implemented to rebuild the stock, juvenile production is unlikely to improve until the protected year classes mature and spawn over the next several years. The future of striped bass fishing depends on successful reproduction by these protected year classes and on management measures that maintain an adequate spawning stock.

Richards, William J. (ed.) (1988). "Research Accomplishments of the NMFS Southeast Fisheries Center." Marine Fisheries Review, 50(4):77-94.

This overview outlines the broad research operations carried out by the SEFC.

Richardson, Edward J. (1994). "Wreckfish Economic and Resource Information Collection with Analysis for Management." E.J. Richardson Associates, Economic and Market Research for the Fishing, Aquaculture, and Natural Resource Industries, P.O. Box 236, Sandown, New Hampshire, March, 84 pp.

A study was made of the economics of wreckfish harvesting during the transition to a transferable harvesting rights based (ITQ) fishery management program. The goal of the study was to establish a data baseline that could serve as a foundation for subsequent monitoring and assessment efforts.

Vessel costs and returns data was assembled for thirty seven vessels, seventeen of which provided 99.9 percent of wreckfish landings during the initial year of rights based management. The data collection allowed for the measurement of the economic values generated by the harvesting sector during the transition to ITQ management, and an evaluation of the initial functioning of the markets for harvesting rights.

Richardson, Edward J. and John M. Gates (1982). "A Bioeconomic Analysis of Carapace Length Regulation for the American Lobster Fishery." Staff Paper Series No. 82-09, Department of Resource Economics, University of Rhode Island, Kingston, RI.

A bioeconomic fishery simulator is used to determine the impacts of an increase in the minimum size carapace length regulation for American lobster. While suboptimal from both economic and biological perspectives, the results show that the proposal would be more efficient than the status quo.

Richardson, Edward J. and John M. Gates (1986). "Economic Benefits of American Lobster Fishery Management Regulations." Marine Resource Economics, 2(4):353-382.

A simulation model is used to compare measures for future management identified in the American Lobster fishery management plan; specifically, increases in the minimum legal size and a modest reduction in aggregate fishing mortality are evaluated. The analysis differs from previous work in that the distributional aspects of the alternative management regulations are quantified. The results indicate that (1) both an increase minimum size and a reduction in fishing mortality are economically justified in the sense that net benefits are positive; (2) increasing the minimum size without an adjunct regulation to prohibit entry will cause present fishermen to suffer an initial short term reduction in revenues for which there will be no long term gain; (3) because increased minimum size can be justified on the basis of consumer benefits alone, arguments favoring its increase to prevent recruitment failure are moot as far as a test of national economic efficiency is concerned; and (4) a program of effort reduction that reduces by 20% the fraction of available lobsters captured annually is projected to generate \$1 of producer benefits for every pound of lobster landed. Reducing the annual harvest fraction by 20% results in a level of fishery benefits greater than increasing the minimum size to 89 mm (3.5 inches), and increases the coincidence of short run costs and long term benefits among those impacted by fishery management.

Rickards, Lesley J. (1994). "BODC Quality Assurance Procedures for Physical Oceanographic Data." C.M. 1994/(C+E+L):1, Joint Session on Quality Assurance of Marine Measurements, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 10 pp.

The British Oceanographic Data Centre (BODC) is responsible for the UK's National Oceanographic Data Bank. This was established both to protect the long term value of oceanographic data and to make high quality data readily available to a wide user community. Inevitable in order to meet these requirements, quality assurance of the data is a prime consideration. Quality control procedures have been developed and implemented and these are discussed with particular reference to moored current meter, sea surface elevation, and CTD profile data. Some quality assurance procedures are common to all the data types, whereas others are data type specific. Reference is also made to the qualifying documentation or 'metadata' that must accompany the data for their full value to be maintained.



Ridker, Ronald G. and John A. Henning (1967). "The Determinants of Residential Property Values with Special Reference to Air Pollution." The Review of Economics and Statistics, 49(2):246-257.

This appears to be one of the first papers to provide statistical evidence of the effect of variations in air pollution levels on property values for single family dwelling units in an urban area.

Riechers, Robin K. (Chairman) (1992). "Report of the First Coastal Migratory Pelagics Socioeconomic Panel Meeting." April 21-23, Miami, Florida. Prepared by the Socioeconomic Panel, Gulf of Mexico Fishery Management Council.

This report deals with the socioeconomic Panel's decisions on king mackerel and the members' serious concern about the adequacy of social and economic information to give informed advice to the Council.

Riechers, Robin K. and Gary C. Matlock (1990). "A Simple Method for Estimating the Benefits of the "Texas Closure"." Draft Report, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744.

Our paper will estimate change in landings attributable to the Texas closure using linear regression on recruitment data, and will present a model for predicting the annual changes in weight of brown shrimp and pink shrimp landed after each future closure.

Riely, Patricia Lavin (1988). "Economic Valuation of Marine Recreational Fishing." Volume IV in Future Participation in Marine Recreational Fishing. The Sport Fishing Institute, 1010 Massachusetts Avenue, N.W., Washington, D.C.

This volume presents the economic values related to marine recreational fishing and offers a guide to the magnitudes of these values. Both freshwater and saltwater fishery values are included since freshwater fishery values can provide guidelines as to the magnitude of the marine values that are of greatest interest to the National Marine Fisheries Service.

Riley, John G. (1980). "The Just Rate of Depletion of a Natural Resource." Journal of Environmental Economics and Management, 7:291-307.

The optimal pricing and use of a natural resource is reconsidered with respect to intergenerational equity considerations. It is assumed that in a just economy, each generation chooses the plan that maximizes its won utility, subject to the constraint that the plan should not be exploitative in the sense that each generation does not take advantage of its earlier point in time with respect to future generations. It is shown that if the cost of production of an alternative energy source (e.g. solar) is sufficiently high relative to the stock of naturally stored energy, the constraints of justice result in a lower rate of energy use initially, but a higher rate later.

Rinehart, James R. and Jeffrey J. Pompe (1996). State Reaction to Lucas: Planning and Policy Implications. The Southern Business and Economics Journal, 19(4):261-272.

As urban areas have grown so have concerns about overdevelopment and the resultant problems that come with it. Although controls instituted by government attempt to control the negative effects of growth, challenges by

property owners, such as David Lucas, may curtail some of these regulatory activities. A survey of state environmental agencies was conducted to determine if the recent U.S. Supreme Court decision in Lucas v. South Carolina Coastal Council has had any effect on environmental regulation. Although most states feel the Lucas ruling will have narrow effects, a great deal of concern on the part of state agencies with regard to the possible implications of the 1992 ruling was found. Numerous states have planned new legislation, implemented new legislation, or issued new directives for state planners to avoid or mitigate problems that may result from similar takings cases. Additionally, states are exhibiting greater caution due to increased concern over future litigation and enhanced sensitivity to the possible harmful effects of land use regulation.

Risenhoover, Alan (1995). Senate Draft Magnuson Act Bill. Memorandum, Legislative Affairs, National Marine Fisheries Service, Silver Springs, MD, March.

A staff redraft of the Senate Magnuson Act reauthorization bill released by the Senate Commerce Committee.

Ritter, Joseph A. (1995). "The Transition from Barter to Fiat Money." The American Economic Review, 85(1):134-149.

How did it become possible to exchange apparently valueless pieces of paper for goods? This paper provides an equilibrium account of the transition between barter and fiat money regimes. The explanation relies on the intervention of a self-interested government which must be able to promise credibly to limit the issue of money. To achieve credibility, the government must offset the benefits of seigniorage by internalizing some of the macroeconomic externalities generated by the issue of fiat money. The government's patience and the extent of its involvement in the economy are key determinants of whether the transition can be accomplished.

Rizzo, Gianfranco and Massimo Spagnolo (1996). A Model for the Optimal Management of Sea Bass Dicentrarchus Labrax Aquaculture. Marine Resource Economics, 11(4):267-286.

A bioeconomic model for the simulation and the optimal management of a fish farm for sea bass Dicentrarchus labrax is presented. Growth and mortality, considered as a Markovian process, are described by a biological submodel, taking into account the effects of water temperature, feeding level, oxygen content, and water supply. Stochastic effects in growth and mortality, relating to the effects of genetic differences, can be also considered in the model. An economic submodel evaluates costs and revenues relating to plant management. The model exhibits good capabilities in predicting the effects of operating variables on fish growth and on economic outcomes and in determining the optimal strategies for plant management in different scenarios, considering the complex interactions of technical, biological, and economic aspects.

Roberts, Callum M. and Nicholas V.C. Polunin (1993). "Marine Reserves: Simple Solutions to Managing Complex Fisheries." Ambio, 22(6):363-368.

Fisheries on coral reefs are highly complex, can be very productive, but typically have little or no management. Widespread overfishing and declining yields reveal an acute need for proper management. However, conventional management methods are inappropriate for two main reasons: they require much information on the biology of stocks and are expensive and difficult to

enforce. Use of marine reserves has been suggested as an alternative. Protective management potentially has several important benefits including (i) protection of spawning stocks; (ii) provision of recruits to replenish fishing grounds; (iii) enhancement of catches in adjacent unprotected areas through emigration; (iv) minimal requirement for information on biology of stocks; and (v) ease of enforcement. However, the effectiveness of the reserve approach has not been properly tested. We evaluate the evidence available to test whether reserves function as predicted on theoretical grounds. In general, field studies from widespread sites around the globe support predictions of increases in abundance and average size of fishes in protected areas. However, evidence for enhanced catches in adjacent areas is more limited, and evidence to show that reserves can restock fishing grounds is lacking. Nevertheless, protective management appears to hold much promise for low cost management of reef fisheries. Research programs in several areas of the Caribbean and Indo-Pacific have now been launched to refine the approach.

Roberts, Kenneth J. (1995). "Decision Guide to Individual Transferable Quota (ITQ) Management of Fisheries." Draft guide, Louisiana Cooperative Extension Service, Louisiana Sea Grant College Program.

A guide to fishermen explaining individual transferable quotas and an annotated bibliography of selected articles and reports that is designed to answer specific questions posed by individuals interested in limited access.

Roberts, Kenneth J. (1995). "Decision Guide to Individual Quota (IQ) Management of Fisheries." Final Report, Louisiana Cooperative Extension Service, Louisiana Sea Grant College Program, April, 24 pp.

A guide to fishermen explaining individual quotas and an annotated bibliography of selected articles and reports that is designed to answer specific questions posed by individuals interested in limited access.

Roberts, Kenneth J. and M. E. Sass (1979). "Financial Aspects of Louisiana Shrimp Vessels, 1978." Sea Grant Publication No. LSU-TL-79-007, Center for Wetland Resources, Louisiana State University, Baton Rouge, LA, December, 9 pp.

The excellent shrimp harvests of 1977 and 1978 have brought increased interest in shrimp vessels as investment opportunities. Adding to investor interest in 1978 were the favorable price and record dockside value of shrimp (the previous record value was exceeded by 16 percent). Shrimpers and other investors will respond to the record earnings by constructing new vessels. Financial incentives such as the Capital Construction Fund (CCF) and the sheltering of capital gains from vessel appreciation also attract investment. The CCF and capital gains incentives are long term, but the shrimp harvests vary from year to year. The result is that investment in the form of vessels drawn into the fishery due to tax incentives will negatively impact earnings per vessel when catches and prices return to normal. This may result in stress on the credit system and shrimp management alternatives, as well as bring about public assistance to help an ailing industry. Based on a survey of 129 operators, shrimp vessels harvested the same quantity of shrimp in 1978 as they did in the record year of 1977 with 1978 prices higher than 1977, resulting in an above average financial condition for shrimp vessels. The financial condition of shrimp vessels in 1978 may be hard to improve on as shrimp catches retreat from record levels, more vessels begin shrimping, and costs continue to increase.

Roberts, Kenneth J. and Mark E. Thompson (1983). "Petroleum Production Structures: Economic Resources for Louisiana Sport Divers." Louisiana Seafood Production Economics, (August):1-39.

Petroleum production structures have a high recreational value for sport divers when left in place as artificial reefs. There remains the need to initiate research on other users in depicting the sport and commercial value of structures.

Roberts, Kenneth J., Walter R. Keithly, and Charles M. Adams (1992). "The Impact of Imports, Including Farm-Raised Shrimp, on the Southeast Shrimp Processing Sector." NOAA Technical Memorandum NMFS-SEFC-305, USDOC, NOAA, NMFS, January.

Processing activities of southeastern shrimp processors increased in recent years. This activity was linked to an increase in shrimp imports. An initial source of the new supply was Ecuador. Farming of shrimp in pond systems there rapidly increased United States purchases to a record 101 million pounds by 1987. Shrimp from China and Taiwan added another 80 million pounds to US supplies by 1987. Imports primarily from shrimp farming nations were thereby recognized by some processors as a new source of raw material. Twelve of the surveyed processors in the southeast began use of imported shrimp after 1984. New sources of supply introduced an element of stability to the southeastern industry for those processors using the shrimp. Stability in terms of entry and exit among the region's establishments utilizing imports was found to be higher than non-users. Hence, as more establishments adopt the use of imports, especially farm-raised imports, in their processing activities, total industry stability in the southeast may be expected to rise. The analysis indicated a possible decline in industry concentration in 1987. This decline to the extent that it might be related to increasing raw material availability and hence, less ability among the larger firms to exhibit some control over input usage, suggests that an additional decline in concentration might be forthcoming as aquaculture supplies expand. Exporting countries with farmed shrimp supplies could at some point lessen these influences on southeastern processors if they increase their value added processing.

Roberts, Kenneth J., Mark E. Thompson, and Perry W. Pawlyk (19??). "Structure Changes in U.S. Shrimp Markets." Draft report, Center for Wetland Resources, Louisiana State University, Baton Rouge, La.

This paper presents the results of a seven equation monthly model of the domestic shrimp market. More emphasis was placed on sources of supply than evident in previous simultaneous models.

Roberts, Kenneth J., Mark E. Thompson, William D. Chauvin, and Vito J. Blomo (1983). "Assessment of User Conflicts Between Various Harvester Groups and with Other Fishing Industries." Report III in Assessment of Shrimp Industry Potentials and Conflicts, Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August, 90 pp.

This report addresses the conflicts between inshore and offshore shrimp fishermen and between shrimp fishermen and fishermen who use other gear types on shrimp fishing grounds, for example stone crab pots.

Roberts, Kenneth J., Mark E. Thompson, Fred J. Prochaska, and William D. Chauvin (1983). "Potential Actions of Tariff and Quota Legislation." Report V in Assessment of Shrimp Industry

Potentials and Conflicts, Volume II, Shrimp Notes Incorporated,  
417 Eliza Street, New Orleans, Louisiana, August, 143 pp.

The impact of shrimp imports on ex-vessel prices is discussed using the results of five different econometric studies. The paper reviews domestic production of all shrimp species from U.S. waters. It presents trends in shrimp imports by product type from 1970 to 1981 including marketing channels and retailing activities, and impacts on employment and capital invested in the harvesting sector of the shrimp fishery.

Roberts, Terrell W. (1986). "Abundance and Distribution of Pink Shrimp in and around the Tortugas Sanctuary, 1981-1983." North American Journal of Fisheries Management, 6:311-327.

Size and abundance of pink shrimp (Penaeus duorarum) in and around the Tortugas sanctuary in the Gulf of Mexico were surveyed monthly from September 1981 through July 1983. Samples were not taken in April and June 1983. Shrimp size varied widely at most stations and abundance varied between stations, but the average size increased with increasing depth and abundance decreased with increasing depth. A large proportion of small shrimp (<103 mm total length) in all samples combined monthly were caught inside the sanctuary, but their abundance varied monthly and annually. Small pink shrimp dominated the catch from fewer than half the stations inside the sanctuary in September-December 1981 but increased in abundance and dominated half or more of the stations inside the sanctuary in January-December 1982 and February-May 1983. January and July were the only months in which catches from at least half the stations inside the sanctuary were composed mostly of shrimp at least 103 mm long in 1983. Recruitment was continuous but uneven throughout the survey. Peak months of recruitment varied annually, occurring in January and July-September 1982 and in January and March 1983. Small shrimp were less abundant outside the sanctuary but peaks in abundance at some stations outside the sanctuary, indicating strong recruitment, occurred in January and July-August 1982 and in March 1983. Conservative population estimates for the Tortugas fishing ground for September 1982-July 1983 varied from  $11.8 \times 10^6$  pink shrimp in July to  $52.7 \times 10^6$  pink shrimp in March. Although the trawlable area inside the southwestern sanctuary accounted for only 6% of the total trawlable area covered by the survey, the sanctuary contained an average of 36% of the total estimated pink shrimp population.

Robinson, Michael A. and Francis T. Christy, Jr. (1989). "Comment on Professor Pontecorvo's "The State of Worldwide Fishery Statistics: A Modest Proposal"." Marine Resource Economics, 6(1):83-84.

The authors oppose Professor Pontecorvo's statement that better world wide fishery economics data needs to be collected.

Robinson, Sherman, Maureen Kilkenny, and Kenneth Hanson (1990). The USDA/ERS Computable General Equilibrium (CGE) Model of the United States. Staff Report No. AGES 9049, Agriculture and Rural Economy Division, Economic Research Service, U.S. Department of Agriculture.

This paper documents the basic Computable General Equilibrium (CGE) model of the U.S. economy developed at the Economic Research Service (ERS), USDA. The paper both describes the model equations in detail and how the model is benchmarked to a base data set. The paper also lists the computer program used to implement the model. The objective of the CGE work program at ERS is to provide a multi sectoral framework for analyzing the effect of changes in agricultural policies and exogenous stocks on the farm sector, on the rural economy, on related nonagricultural sectors, and on the rest of the

economy. The basic model has provided a starting point for a variety of extensions and applications exploring a number of policy issues. To date, work has largely focused on issues of agricultural trade policy and the effect of alternative domestic policies.

Robinson, William L. (1985). "Effort Management in Australian Fisheries." A Presentation to the Gulf of Mexico Fishery Management Council, July 10, 34 pp.

A presentation of the effort limitation programs in eight fisheries in Australia.

Robson, Arthur J. (1986). "The Existence of Nash Equilibria in Reaction Functions for Dynamic Models of Oligopoly." International Economic Review, 27(3):539-544.

It is not in general possible to satisfy the conditions proposed by Friedman (1968, 1973, 1976, and 1977) for a Nash equilibrium in reaction functions.

Roche, Ellie F. and Frederick C. Sutter (1996). Marine Fisheries Initiative Program (MARFIN). Ninth Annual MARFIN Conference, National Marine Fisheries Service, Cooperative Programs Division, 9721 Executive Center Drive North, Southeast Regional Office, St. Petersburg, Florida, November 6-7.

Abstracts of cooperative agreement reports presented at the ninth annual MARFIN conference covering shrimp bycatch, highly migratory pelagic species, reef fish, and coastal herrings.

Rockett, Andrew M. and John C. Stevenson (1987). "Karmarkar's Algorithm." Byte, September: 146-160.

A description of Karmarkar's algorithm for solving linear programming problems and an explanation of how it differs from the simplex method.

Rockland, David Ben (1983). "An Economic Analysis of Delaware's Recreational/Commercial Fisheries Conflict." Dissertation, Department of Marine Studies, University of Delaware, Newark, Delaware.

This dissertation analyses the economic impact of recreational and commercial gray seatrout fishermen on the state of Delaware. Consumer surplus from recreational fishing is estimated to be between \$13 and \$25 million while producer and consumer surplus from the commercial gillnet fishery is over \$875,000. The economic impact of the recreational fishery is almost \$13 million and \$3.3 million for the commercial fishery. Since the biological and technical relationships between the catches of the two sectors cannot be determined, it is not possible to derive an optimal allocation of fish between them.

Rodgers, Philip (1995). The Bio-Economic Simulation Model of the Catching Sector of the Irish Sea Fishery. In, Bio-Economic Modelling in the EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 44-51.

This model describes the conceptual structure of a thorough going bioeconomic model of the Irish Sea multispecies multi-method fishery that

accommodates the variety of interactions between economic behavior and biological factors and the data needed for that model. The schematics show the true position of the stocks as constraints on economic activity and are not an end in themselves. Capacity is also shown to be a constraint on effort and not causal.

Rodrick, Jeff (1994). "Effort Responsiveness to Changing Relative Prices in the North Atlantic Swordfish Fishery." Thesis proposal, Department of Food and Resource Economics, University of Florida, Gainesville, FL, July, 21 pp.

A thesis proposal to develop a model of the swordfish fishery in the southeastern region. A hypothesis of nonjointness in production will be tested using the model.

Roedel, Philip M. (1973). "Shrimp '73 - A Billion Dollar Business." Marine Fisheries Review, 35(3/4):1-6.

A presentation to the Louisiana Shrimp Association that discusses shrimp landings, imports, and cold storage holdings for 1972. The presentation also discusses other shrimp fisheries in New England and off the Pacific coast. A summary of a report by Miller and Nash (1971) on shrimp consumption and a U.S. Department of Commerce News article on shellfish shell salvaged for commercial uses are included.

Roedel, Philip M. (1975). Optimum Sustainable Yield as a Concept in Fisheries Management. Proceedings of a Symposium Held During the 104th annual Meeting of the American Fisheries Society, Honolulu, Hawaii, September 9, 1974. Special Publication No. 9, American Fisheries Society, Washington, D.C., 89 pp.

The traditional view of maximum sustainable yield as the philosophic base for fisheries management programs has come under increasing attack over the last decade. The opportunity arose to debate the issues at the 104th Annual Meeting of the American Fisheries Society with a multidisciplinary group of experts.

Rogers, Donna R., Barton D. Rogers, and Vernon L. Wright (1993). Evaluation of Shrimp Trawls Designed to Reduce Bycatch in Inshore Waters of Louisiana. MARFIN Report NA17FF0375-01, School of Forestry, Wildlife, and Fisheries, Louisiana State University Agricultural Center, Baton Rouge, Louisiana, January, 142 pp.

To evaluate the effectiveness of the Authement-Ledet Excluder, Cameron Shooter, Lake Arthur Excluder, and the Eymard Accelerator Bycatch Reduction Devices (BRDs) in inshore waters, tests were conducted in three areas of coastal Louisiana during the spring and fall shrimp seasons using a twin trawl, with a BRD on one side and a control net on the other. Shrimp and finfish loss varied between the different BRDs and depended upon the species and size of organisms within each test area. Estimates of the value of shrimp loss or gain using each BRD prototype are also provided. BRD designs with increased finfish reduction and minimal shrimp loss appear achievable. However, the high variability of bycatch species and length-frequency distributions suggests that devices may have to be designed for specific areas and possibly different seasons to release a particular or abundant species.

Rogers, George W. (1979). "Alaska's Limited Entry Program: Another View." J. Fish. Res. Board Can., 36:783-788.

Viewed in an historical perspective, the 1973 Alaska limited entry law evolved from fisheries policies motivated by distributive (Alaska first) and social (maintenance of rural fishing communities) criteria more than the traditional economic criteria of efficiency. Fisheries economics research has been primarily concerned with such matters as dissipation of economic rent through excessive units of harvesting. There is a need to expand this research into employment, labor mobility, and the evaluation of opportunity costs as well as economic efficiency.

Roitmann, Michael (1998). Note on Multi-Annual Guidance Programmes Under the Common Fisheries Policy. European Commission, Brussels, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 3 pp.

History of the European Communities effort to legislate reductions in fishing fleet capacity among its member states under the multi-annual guidance program (MAGP). Although capacity has been reduced, the economic or socio-cultural impacts on member states or the biological impacts on stocks were not presented.

Rompa, William J. (1980). "Factors in Establishing an Albacore Tuna Processing Facility in Clatsop County, Oregon." Draft, Sea Grant College Program, Oregon State University.

The possibilities of establishing an albacore tuna processing facility in Clatsop County, Oregon are explored in this report.

Rose-Ackerman, Susan (1977). "Market Models for Water Pollution Control: Their Strengths and Weaknesses." Public Policy, 25(3):383-406.

Two market schemes for controlling water pollution, effluent charges, and pollution rights, are contrasted. Rights are, in general, found to be superior to charges, but market mechanisms must also be supplemented by non-market regulatory devices. Rights are preferred to charges because they (1) assure the attainment of water quality thresholds; (2) minimize inequities; (3) provide a means of subsidizing municipalities without sacrificing efficiency; (4) permit growth without burdening existing dischargers; and (5) provide a way to handle emergencies. In addition, they can be incorporated into the existing legislation without a drastic revision of the Water Pollution Control Act of 1972.

Rose, Debra A. (1996). An Overview of World Trade in Sharks. A Traffic Network Report, Cambridge, United Kingdom.

This report offers a brief description and analysis of available data and information reviewed during the course of this study. These sources include national fisheries statistics; data collated by the Food and Agriculture Organization of the UN (FAO) and other international and inter-governmental bodies; and biological and status assessments. Thereafter, those shark fisheries covered by this study are described briefly, followed by a summary of the various shark products in trade, their processing and preparation, their use in domestic and international markets, and of the species from which they are derived. The final sections of the report discuss the management and conservation implications of these chondrichthian fisheries and resultant trade, and subsequent conclusions and recommendations for the future management of chondrichthian stocks.

Rose, Marshall (1986). "Assessment of Resources." In T. Grigalunas and



L.C. Hanson (eds.) The Continental Shelf: Resource Boundaries.  
Proceedings from the 9<sup>th</sup> Annual Conference, Center for Ocean  
Management Studies, University of Rhode Island, June 16-19.

This paper discusses the concepts, methods, and results of an economic analysis of the nonrenewable resources of the outer continental shelf as part of a five year leasing program.

Rosen, Sherwin (1974). "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." Journal of Political Economy, :34-54.

A class of differentiated products is completely described by a vector of objectively measured characteristics. Observed product prices and the specific amounts of characteristics associated with each good define a set of implicit or "hedonic" prices. A theory of hedonic prices is formulated as a problem in the economics of spatial equilibrium in which the entire set of implicit prices guides both consumer and producer locational decisions in characteristics space, buyer and seller choices, as well as the meaning and nature of market equilibrium, are analyzed. Empirical implications for hedonic price regressions and index number construction are pointed out.

Rosenberg, Andrew A. (1994). Background on U.S. Fisheries Management: Status and New Directions. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Most U.S. fisheries are open access. There are currently only 5 fishery management plans (out of 43) that control access to the resources they cover. However, some form of limited access has been approved by Fishery Management Councils for another 15 fisheries and limited access is being considered in 12 more cases. In most of the plans, a moratorium on new entrants has closed access. In a number of others, individual transferable quota systems are being developed.

Rosenberg, Andrew A., and Victor R. Restrepo (1995). Precautionary Management Reference Points and Management Strategies. TCPA/BP4, Technical Consultation on the Precautionary Approach to Capture Fisheries (TCPA), FAO Scientific Meeting, Lysekil, Sweden, May, 13 pp.

The precautionary approach to fishery management seeks to protect fishery resources from fishing practices that may put their long term viability in jeopardy. To take appropriate precautions, fishing activities may need to be controlled even before there is clear scientific evidence that current practices can not be sustained by the resource. To develop fishery control policies, biological reference points are needed for measuring current resource status and the projected effects of fishing.

Rosenberg, A., P. Mace, G. Thompson, G. Darcy, W. Clark, J. Collie, W. Gabriel, A. MacCall, R. Methot, J. Powers, V. Restrepo, T. Wainwright, L. Botsford, J. Hoenig, and K. Stokes (1994). Scientific Review of Definitions of Overfishing in U.S. Fishery Management Plans. NOAA Technical Memorandum, NMFS-F/SPO-17, National Marine Fisheries Service, August, 205 pp.

A panel of biologists reviewed all of the current definitions of overfishing from a technical standpoint and reported on their strengths and weaknesses for conserving fishery resources.

Rosenman, Robert E. (1986). The Optimal Tax for Maximum Economic Yield: Fishery Regulation Under Rational Expectations. Journal of Environmental Economics and Management, 13:348-362.

This paper examines the optimal tax to achieve maximum economic yield (MEY) exploitation in a rational expectations model of a competitive open access fishery. To analyze the dynamic evolution of resource use a structural model that explains the relationship between the firm and the industry is presented. The unregulated equilibrium is contrasted with the potential MEY. Conditions under which the unregulated equilibrium will be MEY are explored. In addition, a tax is devised that will cause non-MEY competitive exploitation to become MEY when the tax is implemented.

Rosenthal, Donald H. (1985). "Representing Substitution Effects in Models of Recreation Demand." PH.D. Dissertation, Department of Agricultural and Natural Resource Economics, Colorado State University, Fort Collins, Colorado.

This study determines how sensitive economic estimates of the value of recreation sites are to the manner in which the influence of substitute recreation sites is modeled. The average consumer surplus per person, per trip at eleven different reservoirs operated by the U.S. Army Corps of Engineers was estimated using three different zonal travel cost models (TCMs). Each TCM differed with respect to its treatment of substitute recreation sites.

Rosenthal, Donald H. (1987). "The Necessity for Substitute Prices in Recreation Demand Analyses." American Journal of Agricultural Economics, 69(4):828-837.

Omitting substitute prices from a travel cost model is shown to cause a significant bias in consumer surplus estimates. Three sets of travel cost models are developed from a common data base representing 60,000 day users of U.S. Army Corps of Engineer reservoirs in Kansas and Missouri. The first set of models omitted substitute prices; the latter two sets included them. An analysis of variance test showed that consumer surplus estimates from the first set of models were significantly higher than the other two ( $F=26.2$  with 2,20 degrees of freedom). The theoretical and practical implications of these findings are discussed.

Rosenthal, Donald H., Marshall B. Rose, and Lawrence J. Slaski (1988). "Economic Value of the Oil and Gas Resources on the Outer Continental Shelf." Marine Resource Economics, 5(3):171-189.

A theoretical framework for estimating the economic value of the federal government's offshore oil and gas resources is developed. This framework is then applied to geological and economic data generated by the Minerals Management Service in support of their five-year leasing plan. With an 8 percent real discount rate and a 1 percent real price growth rate, the remaining economic rent as of 1987 on the reserves plus the undiscovered offshore oil and gas resources is estimated at \$118.6 billion (1987 dollars). The present value of the government's receipts from cash bonus and royalty payments on these deposits is estimated at \$37.2 billion. Over 80 percent of the remaining economic rent is derived from developed reserve deposits located in the Gulf of Mexico. The private sector has previously paid cash bonuses for the leases located on those deposits and financed the installation of the development platforms. Because of this, the government will collect only a small portion, approximately 22 percent, of the rent remaining on those reserves.

Rothschild, Brian J. (1972). "An Exposition on the Definition of Fishing Effort." Fishery Bulletin, 70(3):671-679.

The term "fishing effort" is well defined in population dynamics literature. The term as defined in the population dynamics literature is, however, difficult to reconcile with broader definitions of fishing effort, particularly those having economic implications. The present paper discusses the distinction between the definitions and gives some examples in the context of allocating inputs, the capacities of fishing boats, and several stocks to the catch in a manner that maximizes profits. Managerial behavior is also an important input to the fishing process; this is discussed in a decision theory format where decision quality can be measured relative to entropy in the decision environment affording a comparison among decision environments in terms of information and an imputed valuation of a bit of information under various circumstances. The conventional measures of the quality of the decision environment are often based upon expected catch. Alternate measures are discussed which include the expected loss or the risk involved in the decision process.

Rothschild, Brian J. (1977). "Fishing Effort." Chapter 5 in J.A. Gulland (ed.) Fish Population Dynamics. John Wiley and Sons, New York, New York.

A discussion of fishing effort and fishing mortality as applied to problems involving population dynamics.

Rothschild, Brian J. (1996). "How Bountiful are Ocean Fisheries." Consequences, 2(1):15-24.

In the last seven years, while the world population was climbing by about 10 percent, the total landings of fish from the ocean declined by almost as much, signaling, perhaps, the end of the long summer of human history when the waters beneath the ocean surface seemed to hold an unending supply of fish for food. There is hope that improved knowledge of fish and ocean ecosystems, more enlightened management, and more prudent allocations can once again increase the yield. It is certainly true that the science of fisheries has much to learn, and that fisheries management, as practiced in most seafaring nations, has more often focused on immediate interests than on what is sustainable in the long haul. The need to know more and manage better is heightened by the environmental changes that have altered today's rivers and coastlines, and by tomorrow's prospects of possible climate change. Technological and economic advances in aquaculture, worldwide a growing industry, could also help, where these efforts directed more toward fish as a dietary staple, as opposed to a luxury.

Rothschild, Brian J., A.F. Sharov, and A.Y. Bobyrev (1997). "Red Snapper Stock Assessment and Management for the Gulf of Mexico." Draft report submitted to the Office of Science and Technology, National Marine Fisheries Service by the Center for Marine Science and Technology, University of Massachusetts, North Dartmouth, Massachusetts, August, 52 pp.

This is an independent scientific stock assessment of the status of the red snapper in the Gulf of Mexico as mandated by Congress to determine the status of the stock, appropriateness of the current assessment models, soundness of results and conclusions from the existing stock assessment, level of uncertainty, stock restoration management measures, and their consistency with the precautionary approach to fisheries. A second paper contains a set of comments from three independent peer reviewers.

Rothschild, Brian J., A.F. Sharov, and A.Y. Bobyrev (1997). "Red Snapper Stock Assessment and Management for the Gulf of Mexico." Final report submitted to the Office of Science and Technology, National Marine Fisheries Service by the Center for Marine Science and Technology, University of Massachusetts, North Dartmouth, Massachusetts, December, 173 pp.

This is an independent scientific stock assessment of the status of the red snapper in the Gulf of Mexico as mandated by Congress to determine the status of the stock, appropriateness of the current assessment models, soundness of results and conclusions from the existing stock assessment, level of uncertainty, stock restoration management measures, and their consistency with the precautionary approach to fisheries.

Rottmann, R.W. and J.V. Shireman (1988). "Management of Water Quality for Fish." Circular 715, Cooperative Extension Service, University of Florida, Institute of Food and Agricultural Sciences, 18 pp.

The purpose of this publication is to assist the Florida fish farmer or pond owner in pond management. The text Water Quality Management for Pond Fish Culture by Claude E. Boyd is an excellent source of more detailed information on the subject and is recommended reading. This circular provides a simpler approach and addresses certain aspects of water quality specific to Florida not covered in Boyd's book.

Roy, Noel (1998). Fishing Behavior and the Length of the Fishing Season. Marine Resource Economics, 13(3):193-213.

The basic hypothesis of this paper is that the amount of fishing that a fish harvester undertakes during a year is not determined entirely by circumstances that are exogenous to the fisher, such as weather conditions and resource availability, but is also partially a matter of individual choice. The paper develops a behavioral model of fishing from the perspective that the decision to modify the period of time over which fishing takes place is governed by a comparison of the marginal benefits and costs of doing so. The model is tested econometrically as an error-components model using a 10% longitudinal sample of recipients of seasonal fishermen's unemployment insurance benefits in Newfoundland over the period 1971-93. The results suggest that the Canadian unemployment insurance program has reduced the length of the fishing season in Newfoundland by about 8-10 weeks.

Ruddle, Kenneth (1988). "Social Principles Under Traditional Inshore Fishery Management Systems in the Pacific Basin." Marine Resource Economics, 5:351-363.

Among fisheries management schemes, those based on sole ownership concepts have been relatively little studied. This concept has been most widely applied in the traditional fisheries management or sea tenure systems of the Pacific Basin, where unlike the West, sole ownership resides in the community or other small social group. Information on Pacific Basin sea tenure systems remains largely anecdotal and unsynthesized. In a partial attempt to overcome that, this article defines and exemplifies six social principles common to many traditional systems of sea tenure in inshore fisheries management in the Pacific Basin, with reference to Oceanian islands, and based on an examination of the literature and supplementary field research. These principles are that: (1) sea rights depend on social status, (2) resource exploitation is governed by sea rights, (3) resource territories are defined, (4) marine resources are controlled by traditional authorities,

(5) conservation was traditionally widely practiced, and (6) sanctions and punishments are meted out for infringement of regulations. Most remaining systems are hybrids of traditional and modern components, with the latter becoming dominant. Interpretation of the literature without supplementary field verification is severely constrained by the use of the "anthropological present" tense.

Ruffin, Roy J. and M.D. Anderson (1996). Externalities, Markets, and Government Policy. Economic Review, Third Quarter: 24-29, Federal Reserve Bank of Dallas, P.O. Box 655906, Dallas, Texas.

Coase's contribution to understanding the role of government in the economy is explained. Coase showed that externalities may or may not require a government solution, depending on the institutional setting of the problems and the size of the transaction costs. Moreover, even in the absence of externalities, market transactions require low transaction costs. Firms exit to economize on those costs. In shifting the terms of the debate, Coase single-handedly moved economics from presuming specific roles for government action to a more neutral position requiring detailed analysis to justify government intervention.

Rulifson, Roger A., James D. Murray, and James J. Bahen (1991). "Bycatch Reduction in South Atlantic Shrimp Trawls Using Three Designs of "Finfish Separator Devices"." Final report prepared for NOAA, NMFS.

Standard shrimp trawls used in the southeastern USA commercial fishery were modified in an attempt to reduce the amount of unwanted fish and invertebrates (bycatch) retained during normal shrimp trawling procedures using the Parrish TED, square mesh FSD, and the diamond mesh FSD with and without hoops. No significant loss in marketable-sized fish was observed among the FSD designs compared to control catches. The objective of a 50% bycatch reduction with a shrimp loss of less than 5% was not consistently obtained.

Rulifson, Roger A., James D. Murray, and James J. Bahen (1992). "Finfish Catch Reduction in South Atlantic Shrimp Trawls Using Three Designs of By-Catch Reduction Devices." Fisheries, 17(1):9-20.

Standard shrimp trawls used in the southeastern U.S. commercial fishery were modified in an attempt to reduce the amount of unwanted fish (bycatch) retained during normal shrimp trawling procedures. A sampling design was used to test the effectiveness of bycatch reduction devices (BRDs) towed in combination with unmodified nets in coastal waters off Brunswick, Georgia, in 1990. Several problems hampered statistical analysis of the data, including slight differences in the towing of port and starboard nets, onboard modifications of BRDs during testing to correct design deficiencies, and seasonality of shrimp catches in combination with large masses of sargassum and jellyfish in trawls during fall sampling. The modified Parrish turtle excluder device (TED) was the only BRD that had a significant reduction ( $\alpha = 0.05$ ) in the percent difference in total biomass compared to the control net. Bycatch reduction was not consistent for other designs. No significant loss of marketable sized fish was observed among the BRD designs compared to control catches. The ability of smallest juvenile fish to escape from BRDs, thus shifting (increasing) the length-frequency distribution, was species specific. The normal Parrish TED was best suited for escapement of smallest menhaden, while the diamond-mesh BRD with hoops best minimized capture of the smallest Atlantic bumper, grey trout, and Atlantic croaker. The square-mesh

net was most effective in reducing retention of smallest-sized thread herring, and the modified Parrish TED retained less of the smallest-sized spot. The objective of 50% bycatch reduction with a shrimp loss of less than 5% was not consistently reached; however, BRDs show promise for bycatch reduction in South Atlantic coastal waters.

Runge, Carlisle Ford (1981). "Common Property Externalities: Isolation, Assurance, and Resource Depletion in a Traditional Grazing Context." American Journal of Agricultural Economics, 63(4):595-606.

Institutional alternatives to common property externalities are wider than argued by private exclusive property rights advocates. The "tragedy of the commons" is not a prisoners' dilemma, characterized by the strict dominance of individual strategies. The nonseparable common property externality is an "assurance problem." The assurance problem provides striking perspectives in analytical and policy terms. It redefines the problem of the commons as one of decision making under uncertainty. Institutional rules innovated by the group to reduce uncertainty and coordinate expectations can solve the problem of overexploitation. Rules come in many forms, and private property is only one.

Runge, Carlisle Ford (1984). "Institutions and the Free Rider: The Assurance Problem in Collective Action." The Journal of Politics, 46:154-181.

Political and economic theory make extensive use of the one period Prisoners' Dilemma (PD) to model public goods problems and collective action generally. While the PD provides important insights into the breakdowns of social institutions, it gives no explanation of how or why institutions are developed in the first place. This paper presents a related approach: the Assurance Problem (AP). The AP suggests that interdependent choice creates incentives to establish and maintain institutions that coordinate expectations based on rules of fairmindedness. With such coordinated expectations, voluntary contributions to public goods may be utility maximizing strategies.

Runge, Carlisle Ford (1984). "Strategic Interdependence in Models of Property Rights." American Journal of Agricultural Economics, 66(5):807-813.

This essay explores the implications of strategic interdependence for the theory of property rights and the "new institutional economics" (Schotter). It attempts to clarify some of the linkages from institutional economics to micro- and macroeconomic theory by considering how property institutions result from strategic interdependence, confer payoffs to individual agents, and reflect collective choices based on individual preferences.

Russell, Clifford (1979). "Applications of Public Choice Theory: An Introduction." Introduction from Clifford Russell (ed.) Collective Decision Making. Johns Hopkins Press for Resources for the Future.

Public choice is concerned with the mechanisms by which human societies make decisions about their collective lives.

Sadeh, Arye, Hovav Talpaz, David A. Bessler, and Wade L. Griffin (1989). "Optimization of Management Plans with Short and Long Run Problems: The Case of Shrimp Production." European Journal of

Operational Research, 40:22-31.

A management plan of continuous production is specified and optimized. An optimal control framework is used to solve for the decision variables. An economic interpretation of the optimality conditions is provided. The model is applied to the management of a shrimp pond. Results for different runs of the model are given and discussed.

Sage Associates, Inc. (1981). Economic Assessment of the U.S. Shrimp Industry with Associated Public Policy Recommendations. Washington, D.C.

This report contests the overcapitalization argument for the Gulf of Mexico and south Atlantic shrimp fishing fleet. It argues that a tariff and quota on shrimp imports would be economically efficient and have little impact on retail shrimp prices.

Saila, S.B. (1983). "Importance and Assessment of Discards in Commercial Fisheries." Fisheries Circular 765, Food and Agriculture Organization of the United Nations, Rome, October.

A review is made of the magnitude of the discarded catches from the major fisheries. Wide seasonal, geographic and gear-related variations were found in the discarded catch. Some simple field survey procedures for discard estimation are suggested. The probable biological consequences of discards are assessed on the basis of available information and suggestions for further studies are made. Some specific sampling and estimation methods applicable to the discard problem are suggested and some examples are provided.

Saila, S.B., Robert Francis, and Terrance Quinn (1990). "Report of the 1990 Swordfish Review Panel." Swordfish Review Panel Report, South Atlantic Fisheries Management Council, Charleston, South Carolina, June, 17 pp.

The panel reviewed the biological basis for proposed management measures by three Councils. The panel recommends that the Atlantic swordfish population should be managed under a risk-averse constant harvest rate policy that sets acceptable biological catch to the product of the constant harvest rate, based on  $F_{0.1}$  and the current exploitable biomass. The Atlantic swordfish population should be rebuilt to the 1978 level as soon as practically possible.

Saila, S.B., E. Lorda, and H.A. Walker (1985). "The Analysis of Parameter Error Propagation in Simple Fishery Models." Marine Resource Economics, 1(3):235-246.

Methodology to analyze the propagation of errors in fishery model parameters is described and demonstrated through its application to stock size estimates obtained using Pope's cohort analysis. The method requires that independent standard errors for model parameters be available and its is based upon a formal analysis of how uncertainties propagate through model calculations.

In certain cases the methodology described can be used instead of a numerical sensitivity analysis to investigate the model responses to error or uncertainty in its parameters. The ability to assess the relative merits of increased precision in various parameter estimates is considered especially useful.

Saila, S.B., H.A. Walker, E. Lorda, J.Kelly, and M. Prager (1982).

"Analysis of Data on Shrimping Success, Shrimp Recruitment and Associated Environmental Variables, Shrimp and Redfish Studies: West Hackberry and Big Hill Brine Disposal Sites." Contract No. NA80-GA-00045, NMFS, SEFC, Galveston Laboratory, 4700 Avenue U, Galveston, Texas 77550, May, 238 pp.

This study attempts to identify plausible empirical relationships that may be used to build predictive models of how climatic variability can cause changes in certain population parameters, such as growth and mortality, fecundity, post larval recruitment, age at maturity, etc. Although statistical tests for the effects of various interventions that take climatic fluctuations into account are suggested, it is still not possible to distinguish between effects due to brine disposal and those due to the Texas closure since both were initiated in 1981. The suggested test procedure can be used to determine if the combined effects of the Texas closure and brine disposal are statistically significant once variations in landings due to climatic fluctuations have been taken into account.

Salchenberger, Linda M. (1989). "Sole Owner Harvesting Policies under the Threat of Entry: A Two-Stage Linear Game." Journal of Environmental Economics and Management, 16:121-133.

In this paper, we analyze harvesting policies for a producer who is guaranteed exclusive harvesting rights to a renewable resource for a specified period of time. A second producer may enter the market after these rights have expired and if entry occurs, the duopoly stage is modeled as a noncooperative differential game. We assume that the price and average costs are constant and that the harvest rate is linearly dependent upon the stock level and the effort expended. After the solution to the duopoly game is presented, we give the solution to the two stage profit maximization problem of the incumbent. A modified most rapid approach path solution is shown to be optimal under certain conditions.

Salim, Kamaruzaman H. (1998). A Note for Technical Working Group on Fishing Capacity. Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 4 pp.

Comments on a list of issues dealing with the management, control, or reduction of fishing capacity. Examples of how these issues directly relate to the management of capacity that have been resolved in the context of a country or a fishery and a list of selected issues that should receive attention at the regional or international level.

Salvanes, Kjell G. and Don J. DeVoretz (1993). "Household Demand for Fish and Meat Products: Separability and Demographic Effects." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

This paper focuses on the specification of the Canadian household's demand for fish and meat products. In contrast to the demand literature, this paper directly tests for separability and relevant substitutes by estimating different demand systems over different aggregation levels for fish and meat with an identical retail level household data set. Knowledge of substitute products obtained from separability tests will reveal the potential for product differentiation. The results indicate that all Canadian fish products and species as categorized in this study cannot be modeled separately. In sum, analyzing the structure of meat or fish consumption at a relatively aggregate level is correct based on these results. However, different species of fish and other seafood or different product forms of fish cannot be



analyzed separately.

Salvanes, Kjell G. and Don J. DeVoretz (1997). "Household Demand for Fish and Meat Products: Separability and Demographic Effects." Marine Resource Economics, 12(1):37-55.

By reviewing the current demand literature for fish and meats, it is apparent that several inadequacies arise from the problems of market delineation or aggregation errors. Inappropriate aggregation may lead to biases in price elasticities and associated specification problems with respect to identifying substitutes. Formal separability tests allow for identification of appropriate aggregation levels and the relevant products or market boundaries in a systematic manner. A formal demand system for fish and meat can thus be estimated with one data set over various aggregations with the appropriate demographic arguments. The present article tests for separability (and thus relevant substitutes/complements) by estimating different demand systems over different aggregation levels for fish and meat with an identical retail level household data set for the Canadian market.

Samonte-Tan, Giselle P.B. (2000). Economic Status and Policies Affecting the Shrimp Industry in the Gulf of Mexico. Dissertation, Department of Agricultural Economics, Texas A&M University, College Station, Texas, May, 180 pp.

The economic status of the Texas shrimp harvesting sector is analyzed based on cost and revenue data for the period 1987-1992. Texas ex-vessel shrimp prices have remained low and stable while shrimp operating costs have been increasing resulting in an annual loss averaging \$3,875 per vessel. Second the bioeconomic impacts of sea turtle conservation policies on the shrimp industry are analyzed using the General Bioeconomic Fisheries Simulation Model (GBFSM) extended to include a Kemp's ridley sea turtle biological submodel. Results show that the sea turtle population will rebuild without the use of TEDs at a lower cost to the nation. Better nest protection would be more effective in the long run than the TED regulations in restoring the Kemp's ridley population. Bycatch reduction devices (BRDs) were evaluated and showed that costs to the nation increased as survival rates from shrimp escapement declined. If 50% survived, the total economic loss to society is \$44.9 million and if the survival is 0%, the loss is \$65.7 million.

Samonte-Tan, Giselle P.B., Wade L. Griffin, Teofilo Ozuna, Jr., and John M. Ward (1997). The Economic Status of the Texas Shrimp-Harvesting Sector. Draft report, Department of Agricultural Economics, Texas A&M University, College Station, Texas, August, 14 pp.

An analysis of the economic status of the Texas shrimp-harvesting sector is provided. The study begins by discussing how shrimp imports have affected domestic shrimp supply and how this, in turn, has affected Texas ex-vessel shrimp prices. The impact of fishery conservation and management policies on shrimp landings and returns is also. Finally, an in-depth analysis of the costs and returns of Texas shrimp fishermen is provided examined for the period 1987 through 1992. The results indicate that the Texas shrimp harvesting sector was economically viable up to 1979 but that this viability abruptly ended due to increased imports which have kept shrimp prices low and stable and to increased costs resulting from the imposition of shrimp regulatory policies. In essence, the Texas shrimp-harvesting sector has been experiencing a price-cost squeeze since the early 1980s.

Sample, Rebecca S. (1990). "Transition to Chaos in Multidimensional Constrained Systems." Master of Science thesis, Department of

Physics, University of Maine, Orono, Me, May, 96 pp.

Chaotic behavior occurs in a variety of physical, chemical and biological systems when a constraint is imposed on the total energy or mass of the system. In population models, for example, this constraint can reflect an ecosystem's limited carrying capacity. The focus of this research is the onset of chaos in such systems, probed by simulating simple constrained dynamical models. The simulations track the time evolution of systems with characteristic input, amplification and dissipation terms, analogous to population models with birth, growth and mortality. These model features are chosen so that the system exhibits a stable steady-state solution in the absence of the constraint. When the constraint is implemented, we find that the qualitative features of the transition from regular to the qualitative features of the transition from regular to chaotic dynamics are extremely sensitive to the model dimensionality, and differ greatly from the widely studied period-doubling route to chaos exhibited by a large group of one dimensional nonlinear systems. In low dimensional cases, long periodic cycles are prevalent, whereas higher dimensional systems show intermittency preceding chaos. Fourier transforms of time series have been used to identify intermittent, quasiperiodic and chaotic regimes. Eigenvalue analysis in the vicinity of fixed solutions indicates that a wide range of biological inputs that do not yield chaos in conventional population models do generate chaotic dynamics once the carrying capacity is incorporated into the model. Characteristics of the onset of chaos observed in these models could be relevant to other problems with similar types of constraints, such as turbulence and multistep chemical reactions.

Samples, Karl C. and Richard C. Bishop (1985). "Estimating the Value of Variations in Anglers' Success Rates: An Application of the Multiple-Site Travel Cost Method." Marine Resource Economics, 2(1):55-74.

An estimation method is presented to measure sport fishermen's valuation of exogenous changes in fishing quality (catch rates). A theoretical model is initially presented to show how variations in prevailing catch rates influence an angler's valuation of recreational fishing. A two-stage estimation approach is suggested that capitalizes on the notion that angler consumer surplus is sensitive to changes in success rates. The procedure entails first estimating sportfishing values at qualitatively different fishing sites using a multiple-site travel cost approach. Afterward, the sensitivity of estimated values to different success rate levels is measured using a separate regression procedure. An empirical application of this two-stage method to Lake Michigan sportfishing is given. It is estimated that for Lake Michigan anglers who fish for trout and salmon, a 10% increase in success rates will increase average trip values by \$0.30.

Samples, Karl C. and John T. Sproul (1985). "Fish Aggregating Devices and Open-Access Commercial Fisheries: A Theoretical Inquiry." Bulletin of Marine Science, 37(1):305-317.

This paper explores the economic consequences of deploying fish aggregating devices (FADs) in developed open access or common property commercial fisheries. The objective is to understand how FAD installation can be expected to influence sustained gross revenues (sustained harvests), employment and fishermen's profits over the long run. A Mathematical bioeconomic model is presented that illuminates the biological interdependence between fishing that occurs at FAD locations and fishing that is directed at a background fish stock. Two models of biological interaction are considered. Model A assumes that high levels of FAD fishing effort will not reduce the

biological productivity of the underlying fish stock. In Model B, this assumption is relaxed. Results of both models suggest that if harvesting effort in the FAD fishery is unregulated, installation of FAD networks will not generally increase fishermen's aggregate profit position. Furthermore, depending on relative productivity and cost of effort in FAD and non-FAD fishery, deployment of FADs may generate unintended results; decreases in employment, harvest levels, and sustained gross revenues. Potential problems are especially acute when FAD fishing effort is low cost and efficient, and FADs are effective at aggregating fish. These findings point to the need for managing levels of commercial fishing effort at FAD locations. Limited entry schemes, licensing and user fees are discussed as possible management options.

Sampson, David B. (1991). "Fishing Tactics and Fish Abundance, and Their Influence on Catch Rates." ICES J. Mar. Sci., 48:291-301.

Choosing a location for fishing is the major short run decision made by the skipper of a fishing vessel. Because the spatial density of fish is not uniform everywhere, where a skipper decides to fish largely determines the size and value of his catch. For that to be a rational decision, the skipper must consider not only the catches he is likely to make at different locations but also the costs incurred in fishing at those locations. As a consequence the catch rates and the catch per unit effort observed in a fishery depend not just on fish stock abundance but also on economic factors such as wage rates and fish and fuel prices. This paper develops some simple theoretical models for examining a fisherman's selection of fishing location. The spatial distribution of the fish stock is reduced to a single dimension, distance from port, and it is assumed that fish density increases linearly with distance from port and that the relative densities remain constant regardless of the absolute level of fish stock abundance. If a skipper operates his vessel further from port, he gains access to greater densities of fish and higher instantaneous catch rates but uses more fuel and time for travel. A skipper can maximize his share of the fishing profits by operating his vessel at a particular distance from port. The skipper operates within constraints that determine the form of the revenue and cost functions. Two models are considered. In the first, the duration of a fishing trip is considered by the size of the fish hold or by some other limit to the amount of fish that can be landed; each fishing trip continues until the hold is filled. In this case catch and revenue per trip are constant but the fishing costs vary nonlinearly with distance from port. Here the catch per unit effort is a nonlinear function of the total biomass of the fish stock but the cpue is independent of the price of fish. In the second model, there is a time constraint: to fill the hold would take too much time. In this case each trip is of a fixed duration and catch and revenue per trip are quadratic functions of distance from port and operating costs vary linearly. Here cpue is a linear function of fish stock biomass and a nonlinear function of fish price.

Sampson, David B. (1992). "Fishing Technology and Fleet Dynamics: Predictions from a Bioeconomic Model." Marine Resource Economics, 7(1):37-58.

Bioeconomic models of fisheries usually do not provide details of fishermen's short-run behavior. This paper develops a model for the short-run selection of fishing location by profit maximizing fisherman in an open access fishery given that fish density increases further from port and given that fishing trips have a fixed duration. For any particular level of fish price and fish stock abundance, a fishing vessel's technical characteristics (fuel consumption, catch rate, vessel speed) and economic characteristics (wage rates, fuel price) determine the optimum location for fishing. A long run model is derived; the cost flows for the fishing vessel and the biological

dynamics are added to the system. The modes are applied to the evolution of a hypothetical fishery in which fishermen utilize either an active fishing technology (trawlers) or a passive one (long-liners).

Sampson, David B. (1994). "Fishing Tactics in a Two-Species Fisheries Model: The Bioeconomics of Bycatch and Discarding." Canadian Journal of Fisheries and Aquatic Science, 51(12):2688-2694.

The selections for fishing location largely determine the species mix and value of a fisher's catch. Because of travel costs, these choices also determine the profitability of a fishing trip. This paper develops a simple theoretical model for the selection of fishing locations by a fisher faced with two co-occurring species whose densities vary with distance from port. For each species there can be different catchability coefficients, handling times, and prices. The duration of each fishing trip is assumed to be fixed. The model is used to determine the profit maximizing fishing tactics (the fishing locations and time spent at each location) and to explore the conditions that generate deliberate bycatch and discarding when one of the species cannot be sold because it is unmarketable or because of trip limits.

Samuelson, Paul A. (1954). "The Pure Theory of Public Expenditure." Review of Economics and Statistics, 36:387-389.

The theory of optimal public expenditure based on private consumption goods and collective consumption goods is presented.

Samuelson, Paul A. (1958). "Aspects of Public Expenditure Theories." Review of Economics and Statistics, 40:332-338.

Some difficulties with expenditure theory and with political decision making are discussed.

Samuelson, Paul A. (1976). "Economics of Forestry in an Evolving Society." Economic Inquiry, 14(4):466-492.

A lecture on the debate over maximum sustained yield as a management tool in forestry.

Sandal, Leif K. and Stein Ivar Steinshamn (1997). Efficient Allocation in Fisheries: Domestic Issues. Natural Resource Modeling, 10(1):1-2.

Introduction to the volume dedicated to the international workshop on Assessment and Distribution of Harvest Quotas in Fisheries.

Sandal, Leif K. and Stein Ivar Steinshamn (1997). Optimal Steady States and the Effects of Discounting. Marine Resource Economics, 12(2):95-105.

A simple expression for finding and characterizing the optimal steady state of a general dynamic optimization problem is derived. This expression is easy to interpret and easy to apply for various purposes as, for example, to analytically investigate the effect of the discount rate upon optimal steady state stock levels. It is shown that an increase in the discount rate may result in higher optimal stock levels even in the one-dimensional (single species) case in nonlinear models. An important result is that if demand is inelastic at the optimal steady state, a higher discount rate will unequivocally imply higher standing stock(s). Increasing marginal cost of harvest will further strengthen this result. In the multidimensional case it is demonstrated that an increased discount rate may result in higher optimal stock levels for all stocks included in the model.

Sandal, Leif K. and Stein Ivar Steinshamn (1997). A Stochastic Feedback Model for Optimal Management of Renewable Resources. Natural Resource Modeling, 10(1):31-51.

Analytical expressions for optimal harvest of a renewable resource stock which is subject to a stochastic process are found. These expressions give the optimal harvest as an explicit feedback control law. All relations in the model, including the stochastic process, may be arbitrary functions of the state variable (stock). The objective function, however, is at most a quadratic function in the control variable (yield). A quadratic objective function includes the cases of downward sloping demand and increasing marginal costs which are the most common sources for nonlinearities in the economic part of the model. When it is assumed that there is a moratorium on harvest for stock sizes below a certain level (biological barrier), it is shown that the barrier requirements influence the optimal harvest paths throughout.

Sanders, Nathaniel, Jr., David M. Donaldson, and Perry A. Thompson (eds.) (1990). "SEAMAP Environmental and Biological Atlas of the Gulf of Mexico, 1987." Number 22, Gulf States Marine Fisheries Commission, November, 337 pp.

The Southeast Area Monitoring and Assessment Program (SEAMAP) is a State/Federal/University program for the collection, management, and dissemination of fishery independent data in the United States waters of the Gulf of Mexico. A major SEAMAP objective is to provide the large, standardized data base needed by management agencies, industry, and scientists to wisely manage and develop fishery resources for the least possible cost. This report is the sixth in a series of SEAMAP environmental and biological atlases that presents such data in a summarized form collected during the 1987 SEAMAP surveys.

Sandler, Todd and Frederic P. Sterbenz (1990). "Harvest Uncertainty and the Tragedy of the Commons." Journal of Environmental Economics and Management, 18:155-167.

This paper demonstrates that a fixed number of risk averse firms faced with harvest uncertainty owing to resource stock uncertainty will typically reduce their exploitation of a commons. In addition, the total exploitation of the industry will decrease when entry is permitted and uncertainty is compared with certainty. This result holds for perfectly competitive output markets and also characterizes imperfectly competitive output markets with linear market demand and risk neutral firms. In the latter case, the socially optimum number of firms is determined based upon the degree of uncertainty, the price elasticity of market demand, and the elasticity of input productivity.

Sarthou, Cynthia M. (1996). Letter to Wayne Swingle, Gulf of Mexico Fishery Management Council, September, 20<sup>th</sup>, 2 pp.

Letter expressing the concern of the Gulf Restoration Network about the decline in large coastal shark populations in the Gulf of Mexico.

Sather, J. Henry and Patricia J. Ruta Stuber (tech. Coordinators) (1984). "Proceedings of the National Wetland Values Assessment Workshop." May 23-26, 1983, Alexandria, Virginia. Fish and Wildlife Service, U.S. Department of the Interior.

This is a summary of the information emanating from the Wetland Values Assessment Workshop.

Sathiendrakumar, R. and C.A. Tisdell (1987). "Optimal Economic Fishery Effort in the Maldivian Tuna Fishery: An Appropriate Model." Marine Resource Economics, 4:15-44.

The estimation of a production function for Maldivian tuna fishery is a two step process. First, it is necessary to find the relationship between catch and effort and second, to find the most efficient combination of inputs to produce the various levels of effort and hence output. The paper discusses the selection of an appropriate model to explain the relationship between tuna catch and effort and presents a technique for estimating the effort level required for an optimal allocation of resources that maximize the economic benefit of the fishery to the society. It also considers the extent to which the present pricing policy of the State Trading Organization for tuna has prevented the fishery reaching the open access equilibrium yield level of effort and dissipating resource rent.

Schabram, Dennis (1995). Texas Shrimpers Ready or Not for Limited Entry and Bycatch . The Herald, 6(4), February 16, 2 pp.

Will recreational fishermen do to the shrimp fishery what they did to the finfish fishery in Texas? Ultimately the consumer will share the price. Will free enterprise forces regulate the shrimp industry?

Schaefer, H. Charles, Lyman E. Barger, and Herman E. Kumpf (1988). "The Driftnet Fishery in the Fort Pierce-Port Salerno Area off Southeast Florida." Draft report, National Marine Fisheries Service, Southeast Fisheries Center, Economics and Statistics Office, 727 Belvedere Road, West Palm Beach, Florida.

From May through September 1987, observations were made on 38 trips in the driftnet fishery off the Fort Pierce-Port Salerno area off southeast Florida. Of the number and weight of fish landed on observed trips, 91.6 percent consisted of king mackerel, Scomberomorus cavalla, the targeted species. Over 33 species of fish were observed among the discarded bycatch. The most frequently occurring species in the discards was little tunny, Euthynnus alletteratus, that made up 67 percent by number of the discarded bycatch. Total landings for all commercial gear from Saint Lucie and Martin counties (the counties of the study area) increased 516,741 pounds from 1986 to 1987. In 1986, 55 percent of the catch was from handline and 45 percent from driftnet landings. In 1987, 78 percent was from driftnet and 22 percent from handline landings. A comparison of lengths from recreational and commercial landings showed recreationally caught fish to be, on the average, smaller. No marine mammals, birds, or turtles were entangled in the net on observed trips. Data on cost of nets, fuel, and supplies plus the distribution of earnings among the crew were obtained for five driftnet boats.

Schaefer, H. Charles, Lyman E. Barger, and Herman E. Kumpf (1989). "The Driftnet Fishery in the Fort Pierce-Port Salerno Area off Southeast Florida." Marine Fisheries Review, 51(1):44-49.

From May through September 1987, observations were made on 38 trips in the driftnet fishery off the Fort Pierce-Port Salerno area off southeast Florida. Of the number and weight of fish landed on observed trips, 91.6 percent consisted of king mackerel, Scomberomorus cavalla, the targeted species. Over 33 species of fish were observed among the discarded bycatch. The most frequently occurring species in the discards was little tunny, Euthynnus alletteratus, that made up 67 percent by number of the discarded bycatch. Total landings for all commercial gear from Saint Lucie and Martin counties (the counties of the study area) increased 516,741 pounds from 1986

to 1987. In 1986, 55 percent of the catch was from handline and 45 percent from driftnet landings. In 1987, 78 percent was from driftnet and 22 percent from handline landings. A comparison of lengths from recreational and commercial landings showed recreationally caught fish to be, on the average, smaller. No marine mammals, birds, or turtles were entangled in the net on observed trips. Data on cost of nets, fuel, and supplies plus the distribution of earnings among the crew were obtained for five driftnet boats.

Schaefer, Milner B. (1954). "Some Aspects of the Dynamics of Populations Important to the Management of the Commercial Marine Fisheries." Inter-American Tropical Tuna Commission Bulletin, 1(2):27-56.

In this investigation it will be attempted to indicate the manner in which the fundamental laws of population growth operate in the case of a commercial fishery, and so, perhaps, clarify some of the important considerations basic to the management of the oceanic fisheries. These will be shown by means of mathematical models parts of which are similar to ones used in predator-prey investigations of other organisms and in other attempts to apply them to fisheries.

Schaefer, Milner B. (1957). "Some Considerations of Population Dynamics and Economics in Relation to the Management of the Commercial Marine Fisheries." Journal of the Fisheries Research Board of Canada, 14(5):669-681.

This paper considers some significant aspects of the population dynamics of commercial fish stocks and of the economics of commercial fishing to arrive at a rational basis of considering the social problem of fisheries management.

Schaefer, M. B. (1959). "Biological and Economic Aspects of the Management of Commercial Marine Fisheries." Trans. Am. Fish. Soc., 88:100-104.

Conservation management of the commercial marine fisheries has the general objective of maximizing man's long term benefits from the exploitation of the fish resources. The question of what is most beneficial to man involves both biological and economic considerations. In this paper some of the effects of fishing on the fish stocks, and on the sustainable yields from them, are considered, together with important economic factors. It is indicated that the maximum sustainable average catch and the maximum net economic yield are mutually exclusive. It is possible, however, to obtain some net economic yield at the level of maximum sustainable harvest, but this requires some modification of the common property nature of fish stocks.

Schaefer, Richard (1995). "Biological Assessment for Regulatory Changes for the Atlantic Swordfish Fishery." Memorandum for William Fox, National Marine Fisheries Service, Silver Spring, Maryland.

The purpose of this memorandum is to: (1) provide a biological assessment for a proposed rule that would implement regulatory changes for the Atlantic swordfish fishery and (2) request initiation of an informal Section 7 consultation as required by the Endangered Species Act.

Scheibling, Robert E. and Philip V. Mladenov (1987). "The Decline of the Sea Urchin, Tripneustes ventricosus, Fishery of Barbados: A Survey of Fishermen and Consumers." Marine Fisheries Review, 49(3):62-69.

For over a century, Barbadians have fished the sea urchin for its roe that they consider a traditional delicacy. However, the abundance of these sea urchins has declined drastically in recent years resulting in the collapse of this fishery. Interviews with sea urchin fishermen and consumers document this decline and its socioeconomic impact.

Schelling, T.C. (1973). "Hockey Helmets, Concealed Weapons, and Daylight Saving." Journal of Conflict Resolution, 17(3):381-428.

This paper discusses binary choice with externalities.

Schelling, T.C. (1992). "Some Economics of Global Warming." The American Economic Review, 82(1):1-14.

The author presents a qualitative discussion of the impacts of global warming due to the emissions of green house gases from industrialized and developing countries. After a review of various estimates concerning warming levels, he concludes that it is not in the interest of developed nations to reduce their emissions nor is it in the interest of developing nations to forego industrialization that leads to increased emissions of green house gases. A transfer of wealth from the industrialized countries to the less developed countries is required to reduce future emissions.

Scheurer, Paul G. (1994). "Why Won't It Work?" My View in the Gloucester Daily Times, October 13th.

Marine reserves in New Zealand for crawfish offer hope for the American Lobster in New England as a management measure. In addition, the creation of a marine reserve on Georges Banks could increase the speed in which those fishery resources recover.

Schirrips, Michael J. (1998). "Status of the Red Snapper in U.S. Waters of the Gulf of Mexico: Updated through 1997." Sustainable Fisheries Division contribution: SFD-97/98-30, Sustainable Fisheries Division, Miami Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, FL, September, 73 pp.

This document updates certain aspects of the red snapper stock assessment for the Gulf of Mexico.

Schirrips, Michael J. and C. Phillip Goodyear (1994). "Status of the Gag Stocks of the Gulf of Mexico: Assessment 1.0." Miami Laboratory Contribution No. MIA-93/94-61, Coastal Resources Division, Miami Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, FL, August, 156 pp.

This document represents an attempt to fully integrate all available knowledge on gag and to incorporate it into an assessment of the current status of the stock. Many, if not most, of the life history aspects estimated here will require further refinement in the future. Nonetheless, a considerable body of information does exist and it is felt that this work is a good starting point for management of the gag stock.

Schirripa, Michael J. and Christopher M. Legault (1997). "Status of the Gag Stocks of the Gulf of Mexico: Assessment 2.0." Sustainable Fisheries Division, Miami Laboratory, Southeast Fisheries Science Center, National Marine Fisheries Service, 75 Virginia Beach



Drive, Miami, FL, October, 114 pp.

This report updates the original assessment of Schirripa and Goodyear (1994) which was based on landings and catch per unit effort trends from 1986-92. In this report additional data and analyses are being considered. First, the catches and CPUE s have been updated through 1996 and reanalyzed. Secondly, preliminary estimates of discard mortality were included in the virtual population analyses, whereas they were not in the previous assessment. And third, the implications of several different scenarios about the protogynous reproductive behavior of gag on the measurement of SPR were evaluated.

Schmalensee, Richard (1976). "Resource Exploitation Theory and the Behavior of the Oil Cartel." European Economic Review, 7:257-279.

This paper examines the implications of the partial equilibrium theory of optimal exploitation of a nonrenewable resource for the behavior of the OPEC cartel. A relatively general extraction cost structure is assumed, and several new theoretical results are derived. The influence of oil exporting countries' ultimate objectives on cartel behavior is examined under alternative assumptions about trading and investment opportunities. Some implications for the policies of oil importing nations are discussed.

Schmidt, Peter and Robert P. Strauss (1975). "The Prediction of Occupation Using Multiple Logit Models." International Economic Review, 16(2):471-486.

The paper analyzes patterns of employment by estimating a multiple logit model of occupational attainment, using race, sex, educational attainment and labor market experience as explanatory variables. The advantages of this direct approach are that it makes it unnecessary to make assumptions about an appropriate reference point (such as average educational attainment in the occupation), and that the analysis may be based on individual observations rather than percentages.

Schmied, Ronald L. (1984). "Tools and Methods for Fisheries Development." Chapter 16 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

This paper presents several tools and methods which should lend direction to the challenging process of developing marine recreational fishing. Effective use of these tools and methods requires that several precepts regarding marine recreational fisheries be understood.

Schmied, Ronald L. (1994). "Report to Congress on the Cooperative Research Program Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries." Draft report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, November, 27 pp.

This report updates members of Congress and other interested parties on progress made by the Secretary of Commerce in developing and implementing a cooperative shrimp trawl bycatch research program for the southeastern United States.

Schmied, Ronald L. (1995). "Report to Congress on the Cooperative Research Program Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries." Second draft report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, January, 47 pp.

Revised Schmied (1994) report that updates members of Congress and other interested parties on progress made by the Secretary of Commerce in developing and implementing a cooperative shrimp trawl bycatch research program for the southeastern United States.

Schmied, Ronald L. (1995). "Report to Congress on the Cooperative Research Program Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries." Final draft report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL, February, 52 pp.

Revised Schmied (1995) report that updates members of Congress and other interested parties on progress made by the Secretary of Commerce in developing and implementing a cooperative shrimp trawl bycatch research program for the southeastern United States.

Schmied, Ronald L. and Edward E. Burgess (1987). "Marine Recreational Fisheries in the Southeastern United States: An Overview." Marine Fisheries Review, 49(2):2-7.

Marine recreational fishing in the southeastern United States is an outdoor recreational activity of increasing popularity, economic significance, and consequence to the region's fishery resources. In 1985, over 11 million anglers made 44 million fishing trips in the south Atlantic and gulf and caught 222 million fish. Thirty-five percent were landed weighing over 131 million pounds, representing 40 percent of total edible finfish landings in the region. In 1985, the region accounted for 40 percent of all U.S. saltwater anglers, 62 percent of all trips, and 50 percent of the total number of recreationally caught fish. Direct expenditures by south Atlantic and Gulf anglers in 1985 were estimated to be nearly \$3.4 billion. These expenditures are estimated to have generated an additional \$1.5 billion in value added and supported over 42,000 person-years of employment in marine recreational fisheries related support and service industries. Additional detailed discussion of the nature and extent of marine recreational fishing in the south Atlantic, Gulf of Mexico, Puerto Rico, and U.S. Virgin Islands is presented.

Schmitten, Rolland A. (1994). "Reinitiation of Endangered Species Act Section 7 Consultation on the Impacts of Shrimp Trawling in the Southeastern United States." Memorandum, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

Based on the attached biological opinion, we conclude that the continued long term operation of the shrimp fishery in the nearshore waters of the southeastern United States is likely to jeopardize the continued existence of the highly endangered Kemp's ridley sea turtle.

Schmittten, Rolland A. (1995). "United Nations UN Conference on Fisheries." Memorandum, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

The attached Agreement for the Implementation of the Provisions of the UN Convention of the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks aims to reverse the global trend of declining fish stocks.

Schmittten, Rolland A. (1996). Food and Agriculture Organization Expert Consultation on Fishing Capacity. Letter, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, MD.

Letter agreeing to the joint sponsorship of a expert consultation on fishing capacity and a tentative budget. Also included is a list of the initial organizers of the workshop.

Schmittten, Rolland A. (1997). Approval of Amendment 9 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico. Informational Memorandum to Terry D. Garcia, Acting Assistant Secretary for Oceans and Atmosphere, National Marine Fisheries Service, Silver Spring, MD, July.

Pre-decision memorandum for shrimp amendment 9 imposing bycatch reduction devices on the Gulf of Mexico shrimp fishery.

Schmittten, Rolland A. (1997). Win-Win bycatch Solutions Phase II: The Federal Role. In Solving Bycatch, Considerations for Today and Tomorrow, Alaskan Sea Grant College Program Report No. 96-03, University of Alaska, Fairbanks, Alaska, 322 pp.

Solutions to bycatch problems will come from a strong industry-government partnership that makes good use of the energies and skills of the conservation and academic communities. The proper role of government is not to force bycatch regulations and systems on an already heavily burdened industry. Instead, it should be to provide planning support, sponsor and coordinate research, disseminate bycatch data and other information, educate the public on the real issues and progress being made, and perhaps most important, listen to what the industry is saying. Examples of what government is doing are described. The paper ends by describing, in general terms, what has been learned so far about resolving bycatch problems.

Schmittten, Rolland A. (1997). Testimony of Rolland A. Schmittten. Assistant Administrator for Fisheries National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Before the Committee on Resources, U.S. House of Representatives, September 14 pp.

A review of work being performed by the NMFS presented to Congress.

Schmitz, Andrew (1995). Boom/Bust Cycles and Ricardian Rent. American Journal of Agricultural Economics, 77(5):1110-1125.

North American agriculture has been characterized by many as a boom/bust industry. This paper focuses on a particular agricultural boom/bust cycle, which began in the early 1970's in Saskatchewan Canada, a major wheat

producing region. It is important to understand cycles because often the wealth that they generate bears little or no relationship to Ricardian rent which, in turn, makes the design of economic policy difficult. Specifically, the factors that give rise to boom/bust cycles and how they are related to Ricardian rent are explored. Wealth is distinguished from net farm income and/or Ricardian rent. Wealth multiplier effects are likely to far exceed income effect multipliers during certain phases of the boom/bust cycle. Other effects of the boom/bust cycle phenomenon are discussed, including farm diversification, farm size, rural communities, and farm debt.

Schnare, Ann B. (1976). "Racial and Ethnic Price Differentials in an Urban Housing Market." Urban Studies, 13:107-120.

This study examines the role of racial and ethnic preferences in an urban housing market. The theoretical section develops a simple, long run equilibrium model of household location that examines the relationship between demographic externalities, housing market segregation, and housing prices. Under assumption of perfectly mobile households and complete supply adjustment, externalities will normally produce highly segregated neighborhoods with rent differentials that reflect the demographic preferences of their residents.

Schnare, David W. (1998). "Protecting Fish and Fisherman - Economic Analysis Under the Regulatory Flexibility Act." Draft report presented at the American Fisheries Society Annual Meeting, Hartford Conn, August, 31 pp.

A discussion of the economic analysis necessary to meet the requirements under the Regulatory Flexibility Act with a detailed discussion of the shortcomings in the IRFA for the proposed shark quota regulations.

Schrank, William E. (1997). The Newfoundland Fishery: Past, Present and Future. Department of Economics, Memorial University, St. Johns, Newfoundland, March, 47 pp.

A discussion of the collapse of the cod fishery in Newfoundland and the governments response to it. The fundamental problems of the Newfoundland fishery are considered and suggested long term solutions are discussed.

Schrank, William E. (1997). The Newfoundland Fishery: Past, Present and Future. In World Wildlife Fund s Subsidies and Depletion of World Fisheries, WWF s Endangered Seas Campaign, 1250 Twenty-Fourth St., NW, Washington, D.C., 136 pp.

A discussion of the collapse of the cod fishery in Newfoundland and the governments response to it. The fundamental problems of the Newfoundland fishery are considered and suggested long term solutions are discussed.

Schrank, William E. and R.L. Mazany (1994). Econometric Modeling of World Trade in Groundfish: Progress Report. North American Journal of Fisheries Management, 14:291-296.

This paper describes the process that led to the world groundfish trade model project that originated at the 1988 conference of the International Institute for Fisheries Economics and Trade, held in Esbjerg, Denmark, and was organized at an international conference held in St John s, Newfoundland, in 1989. The motivation for the project is discussed, as are the proceedings of the Newfoundland conference, with its emphasis on the interactions among demand, supply, and institutional factors in the development of such a model,

and on the extensive data requirements of such a project.

Schrank, William E., Noel Roy, and Eugene Tsoa (1986). Employment Prospects in a Commercially Viable Newfoundland Fishery: An Application of An Econometric Model of the Newfoundland Groundfishery. Marine Resource Economics, 3(3):237-263.

An econometric model is utilized to simulate the effects of a policy change in which government financial assistance to a major Canadian marine fishery is withdrawn and the industry is placed on a commercially viable basis. Under near ideal conditions of marketing and harvesting, harvesting employment would fall drastically, from approximately thirty thousand fishermen under the current regime to approximately six thousand. There would be a concomitant fall in seasonal fish plant employment, and severe fall in those federal transfer payments (e.g., unemployment insurance) that are currently generated by extensive seasonal employment in both harvesting and processing sectors of the fishery.

The policy analysis consists of simulations with a prototype econometric model which integrates the demand, processing, and harvesting sectors of the fishery. The essential components of the 1,000-equation model are described.

Schuhmann, Peter William (1996). A Welfare Analysis of Commercial Fishery Harvest Restrictions: A Bioeconomic Model of Red Drum Stock Dynamics and Recreational Demand. Dissertation, North Carolina State University.

The purpose of this work is to develop a methodology that allows for an a priori examination of the biological and economic effects of a specific fisheries policy measure: the restriction of commercial harvests in the North Carolina red drum (Scianops ocellatus) fishery. The models that make up this methodology account for the natural characteristics of the red drum fish population, as well as the characteristics of the user groups that utilize the stock. Proposed regulations to reallocate red drum stocks to the recreational sector are evaluated using the simulation model.

Schulze, Margo (1996). 1997 Management Measure Options Pros and Cons. Highly Migratory Species Management Division, National Marine Fisheries Service, Silver Springs, MD.

Some arguments and issues to be developed in the environmental assessment for amendment 2 to the shark fishery management plan concerning quota reductions, minimum size limits, and recreational bag limits.

Schultze, Charles (1977). The Public Use of the Private Interest. Brookings Institution, Washington, D.C., pp. 16-90.

The role of government in the economy is discussed in terms of sources of market failure, public ownership of resources, equity versus efficiency, and the sources of government failure.

Schultze, Donald L. and Robert C. Fletcher (1984). "Integrating Multiple Interests." Chapter 19 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

This discussion deals with the need to integrate and coordinate numerous interests and disciplines to effect marine recreational fisheries (MRF) development from the perspective of a fisheries manager.

Schworm, William E. (1983). "Monopsonistic Control of a Common Property Renewable Resource." Canadian Journal of Economics, 8:275-287.

In this paper the Crutchfield and Pontecorvo conjecture that a monopsonistic processing sector would induce efficient use of a common property resource is analyzed. It is shown that if the harvesting sector consists of a large number of firms with identical convex technologies, then the conjecture is correct. In addition, sufficient conditions are found under which the stationary resource stock with a monopsonistic processing sector is greater than the efficient size.

Scott, Anthony (1955). "The Fishery: The Objectives of Sole Ownership." Journal of Political Economy, 63:116-124.

This paper compares the use of a fishery by competing fishermen with the mode of management that would be most profitable to a sole owner of the same fishery. The long run considerations of efficiency suggest that sole ownership is a much superior regime to competition but that in the short run in the ordinary case there is little difference between the efficiency of common and of private property.

Scott, Anthony (1967). "The Theory of the Mine Under Conditions of Certainty." In M. Gaffney (ed.), Extractive Resources and Taxation, University of Wisconsin Press.

The purpose of this paper is to examine decisions about rates of production, investment in capacity, and the life of a mine. The same considerations would apply to the extraction of trees from a forest, oil from a well, or fish from a fishery.

Scott, Anthony (ed.) (1970). Economics of Fisheries Management: A Symposium. Institute of Animal Resource Ecology, University of British Columbia, University of British Columbia Press, Vancouver, Canada.

A set of papers from a conference on fisheries management. Topics include dynamic models of fishing, seasonality models, efficient regulation, management, prices and allocation over space, and the economics of international fishing conventions.

Scott, Anthony (1973). Natural Resources: The Economics of Conservation. The Carleton Library No. 68, McClelland and Stewart Limited, University of Toronto Press, Toronto.

This book is designed to throw some theoretical light on the implications of conservation. Economics has at hand a body of theory that may be used to analyze the exploitation and restoration of natural resources as a special case of using up any productive asset. In addition to accounting for individual profits and expenses, the student of natural resource use must also observe the extra social costs and benefits accruing to other persons and groups.

Scott, Anthony (1979). "Development of Economic Theory on Fisheries Regulation." J. Fish. Res. Board Can., 36:725-741.

A survey of the economic literature of fisheries regulation shows that little of analytical value for the comparison of alternative regulatory techniques has emerged. The suggestion that the general literature on regulation, and on public choice, has something to contribute to the

understanding of alternative regimes produces eight criteria. These are applied to the choice between two systems of restricting entry: a tax and quotas. The transactions costs of the two systems are also investigated. The hypothesis is formed that the eight criteria, plus expected transactions costs, give the edge to a quota system; but this is only illustrative of the approach.

Scott, Anthony (ed.) (1985). Progress in Natural Resource Economics. Clarendon Press, Oxford.

This volume attempts to meet the obvious need for intensive research on resource topics based on a Canadian Council program grant. It surveys the fields of renewable and nonrenewable resources, institutions, and ideologies.

Scott, Anthony (1988). "Development of Property in the Fishery." Marine Resource Economics, 5:289-311.

To what extent is the recently invented individual catch quota a form of real property right? This article introduces six quantitative characteristics of all personal interests in land and natural resources. It is shown that medieval fishing rights had some of these characteristics, but these rights were not developed in the common law of property. The article then turns to modern regulatory licenses and catch quotas and examines the extent to which they embody property characteristics. In a digression, the obstacles to political acceptance of the individual fishery property concept are surveyed. The paper concludes by suggesting that catch quotas may develop into shares in the fish stock or biomass itself.

Scott, Anthony (1989). "Conceptual Origins of Rights Based Fishing." Pages 11-38 in P.A. Neher, R. Arnason, and N. Mollett (eds.) Rights Based Fishing. Dordrecht: Academic Publishers.

Recent innovations in quota rights are only a stage in the progression to private ownership of fisheries.

Scott, Anthony (1993). "Obstacles to Fishery Self-Government." Marine Resource Economics, 8(3):187-199.

This paper uses some aspects of modern organization and management theory to suggest what difficulties arise with the introduction of self government in fisheries. Recent studies are used to shed light on the characteristics of fisheries that already have apparently successful schemes of self government. A simple question is asked: if for a fishery under regulation it had already been decided, in principle, that self government should be tried, which obstacles would be most serious? Among the suggested answers are deficient information, excessive numbers of fishermen and fishermen heterogeneity. The least serious of these are the distributional problems.

Scott, Frank A. (1983). "A Note on Uncertain Input Prices, Profit Risk, and the Rate-Of-Return Regulated Firm." Land Economics, 59(2):247-254.

The themes of lagged regulation and uncertainty are brought together in this paper because existing studies of rate of return regulation and uncertainty have focused predominately on demand or revenue uncertainty, while input price uncertainty has been virtually ignored. Rapid changes in input prices have brought the issue of regulatory lag to the forefront. This and the regulatory commissions response of moving toward continuous regulation

raises the issue of how will the combination of input price uncertainty and continuous rate of return regulation affect the firms's section of inputs. Using a capital asset pricing model, the authors find that the continuously regulated firm has the incentive to use relatively less capital than when input prices are known with certainty.

Scott, Gerald P. (1991). Some Options for Estimating 1992 U.S. TAC for Swordfish. MIA-91/92-21, National Marine Fisheries Service, Southeast Fisheries Science Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Fl, December, 28 pp.

Several options for projecting swordfish stock size and yield for estimating 1992 U.S. total allowable catch (TAC) are provided. The projection options considered utilize several hypothetical 1991 fishing mortality reduction scenarios based on regulatory measures imposed in 1991. The estimation and projection methods described in Scott and Powers (1991) are used herein, except where noted. In contrast to Scott and Powers, who used a deterministic projection, stochastic projections are applied in this document. The basis for these projections are the Monte Carlo simulation outcomes resulting from analyses conducted by the 1991 ICCAT SCRS swordfish species group at its September, 1991, meeting in St. Andrews, Nova Scotia, Canada.

Scott, Gerald P. (1995). Bycatch Report for ICCAT. Memorandum, Southeast Fisheries Science Center, National Marine Fisheries Service, August 7, 8 pp.

Preliminary estimates of bycatch by species from 1993 observer data collected for the longline, pair trawl, and gillnet fishery.

Scott, Gerald P. (1996). On a Swordfish Cleithrum to Keel Measure Corresponding to 119 cm LJFL. National Marine Fisheries Service, Southeast Fisheries Science Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Fl, April 2 pp.

The paper re-estimates the statistical conversion factor (Lee and Scott, 1992) for measurements taken from cleithrum to keel for the minimum size corresponding to 119 cm lower jaw fork length (LJFL) based on a larger data base with greater depth in length measurements. A recommendation for a minimum CK size with zero probability of exceeding the minimum LJFL size is presented.

Scott, Gerald P. and Angelo Bertolino (1990). "Standardized Catch Rates for Swordfish (Xiphias gladius) from the U.S. Longline Fleet Through 1989." ICCAT Working Document SCRS/90/, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida.

Swordfish catch, size, and effort data collected from the U.S. longline fleet operating over a wide geographical range of the western North Atlantic Ocean were used to develop age-specific indices of abundance of North Atlantic swordfish. Standardized catch rates were estimated using the General Linear Modeling approach.

Scott, Gerald P., Victor R. Restrepo, and Angelo Bertolino (1991). "Standardized Catch Rates for Swordfish (Xiphias gladius) from the U.S. Longline Fleet Through 1990." ICCAT Working Document SCRS/91/41, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service,



Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida and Cooperative Institute for Marine and Atmospheric Studies, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida.

Swordfish catch, size, and effort data collected from the U.S. longline fleet operating over a wide geographical range of the western North Atlantic Ocean were used to develop age-specific indices of abundance of north Atlantic swordfish. Standardized catch rates were estimated using the General Linear Modeling approach.

Scott, Gerald P., Douglas M. Burn, Larry J. Hansen, and Ralph E. Owen (1989). "Estimates of Bottlenose Dolphin Abundance in the Gulf of Mexico from Regional Aerial Surveys." Draft report, NMFS, SEFC, Miami Laboratory, Coastal Resources Division, Contribution Number CRD-88/89-07, 75 Virginia Beach Drive, Miami, FL 33149, February, pp. 24.

Aerial sampling surveys of the U.S. Gulf of Mexico were conducted between September 1983 and February 1986. Seasonal sampling of the 359,000 square kilometer study area was completed to allow estimation of the regional abundance of bottlenose dolphins (Tursiops truncatus). Under the assumption of no net movement between sampling regions and sampling periods it was estimated on average between 35,000 and 45,000 bottlenose dolphins may live in U.S. Gulf of Mexico waters of depths 183 m or less. The dominant proportion of these animals appear to inhabit waters of greater than 18.3 m. The data were stratified to allow estimates sufficient for quota recommendations for managing the live capture fishery for bottlenose dolphins in the Gulf of Mexico.

Searle, S.R. (1971). Linear Models. John Wiley & Sons, New York.

This book describes general procedures of estimation and hypothesis testing for linear statistical models and shows their application for unbalanced data (i.e., unequal subclass numbers data) to certain specific models that often arise in research and survey work. In addition, three chapters are devoted to methods and results for estimating variance components, particularly from unbalanced data. Balanced data for the kind usually arising from designed experiments are treated very briefly, as just special cases of unbalanced data. Emphasis on unbalanced data is the backbone of the book, designed to assist those whose data cannot satisfy the strictures of carefully managed and well designed experiments.

Seber, G.A.F. and C.J. Wild (1989). "Prediction and Transformation Bias." Section 2.8.7 in Nonlinear Regression, John Wiley & Sons, New York.

Correcting for transformation bias when predicting the value of the dependent variable using inherently linear models.

Sedjo, Roger A. (1995). Ecosystem Management: An Uncharted Path for Public Forests. Resources, Fall, 4 pp.

Ecosystem management ignores the social consensus implicit in a legislated objective of producing multiple forest outputs and, instead, attempts to achieve some arbitrary forest condition about which society has little say.

Segerson, Kathleen (1987). "Risk-Sharing and Liability in the Control

of Stochastic Externalities." Marine Resource Economics, 4:175-192.

This paper analyzes alternative policies for controlling stochastic externalities, considering both the incentive and the risk sharing effects of each. When polluter actions are unobservable so that regulation is not possible, alternative liability rules including zero, partial, and full liability are compared. When actions are observable, then regulation is possible, and the use of regulation is compared to the use of liability. The principle agent paradigm provides the analytical approach used to determine the efficient policy choice. The effect of the availability of insurance is also addressed. This paper concludes with a discussion of the implications of the analysis for the control of stochastic marine pollution.

Segerson, Kathleen and Dale Squires (1990). "On the Measurement of Economic Capacity Utilization for Multi-Product Industries." Journal of Econometrics, 44:347-361.

This paper considers capacity utilization measures for the multiproduct firm. The single product dual measure of capacity utilization easily extends to the multiproduct case. Three possible extensions of the single product primal measure are considered. Although each has its limitations because of the restrictions embodied in it, each provides different, yet potentially useful information about capacity utilization in a multiproduct industry. The dual and primal measures of multiproduct capacity utilization are applied to the multispecies New England fishing industry to evaluate the potential for capacity expansion under a regulatory program of license limitation.

Sen, Sevaly (1994). The Environmental Effects of Trade in the Fisheries Sector. AGR/FI(94)8/ADD1, Committee for Fisheries, Directorate for Food, Agriculture and Fisheries, Organization for Economic Co-Operation and Development, Feb., 21 pp.

This paper discusses current trade flows and the potential environmental effects of international trade flows in fish and fishery products. It discusses how trade policies can temper or exacerbate these effects. Finally, the paper assesses the effectiveness of trade instruments to assist in the achievement of environmental goals in the fisheries sector and discusses other possible measures which could be implemented.

Sethi, Rajiv and E. Somanathan (1996). The Evolution of Social Norms in Common Property Resource Use. American Economic Review, 86(4):766-788.

The problem of extracting commonly owned renewable resources is examined within an evolutionary-game-theoretic framework. It is shown that cooperative behavior guided by norms of restraint and punishment may be stable in a well defined sense against invasion by narrowly self interested behavior. The resource stock dynamics are integrated with the evolutionary-game dynamics. Effects of changes in prices, technology, and social cohesion on extraction behavior and the long run stock are analyzed. When threshold values of the parameters are crossed, social norms can break down leading generally to the lowering of the long run stock, and possibly to its extinction.

Shabman, Leonard A. and Sandra S. Batie (1986). "Mitigating Damages From Coastal Wetlands Development: Policy, Economics and Financing." Draft report, Department of Agricultural Economics, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Public programs to reduce the rate of coastal wetlands losses are based upon an ambiguous policy framework. Also, scientific uncertainty about the services of wetlands make credible economic valuation difficult, thus reducing the utility of benefit cost analysis within the wetlands regulation process. Reform of national wetlands programs can result in enhanced maintenance of wetlands stocks and accommodation of development pressures. The policy reforms proposed in this paper will result in achievement of these objectives in an economically efficient manner.

Shabman, Leonard A. and Sandra S. Batie (1987). "Mitigating Damages From Coastal Wetlands Development: Policy, Economics and Financing." Marine Resource Economics, 4:227-248.

Public programs to reduce the rate of coastal wetlands losses are based upon an ambiguous policy framework. Also, scientific uncertainty about the services of wetlands make credible economic valuation difficult, thus reducing the utility of benefit cost analysis within the wetlands regulation process. Reform of national wetlands programs can result in enhanced maintenance of wetlands stocks and accommodation of development pressures. The policy reforms proposed in this paper will result in achievement of these objectives in an economically efficient manner.

Shabman, Leonard A. and Oral Capps, Jr. (1985). "Benefit Taxation for Environmental Improvement: A Case Example from Virginia's Soft Crab Fishery." Land Economics, 61(4):398-408.

The objective of this paper is to use the restoration of submerged aquatic vegetation (SAV) levels to support the Virginia soft crab fishery as an illustration of the necessary analysis to support an environmental improvement plus beneficiary tax program. Toward that end the relationship between SAV abundance and soft crab harvest will be demonstrated. Then a conceptual model is developed discussing principles for setting benefit taxes on an open access fishery. Empirical estimation of the model components illustrates the application of the approach.

Shaik, Saleem and Glenn Helmers (1999). Shadow Price of Environmental Bads: Weak vs. Strong Disposability. Selected Paper, American Agricultural Economics Association Meetings, Nashville, Tennessee, August 8-11, 15 pp.

This paper addresses the issue of the shadow price of environmental bads treated as an undesirable output (normal input) with weak (strong) disposability in a two-stage estimation. Nebraska agriculture sector time series data is spread over 1936-94. Results indicate the difference in the price due to the disposability property.

Shark Specialist Group (1996). The Implications of Biology for the Conservation and Management of Sharks. Report prepared for the thirteenth Meeting of the CITES Animals Committee, 23-27 September, Pruhonice, Czech Republic, September, 37 pp.

A summary of the biological knowledge of sharks including life history characteristics, conservation status, shark fishery trends and implications for the future, management history and implications, and finally a call for more biological data collection and the immediate management of sharks around the world even if the necessary data supporting it does not exist.

Sharples, Jerry A. and Forrest D. Holland (1981). "Impact of the Farmer-Owned Reserve on Privately Owned Wheat Stocks." American

Journal of Agricultural Economics, 63(3):538-543.

The paper estimates the impact of the farmer owned reserve on the demand for year ending wheat stocks and demonstrates the potential of a little used functional form for estimating the demand for stocks.

Shaw, Daigee (1988). "On-Site Samples Regression: Problems of Non-negative Integers, Truncation, and Endogenous Stratification." Journal of Econometrics, 37:211-223.

This paper corrects an estimation problem that has not yet been recognized in previous estimates of demand functions using on site samples. There are three kinds of problems that one faces in on site samples, namely, non-negative integers, truncation, and endogenous stratification. Two theoretically correct maximum likelihood methods are developed based on two different assumptions about the variable distribution: the normal distribution and the Poisson distribution. A simulation is performed to compare the two methods using generated data sets of known models. We should not use OLS and instead should use the maximum likelihood methods developed here to estimate demand functions that use on site samples. If forecasting is the purpose of estimation, then the simulation indicates that the Poisson ML method may be better.

Shepherd, J.G. and D.J. Garrod (19??). "Modeling the Response of a Fishing Fleet to Changing Circumstances, Using Cautious Non-Linear Optimization." J. Cons. Int. Explor. Mer., 39:231-238.

The cautious non-linear optimization model ascribes non-linear penalties to deviations from a reference solution and any constraints that fail to be observed and minimizes the resulting compound objective function using the conjugate gradient method to achieve excellent results in modeling fleet changes as a result of changes in the availability of fish resources.

Shelden, Kim E.W. and David J. Rugh (1995). The Bowhead Whale, Balaena mysticetus: Its Historic and Current Status. Marine Fisheries Review, 57(3-4):1-20.

The bowhead whale, Balaena mysticetus, is currently listed as endangered under the Endangered Species Act of 1973 and as depleted under the Marine Mammal Protection Act of 1972. Literature on the species is updated since 1984, and elements are reviewed that may contribute to the evaluation of the status of bowhead whale stocks.

Sheridan, Peter F., Frank J. Patella, Jr., Neal Baxter, and Dennis A Emiliani (1987). "Movements of Brown Shrimp, Penaeus aztecus, and Pink Shrimp, P. duorarum, Relative to the U.S.-Mexico Border in the Western Gulf of Mexico." Marine Fisheries Review, 49(1):14-19.

Seasonal movement patterns of marked brown shrimp and pink shrimp relative to the U.S.-Mexico boarder in the western Gulf of Mexico are described from recaptures of shrimp tagged during 1978-1980. The intent was to determine the degree to which coastal shrimp movements would affect commercial catches after implementation of new fishing regulations off Texas and Mexico. Shrimp were collected by trawl, marked with polyethylene streamer tags, and released during March-November at sites between Galveston, Texas, and Tampico, Tamaulipas, Mexico. Movements were examined by vector analysis and by recaptures per unit commercial landings. Over 121,500 shrimp were marked during seven releases in estuaries of which 1,827 (1.5 percent) were recaptured. Only 72 brown shrimp and 126 pink shrimp were recaptured

offshore, but southerly movement patterns were indicated after five of those seven releases. Offshore releases of 71,485 brown shrimp and 19,185 pink shrimp resulted in 12.4 percent and 19.7 percent recapture proportions, respectively. Tagged brown shrimp moved up to 620 km from release sites and remained free up to 430 days. Tagged pink shrimp moved a maximum 428 km and were free up to 446 days. Recaptures were higher south of release sites after 20 of 30 releases of brown shrimp off Texas and Tamaulipas. In contrast, recaptures of pink shrimp were higher south of release sites after only 7 of 13 releases. The effectiveness of the Gulf of Mexico shrimp fishery management plan, enacted in 1981 to increase brown shrimp yield by seasonal prohibition of fishing could be diminished by the tendency for brown shrimp to migrate south.

Sherwin, Rosen (1987). "Dynamic Animal Economics." American Journal of Agricultural Economics, 69(3):547-557.

Market equilibrium dynamics of herd inventory management are derived for homogenous female populations. Short run supply is backward bending in response to permanent changes in demand and is rising in response to transitory changes in demand. Increasing inventories are associated with high and falling prices and decreasing inventories with low and rising prices, but there is no market instability in this. These unusual intertemporal substitution effects follow from both rational expectations and appropriately formulated cobweb models and go part of the way toward explaining hog and cattle inventory cycles.

Shortle, James S. (1984). "The Use of Estimated Pollution Flows in Agricultural Pollution Control Policy: Implications for Abatement and Policy Instruments." Northeast Journal of Agricultural and Resource Economics, October: 277-285.

Flows of water pollution from agricultural sources are, for all practical purposes, unobservable by direct monitoring. These flows can, however, be estimated using hydrological models. The analysis presented in this paper demonstrates that uncertainty on estimated flows is not neutral with respect to the optimal level and allocation of estimated abatement or with respect to the expected net benefits of alternative pollution control policy instruments. Policy implications are noted.

Shrimp Notes Incorporated (1983). Assessment of Shrimp Industry Potentials and Conflicts. Volumes I, II, and III. Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August.

This report is intended to provide an update on the potentials and conflicts faced by the domestic shrimp industry with special attention directed at future actions that may significantly impact respective segments of the industry.

Shriver, Ann L. (1994). U.S. Groundfish Demand. OSU-94-108, International Institute of Fisheries Economics and Trade, Agricultural and Resource Economics Department, Oregon State University, April, 27 pp.

This report describes recent developments in the demand for groundfish in the U.S. It begins with a review of general trends in U.S. food consumption and their implications for groundfish. Groundfish consumption data is presented, along with a discussion of its determining factors. U.S. market channels for cod in particular are described, and supply factors are assessed for their impact on consumption. Efforts to date to model groundfish markets are described, and their conclusions and limitations discussed. Among

the report's conclusions are that seafood demand continues to rise in the face of rising prices, and that the highly concentrated U.S. cod market is shifting over to the more available and cheaper pollock. While existing models need some revisions to accurately reflect developments since 1988, they provide useful guidance about the responsiveness of the U.S. market to changes in prices and supply levels of some species and product forms.

Shumway, C. Richard, Rulon D. Pope, and Elizabeth K. Nash (1984).

"Allocatable Fixed Inputs and Jointness in Agricultural Production: Implications for Economic Modeling." American Journal of Agricultural Economics, 66(1):72-78.

Allocatable fixed inputs, such as land, are a potentially important source of jointness in agriculture. As with other causes of jointness, they necessitate multiple product systems for modeling product supply and input demand. In other important ways, however, their analytical implications are very different from other causes of jointness. Model specification differs. Demand functions for the quantities of each input used in the production of individual commodities can be derived if a primal approach is used, but such allocation equations cannot in general be identified from a dual specification. Available allocation data are not even useful in such dual estimations.

Sick, Lowell V., James W. Andrews, and David B. White (19??).

"Preliminary Studies of Selected Environmental and Nutritional Requirements for the Culture of Penaeid Shrimp." Fisheries Bulletin, 70(1):101-109.

Establishing selected preliminary environmental and nutritional requirements for penaeid shrimp resulted in the successful and reproducible production of major biomass increases with relatively high survival rates and low food conversion ratios.

Siegel, Robert A. and Richard S. Johnston (eds.) (1989). "Economic and Trade Strategies in World Fisheries." Marine Fisheries Review, 51(1):1-2.

Introduces the special section of the Marine Fisheries Review that presents papers dealing with world trade issues. The aim of the section was to provide an overview of several international trade issues that affect the development of fisheries economic policy. The general areas of discussion include the role of fisheries in the U.S. balance of trade, current negotiations on fisheries trade and tariffs, and U.S. and foreign economic trade strategies and policies.

Sil, Jayashree and Steven Buccola (1995). Efficiency of the Multiplant, Multiproduct Firm. American Journal of Agricultural Economics, 77(4):1001-1011.

A general framework is provided for assessing the technology, cost, and efficient scale of a multiplant, multiproduct firm. We show sufficient conditions for the existence of a plant cost function, and necessary and sufficient conditions for using plant-level data to draw exact firm-level cost inferences. We also distinguish between plant and input nonjointness and show the optimal relation between plant-level and firm-level cost elasticity in a multiproduct setting. The framework is applied to a vegetable processing cooperative, which is found to operate below its efficient scale.

Silberberg, Eugene (1972). "Duality and the Many Consumer's Surpluses."

American Economic Review, (Dec.):942-952.

This paper presents a unifying treatment of the many consumer's surpluses. All consumer surpluses are variations on the compensating variations and equivalent variations themes and differences among them may be directly traced to what variables are being held fixed.

Silberberg, Eugene (1978). The Structure of Economics. McGraw-Hill Book Co., New York.

Microeconomic theory using calculus to explain the theory of the firm and utility theory using duality concepts.

Simberloff, Daniel (1996). Impacts of Introduced Species in the United States. Consequences, 2(2):12-22.

Many examples of introduced plants, animals, and pathogens often pose an initially hidden but eventually monumental problem in the U.S. or any other country whose doors are opened to traffic from other lands. Some costly invaders remain inconspicuous in this country for decades and then spread swiftly. Their harmful effects are often subtle and surreptitious, but the eventual impacts on the economy or natural environment are no less real, and often disastrous and even irreversible, as when native species disappear.

Simmons, David C. (1980). "Review of the Florida Spiny Lobster Resource." Fisheries, 5(4):37-42.

The spiny lobster resource in Florida has developed into an important commercial and recreational fishery resource. Fishing pressure on this resource has increased dramatically over the last fifteen years without a corresponding increase in landings. Some important research has been completed on this resource, but before a sound management plan can be developed some critical information gaps need to be filled.

Sinclair, M., D.L. Burke, J.R. Angel, R.N. O'Boyle, F.G. Peacock, and K.C.T. Zwanenburg (1994). "A Report Card on Quota Management: The Scotia-Fundy Groundfish Experience." C.M. 1994/T:58, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, St. John's, Newfoundland, Canada, September, 39 pp.

The findings of a workshop that described the groundfish management activities in the Scotia-Fundy Region from 1977 to 1993 are presented. The workshop objectives were to (1) identify the degree to which the management objectives for this part of the Atlantic Canada fishery were met since the extension of jurisdiction in 1977 and (2) to the degree that they have not been met, identify the causes that prevented successful attainment of the objectives. The primary objective of stock conservation was to be obtained using  $F_{0.1}$  single species quota management. The inability to meet the conservation objectives, in part due to short term trade offs in support of economic and social objectives, has in the longer term undermined the sustainability of the commercial fishery and the fishing community.

Sinclair, William F. (1978). "Management Alternatives and Strategic Planning for Canada's Fisheries." J. Fish. Res. board Can., 35:1017-1030.

The evils of operating Canada's commercial and recreational fisheries

under open access conditions were known before Confederation. Early recognition of these ills did not lead to an understanding of the basic problems nor to long-term solutions. In the early 1950's the first economic model was developed that articulated the underlying causes of excess capacity and the tendency of overexploitation in open access fisheries. This was followed by a number of studies that explored the relationship between the biological reproductive capacity of a fishery and the economic consequences of managing publicly owned resources under open access conditions. This early work provides a general framework from which a number of fisheries management alternatives emerge. Each of six management alternatives, that are implicit in policy for Canada's commercial fisheries, are assessed in terms of political acceptability, administrative feasibility, and effectiveness. It is emphasized that the responsibility of a government fisheries agency is to manage fisheries resources in the best interest of the owners of the resource - the nation's taxpayers. A properly implemented license control system would dissipate, rather than perpetuate, social and economic hardship among fishermen. This misplaced concern for unproven social problems often leads fisheries managers to support programs that sacrifice all the benefits that could be generated from the resource and the resource itself. A management scheme is recommended that encompasses a simple licensing system, a tax or a royalty on catch, and a limited variation of the "Grandfather System." The combination of these three incorporates the main advantages of most management alternatives while avoiding most of their main shortcomings. A carefully implemented program that accounts for economic and biological considerations would improve the efficiency of the industry, improve fishermen's incomes, minimize social disruptions, help to instill an environmental conscience, protect the resource, and induce less, rather than more, government intervention into the free operation of the fishing industry. Probably more important, the program would generate an economic return for the people of Canada.

Sindermann, Carl J. (1979). "Status of Northwest Atlantic Herring Stocks of Concern to the United States." Technical Series Report No. 23, USDOC, NOAA, NMFS, Northeast Fisheries Center, Sandy Hook Laboratory, Highlands, New Jersey 07732.

This report reviews the status of knowledge about herring stocks of the western North Atlantic of concern to the United States, to review the status of herring stock assessments, to identify critical problem areas and hypotheses to be tested, to identify critical research needs, and proposes activities needed to increase our knowledge in areas relevant to long term productivity of stocks under exploitation.

Sinha, Sujata Bose (1988). "A Graphical Presentation of Economic Data for the Shrimp Fishery in the Gulf of Mexico January 1981 to December 1986." NOAA Technical Memorandum NMFS-SEFC-??, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL, August.

The data is presented here on an essentially macro scale aggregating over all species and sizes of shrimp found in the Gulf of Mexico. The first part of the presentation presents information extracted on an aggregated Gulf wide basis. The second part presents data on a state wide basis for the five individual states, i.e. Florida west coast, Alabama, Mississippi, Louisiana, and Texas. The third section presents the data on the basis of the number of trips taken by individual vessels in any year.

Sissenwine, Michael (1984). "The Uncertain Environment of Fishery



Scientists and Managers." Marine Resource Economics, 1(1):1-30.

Traditionally, single species deterministic models have been used to describe the interaction between fish populations and fish harvesters. Management theory and practice often assume that decisions are made based on exact knowledge of the fishery system (i.e., population size, fishing effort, recruitment, and so on, predicted or measured without error). Unfortunately, traditional approaches of fishery science and management ignore a major aspect of fishery systems-uncertainty. Biological productivity of most fishery resources is primarily dependent on recruitment. Recruitment varies by an order of magnitude or more, with little apparent relationship to spawning stock size except at extremely reduced levels. For practical purposes, production of fish populations is stochastic, not deterministic. Furthermore, growth and natural mortality parameters, that are usually assumed constant when analyzing individual populations, actually vary as a result of population interactions. In addition, the contagious and dynamic spatial distribution of most fish populations contributes still more uncertainty. Some of the variability in recruitment can be accounted for by prerecruit surveys and correlations with environmental factors. Multispecies models that attempt to account for the predation effect on natural mortality are now available. There are robust fishery management methods that are less dependent on precise and real time estimation of population size.

Sissenwine, Michael (1992). "Analysis of the Potential Economic Benefits from Rebuilding U.S. Fisheries." Draft Report, Office of the Senior Scientist for Fisheries, NMFS, USDOC, Silver Spring, Maryland, April.

The potential value of rationally managed U.S. domestic fisheries based on a naive economic analysis concludes that substantial benefits can be generated for the nation including increased jobs.

Sissenwine, Michael and Pamela M. Mace (1992). "ITQs in New Zealand: The Era of Fixed Quota in Perpetuity." Fishery Bulletin, 90(1):147-60.

ITQ management was implemented in New Zealand to address overfishing, overcapitalization, and excess government regulation. Quotas were based on catch histories, with a quota "buyback" and prorated cuts to achieve total allowable catch (TAC) levels indicated by preliminary stock assessments. Fixed amounts of quota were issued in perpetuity. Annual stock assessments are conducted. Government stated that it would buy or sell quota at market determined prices to adjust TACs. On 1 April 1990, ITQs were redefined as proportions of annual TACs. Government extracts resource rent. To date, there is little evidence of improvement in the biological or economic condition of the fisheries resources. Although there is general support for ITQ management in New Zealand, many problems have been encountered: quota overruns resulting from bycatch; inadequate stock assessment capability; disagreement over the level of resource rentals; and failure of government to enter the marketplace to reduce TACs when necessary.

Six, Larry and Pam Buzan (1993). The Status of Marine Fish Stocks and Conservation Efforts by Regional Fishery Management Councils. Pacific Fishery Management Council, July, 33 pp.

This report summarizes the status of marine fish stocks, species, or species groups harvested in the federal Exclusive Economic Zone (EEZ).

Skaperdas, Stergios (1992). "Cooperation, Conflict, and Power in the

Absence of Property Rights." American Economic Review, 82(4):720-739.

This paper examines interaction in the absence of property rights when agents face a trade-off between productive and coercive activities. In this setting, conflict is not the necessary outcome of one-time interaction, and cooperation is consistent with domination of one agent over another. Other things being equal, an agent's power, a well-define concept in this paper, is inversely related to an agent's resources when resources are valued according to marginal productivity theory. Some implications for the evolution of property rights are drawn. The model is applicable to a variety of situations in which directly unproductive activities are prevalent.

Slade, Margaret E. (1982). "Trends in Natural-Resource Commodity Prices: An Analysis of the Time Domain." Journal of Environmental Economics and Management, 9:122-137.

This paper attempts to reconcile the theoretical predictions of increasing real prices for nonrenewable natural resource commodities obtained from Hotelling style models with the empirical findings of falling prices for these commodities. A theoretical model for relative price movements is derived for the case of exogenous technical change and endogenous change in the grade of ores mined. The model suggests a U-shaped time path for relative prices. The implied price movements are tested for all the major metals and fuels and the model parameters are found to be statistically significant for 11 out of the 12 commodities tested.

Slade, Margaret E. (1982). "Taxation of Nonrenewable Resources: A Production-Function Approach." Resources Paper No. 81.

The paper finds that constant royalty rates can be neutral or can lead unambiguously to conservation or to rapid exploitation only when the processing technology is particularly simple (a modified Cobb-Douglas production function). In addition, except for very simple processing technologies, time varying royalty rates cannot be monotonic if they are to achieve neutrality; they must sometimes rise and sometimes fall.

Slade, Margaret E. (1984). "Tax Policy and the Supply of Exhaustible Resources: Theory and Practice." Land Economics, 60(2):133-147.

Unregulated extraction patterns may not be optimal if social and private discount rates differ or if extraction creates an externality. The difficulty of designing tax policy that achieves a particular objective is illustrated by the fact that a tax levied in any time period can have repercussions in all future time periods and, if it is anticipated, it can affect past extraction. A general model for assessing the effects of taxation on resource extraction is developed. The undistorted (no-tax) and distorted paths are compared to determine the direction and magnitude of tax effects. It is found that the change in extraction paths resulting from a particular tax depends on where it falls, on how it affects input and output prices, and on the ease of substituting between the resource and other inputs in processing.

Sluczanowski, Philip R. (1984). "Modeling and Optimal Control: A Case Study Based on the Spencer Gulf Prawn Fishery for *Penaeus latisulcatus* Kishinouye." J. Cons. Int. Explor. Mer, 41:211-225.

Techniques of fish population dynamics, model building, and optimal control theory are applied to the problem of managing the Spencer Gulf prawn fishery in South Australia that involves the annual exploitation of a single

year class of prawns. A model of the fishery is constructed that is then subjected to optimization techniques to derive optimal management strategies. Dynamic programming is used to derive optimal fishery closures for a given number of vessels. The derived controls take into account the major source of variation (variable recruitment). Their sensitivity to the uncertain parameters and to possible changes in costs is also considered, and the best number of vessels is determined taking into account parameter uncertainty, expected total profits, returns to capital, and the statistical distribution of returns.

Sminkey, Thomas R. and John A. Musick (1995). Demographic Analysis of the Sandbar Shark, Carcharhinus plumbeus, in the Western North Atlantic. Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, Virginia, 16 pp.

Sandbar shark demographic analyses, using known and estimated life history parameters, including fishing mortality (F) at ages and levels estimated in a recent stock assessment, were used to estimate potential population growth and exploitation.

Smit, Wil (1996). An Economic Approach to Measuring Fishing Effort: Application to a Dutch Cutter Fleet. Marine Resource Economics, 11(4):305-311.

This paper reports on the on-going attempt to assess fishing capacity and fishing effort for a range of years on the basis of common definitions. An aggregate effort measurement for a specific fleet is developed, taking into account capacity of the fleet and the number of days at sea. In this measurement, the changes in the size and composition of the fleet over time is measured using engine power, by weighting the engine power of vessels of different sizes according to their economic productivity. Then, to find a relationship between fishing effort and productive output, using landings by species is not enough because catchability of the species varies over a wide range. Instead quantities of landings are weighted by using average prices. Thus, output is then a function of fishing effort and the availability of fish stocks.

Smith, Baron A. (1978). "Measuring the Value of Urban Amenities." Journal of Urban Economics, 5:370-387.

This paper develops a model for estimating price gradients for several urban amenities that departs from traditional techniques. The approach used is both intuitively appealing and fully consistent with basic urban location theory developed over the past decade. Multidimensional price gradients are estimated for such amenities as low crime, clean air, accessibility to work, the local quality of education and local taxes. In addition subgroup analysis allows the comparison of the estimated shadow prices for two different income groups.

Smith, Courtland L. (1977). "The Failure of Success in Fisheries Management." Environmental Management, 1(3):239-247.

Law of the Sea negotiations and The Fishery Conservation and Management Act of 1976 create new options for fisheries management. Historical analysis of two major management programs in the United States of America, Columbia River chinook salmon and Pacific halibut, shows two unresolved management problems. One is the innovativeness of fishermen in seeking ways to improve their harvests. The other is changing social priorities that are largely unpredictable and outside the control of fisheries managers. A method for

analysis of patterning associated with management goals is illustrated. Since the general management goals are harvest improvement and more predictability, measures are used that show the adequacy of fit and reduction in variability between actual and predicted management outcomes.

Smith, Courtland L. (1985). "The Life Cycle of Fisheries." Draft report, Department of Anthropology, Oregon State University, National Sea Grant college Program, 6010 Executive Blvd., R/SE1, Rockville, MD 20852, Feb.

Fishermen are viewed as organisms that have an evolutionary pattern and life cycle. The typical evolutionary pattern is development of technologies to substitute cultured stocks for natural ones. The life cycle process is one of declining commercial opportunities as productivity increases require more stringent management measures. Angling and aesthetic uses increase during this process. To adjust to life cycle and evolutionary patterns separate conservation from management decisions, adopt an ecosystem focus for conservation measures, promote nonfishing opportunities, and keep expectations reasonable.

Smith, Courtland L. and Susan S. Hanna (1990). "Measuring Fleet Capacity and Capacity Utilization." Can. J. Fish. Aquat. Sci., 47:2085-2091.

Fishing capacity measures the capability to catch fish. Capacity utilization is the actual effectiveness in catching fish; the ratio of catch to capacity. The factors comprising a fleet's capacity are the number and size of vessels, the technical efficiency of those vessels, and the time commitment of fishermen. Knowing the capacity utilization of a fleet is critical for evaluating management alternatives. This is true regardless of whether fisheries are managed with fleet controls or with individual controls. We illustrate the measurement of capacity utilization with the Oregon bottom trawl fishery, in which fleet capacity quadrupled between 1976 and 1982. From 1982 to 1985, capacity declined 30 percent due to economic problems in the industry and vessels finding better opportunities elsewhere. Capacity measurement is necessary to assess management induced changes in controlled fisheries. Controlling capacity requires addressing all the elements associated with capacity growth. Examination of the components of fleet capacity reveals an array of management options.

Smith, Courtland L. and Robert McKelvey (1986). "Specialist and Generalist: Roles for Coping with Variability." North American Journal of Fisheries Management, 6:88-99.

Two behavior patterns of fishermen, specialist and generalist, are evaluated as ways of coping with market and natural variability. Changes in these behaviors predicted by an analytical model are evaluated against data from several fisheries. The predictions and the data suggest that a mix of specialist and generalist fishing behavior is a way of coping with unpredictability. Management usually regards fishing behavior as homogeneous; as a result, many management rules discriminate against one type of behavior or the other.

Smith, E. Moret (1980). "Japan - A Market for Blackfin Tuna (Thunnus Atlanticus)?" Commercial Development Services, National Marine Fisheries Service, Pascagoula, MS, May, 9 pp.

A potential marketing potential in Japan for blackfin tuna from the Gulf of Mexico was discovered. Since there are no known procedures used by the

Japanese for blackfin, procedures used by Japanese fishermen for other tunas are discussed in this report. If followed, acceptable results will occur.

Smith, J. Barry (1985). "A Discrete Model of Replenishable Resource Management Under Uncertainty." Marine Resource Economics, 1(3):283-308.

This paper examines issues in the management of replenishable resources under uncertainty. The stochastic resource dynamics are given by the discrete time counterpart of the classic logistic growth model. The use of discrete time stochastic dynamics allows for a more general characterization of growth uncertainty than is possible with continuous time models.

Given a general specification of the resource management problem, necessary and sufficient conditions for the optimal management policy are derived. Many important properties of the management policy are derived and comparisons are made with the deterministic counterpart policy. An example serves to illustrate many of the results of the analysis.

Smith, J. Barry (1986). "Stochastic Steady-State Replenishable Resource Management Policies." Marine Resource Economics, 3(2):155-168.

The purpose of this paper is to investigate the generalization of deterministic golden rule results to the case of resource uncertainty. It is shown that within a diffusion framework, the optimal steady state management policy is equivalent to a management policy that is optimal outside the stochastic steady state. The results contained in this paper provide a useful link between steady state optimal management policies in the deterministic resource economics and biology literatures and the quickly developing stochastic resource literature.

Smith, J. Barry and Shlomo Weber (1989). "Contemporaneous Externalities, Rational Expectations, and Equilibrium Production Functions in Natural Resource Models." Journal of Environmental Economics and Management, 17:155-170.

This paper examines traditional approaches to modeling production processes in resource industries and finds that they are often incomplete with respect to desired properties and restrictions. A new notion of equilibrium production functions is introduced in which explicit account is taken of the recognized interdependence of firms involved in extraction. The results are quite encouraging. In particular, the resultant model of production has the ex ante desired technical, externality, mass balance aggregation, and heterogeneity properties. As well, it provides useful insights for empirical research. Finally, this new approach with its explicit recognition of the interdependence of firms has the potential for providing new directions into the analysis of industry equilibrium and regulation of resource industries.

Smith, Joseph W. (1994). Biology and Fishery for Atlantic Thread Herring, Opisthonema oglinum, along the North Carolina Coast. Marine Fisheries Review, 56(4):1-7.

The Atlantic thread herring resource, especially the stock in the eastern Gulf of Mexico, has been extolled as a latent resource and an alternative to menhaden for a reduction fishery. Objectives of this study are to 1) describe the purse seine reduction fishery for Atlantic thread herring in North Carolina and 2) determine the size, age composition, and reproductive conditions of the catch.

Smith, Philip J. (1997). Report to the Fleet. National Marine Fisheries

Service, Restricted Access Management Division, P.O. Box 21668, Juneau, Alaska, March, 25 pp.

This report contains general information about the IFQ program's history and main elements, a review of the performance of the program and the fleet during the 1996 season, a discussion of the numbers, rules, and regulations that will govern the 1997 season, a discussion of ideas for program changes, and a variety of charts and tables in the appendix.

Smith, Philip J. (1998). 1998 Report to the Fleet. National Marine Fisheries Service, Restricted Access Management Division, P.O. Box 21668, Juneau, Alaska, February, 25 pp.

This report contains general information about the IFQ program's history and main elements, a review of the performance of the program and the fleet during the 1997 and 1998 seasons, a discussion of the IFQ program, such as issuance of quota shares, transfer activity, and consolidation. Information on Magnuson/Stevens Act Amendments, IRS tax tips, and the IFQ program on the Internet is also provided.

Smith, Suzanna and Michael Jepson (1993). "Big Fish, Little Fish: Politics and Power in the Regulation of Florida's Marine Resources." Social Problems, 40 (1):?-?.

This paper draws on interviews with 70 couples in commercial fishing families to examine the relative influence of objective scientific information as opposed to political and social considerations on the management and allocation of marine resources. Decisions about the regulation of commercial fishing are influenced by Florida's economic dependence on tourism and related development and competition for control of the state's coastal resources. Class, power, and bureaucratic knowledge all have a part in the decisions that shape the regulation of Florida's inshore net fishing industry.

Smith, Terrance (1997). Solving the Bycatch Problem: An Economic Perspective. In Solving Bycatch, Considerations for Today and Tomorrow, Alaskan Sea Grant College Program Report No. 96-03, University of Alaska, Fairbanks, Alaska, 322 pp.

Because most fishing gear is completely selective, fishing operations result in the incidental catch of species not targeted. This incidental catch, or bycatch, can occur in two contexts: (1) in a mix species or multispecies fishery where the species caught are managed as a unit or by a single management agency, or (2) in fisheries where the bycatch of species regulated by a different management entity must be minimized. From an economic perspective, the first kind of bycatch can be dealt with using traditional management tools. Regulating the second kind of bycatch, however, creates additional costs. The bycatch fishery experiences control costs - foregone revenue from the loss of target species that might have been taken, and in addition, the increased operational cost associated with avoiding bycatch. The other fishery experiences impact cost - foregone revenue because the bycatch fishery reduced the potential yield from the fishery. This second class of bycatch control problem is common and exists, for example, in the groundfish fisheries off Alaska, where the bycatch of halibut, red king crab, Tanner crab, herring, and salmon is limited. It also exists in the gillnet fisheries for groundfish off New England, where time/area closures limit target catch to reduce harbor porpoise bycatch mortality. Controlling bycatch is thus another allocation issue and amenable to cost/benefit analysis. An examination of current bycatch management systems in the Alaskan groundfish fisheries and the northeast groundfish gillnet fisheries illustrate

considerable differences between control and impact costs.

Smith, Terry and Ron Miller (1987). "Limited Access in Alaskan Fisheries: some Options." Discussion Paper 87-1, North Pacific Fishery management Council, September, 17 pp.

This paper describes limited access management for the Alaskan groundfish fisheries.

Smith, V. Kerry (1975). "Travel Cost Demand Models for Wilderness Recreation: A Problem of Non-Nested Hypotheses." Land Economics, 51(2):103-111.

The purpose of this paper is to examine the extent to which the traditional specifications of the travel cost demand equations would be acceptable models for wilderness recreation for one case study - the Desolation Wilderness Area in Northern California. Several specifications of travel cost models are examined and a recent test for non-nested hypotheses is used to discriminate between them. Overall the findings suggest that while travel cost equations can readily be estimated and by conventional criteria they might be considered fully acceptable, it is not clear that they should be accepted as reflecting adequately the character of the demand for wilderness recreation.

Smith, V. Kerry (1977). "Control Theory Applied to Natural and Environmental Resources, An Exposition." Journal of Environmental Economics and Management, 4:1-24.

Four control theory models of natural and environmental resource use, drawn from the existing literature, are developed in a manner to emphasize their technical and decentralized interpretive similarity. Renewable, nonrenewable, and amenity resource use are treated as closely related problems of optimal (biological, earth material, ecological, or environmental) capital allocation over time. Thus nonrenewable resources, and the problem of exhaustion, are just limiting (zero growth) cases of renewable resources, and the problem of species extinction. Just as exhaustion can be optimal, extinction can be optimal. Waste recycling is treated as part of the problem of optimal regeneration of "clean" environmental capital; wilderness use as a problem of managing the regeneration of ecological capital.

Smith, V. Kerry (1979). "Natural Resource Scarcity: A Statistical Analysis." The Review of Economics and Statistics, 61:423-427.

This paper evaluates the trends in relative prices of natural resource commodity aggregates using statistical methods that permit the analysis of the stability and the direction of movement in these series over time to determine resource scarcity.

Smith, V. Kerry (1979). Scarcity and Growth Reconsidered. Resources for the Future, The Johns Hopkins University Press, Baltimore.

This volume is based on a conference that investigated resource scarcity. The objective is to report on an effort to reconsider the long run importance and availability of natural resources for economic growth and material well being. The forum was organized around three broad aspects of scarcity and growth: (1) the role of natural resources in economic modeling; (2) the nature of the physical constraints on the availability of natural resources; and (3) the ability of empirical methods to gauge the potential for stringencies in our natural resource endowments.

Smith, V. Kerry (1980). "The Evaluation of Natural Resource Adequacy: Elusive Quest or Frontier of Economic Analysis." Land Economics, 56(3):257-298.

This paper addresses how well analysts have dealt with evaluating the adequacy of our natural resources. To do so, we consider the most influential analyses of resource scarcity, developing their intellectual roots and detailing the methods they used. With this background, together with some perspective on the current empirical analyses of the extent to which the United States has experienced increased scarcity of natural resources, we examine the theory underlying the measurement of scarcity indexes and the mechanisms through which natural resource constraints might be relaxed. Our appraisal of this work is closed with direct consideration of the relationship between meeting environmental quality goals and natural resource needs, as well as with a review of the implications of this evaluation for further research.

Smith, V. Kerry (1988). "Selection and Recreational Demand." American Journal of Agricultural Economics, 70(1):29-36.

This article compares five methods for estimating travel cost recreation demand models with micro data. The models are distinguished by their treatment of selection effects that arise with on-site surveys. The comparison considers adjusting for selection effects in a variety of ways, including single and double selection rule models. Both parameter and consumer surplus estimates were evaluated. The findings indicate that the treatment of selection effects alone was not important for this case. However, the choice of an estimator did lead to large variations in per trip consumer surplus estimates.

Smith, V. Kerry (1990). "Estimating Recreation Demand Using the Properties of the Implied Consumer Surplus." Land Economics, 66(2):111-120.

Bockstael and Strand (1987) judged the methods for estimating demand or random utility models based on the properties of their respective consumer surplus estimates. This paper proposes to define estimators based on the properties of their implied consumer surplus estimates. This type of argument is not new and usually is associated with the rationale offered for Bayesian estimators. However, the motivation for the estimator proposed here can be based on minimizing the mean squared error of the consumer surplus estimates. Moreover, it can be constructed from the statistics usually reported with ordinary least squares estimates.

Smith, V. Kerry (1993). "Parallels in Fishery Management and Natural Resource Damage Assessment: Discussion." American Journal of Agricultural Economics, 75(5): 1196-1197.

The papers by Milon "U.S. Fisheries Management and Economic Analysis: Implications of the Alaskan Groundfish Controversy," Hanemann and Strand "Natural Resource Damage Assessment: Economic Implications for Fisheries Management," and Sutinen "Recreational and Commercial Fisheries Allocation with Costly Enforcement" provide practical and conceptual insights by identifying the relevance of marginal and boundary conditions for both the economic measures of efficiency and of asset values used to address fishery policies.

Smith, V. Kerry (1993). "Nonmarket Valuation of Environmental Resources: An Interpretive Appraisal." Land Economics, 69(1): 1-



This paper reviews research on nonmarket valuation. It seeks to gauge whether the methods are up to the tasks demanded of them and to identify new research priorities. The evaluation suggests that we can outline a protocol for implementing and using the methods with some resources, while for other resources our experience is still developing. Because the demands for valuation information are increasing as fast as our understanding of measurement methods is advancing, the next step in development requires defining a systematic commodity structure for environmental services with the needs for valuation measures providing conceptual underpinnings.

Smith, V. Kerry (1993). "Welfare Effects, Omitted Variables, and the Extent of the Market." Land Economics, 69(2): 121-131.

This paper offers an economic interpretation of Kling's (1989) finding that single price change measures of consumer surplus will provide an unbiased measure for a multiple price change, provided the prices are perfectly correlated. The explanation lies in recognizing that correlation in this case serves to define the commodity extent-of-the-market. Using this link, the paper demonstrates how the insights involved in defining general equilibrium demand functions or equivalently residual demand models can be adapted to fit the issues raised with travel cost models in accounting for the effects of substitutes.

Smith, V. Kerry and William H. Desvousges (1986). Measuring Water Quality Benefits. Kluwer-Nijhoff Publishing, Boston.

This book reviews alternative approaches for estimating recreation and related benefits of water quality.

Smith, V. Kerry and Yoshiaki Kaoru (1987). "The Hedonic Travel Cost Model: A View from the Trenches." Land Economics, 63(2):179-192.

The hedonic travel cost framework recognizes that individuals' decisions to visit recreation sites can be used to estimate implicit prices for the characteristics of these sites. Moreover, with these prices and individuals' consumption choices, the demands for characteristics can also be recovered. However, the actual process of implementing the model requires a substantial amount of information on households' recreation decisions as well as some detailed models.

Smith, V. Kerry and Raymond J. Kopp (1980). "The Spatial Limits of the Travel Cost Recreational Demand Model." Land Economics, 56(1):64-72.

This article describes a method for judging the spatial limits of travel cost recreational demand models as they are conventionally applied to secondary data sets. The spatial limits result from the assumptions necessary to use the available secondary data to estimate the representative individual's demand for a given recreational site's services including (a) the objective of the trip to the recreational site; (b) the amount of time spent on the site during each trip, and (c) the mode of travel and corresponding travel costs required to reach the site. A statistical test for the stability of the estimated demand functions' parameters provides an empirical basis for determining the extent to which the required assumptions are consistent with given samples. Further it is possible to adjust the composition of the sample of origin zones used in deriving final demand estimates to reflect these bounds.

Smith, V. Kerry, William H. Desvousges, and Matthew P. McGivney (1983).  
"The Opportunity Cost of Travel Time in Recreation Demand Models."  
Land Economics, 59(3):259-278.

The purpose of this paper is to evaluate current proposals for valuing travel time in the specification of recreation demand models. Based on a household production framework, our analysis examines the implications of the treatment of travel and on-site times in recreation models. The empirical results are based on demand functions estimated for 43 water based recreation sites with the Federal Estate component of the 1977 National Recreation Survey.

Smith, V.L. (1968). "Economics of Production from Natural Resources."  
American Economic Review 58: 409-431.

This paper attempts to provide a unified theory of production from natural resources. A single model of an industry is used to describe a dynamic process of recovery from such technologically diverse resources as fish, timber, petroleum, and minerals. Recovery for each of these resources is seen as a special case of a general model depending upon whether the resource is replenishable, and on whether production exhibits significant externalities. A model of centralized management, with particular reference to common property resources, such as fisheries under stationary conditions is also discussed and compared with competitive recovery in the stationary state.

Smith, V.L. (1969). "On Models of Commercial Fishing." Journal of Political Economy 77: 181-198.

The model provides one example of a descriptive theory that transforms any specific pattern of assumptions about cost conditions, demand externalities, and biomass growth technology into a pattern (conceivably observable) of exploitation. The model or variations on it would appear to have much wider possible applications, such as (1) a theory of bionomic equilibrium in primitive hunter cultures and (2) possibly the rudiments of an economic theory of species extinction, both historical and modern.

Smith, V.L. (1977). Economics of Natural and Environmental Resources.  
Gordon and Breach, New York.

This book contains a selection of papers in economic theory of natural resources including basic and production theory and petroleum, biological (fisheries), water, and environmental resource applications.

Snead, Larry L. (1989). "A U.S. Perspective on Access to Fisheries Resources." Marine Fisheries Review, 51(1):15-17.

The result of the passage of the Magnuson Act and the adoption of 200 mile exclusive economic zones (EEZ) has been that a new international framework for fisheries is emerging and is continuing to evolve. U.S. international fisheries policies have paralleled this change in the pattern of access to fisheries resources, shifting from the promotion of domestic fishing fleets to emphasizing issues relating to fisheries activities beyond the EEZ.

Snyder, Donald L. and Rabindra N. Bhattacharyya (1990). "A More General Dynamic Economic Model of the Optimal Rotation of Multiple-Use Forests." Journal of Environmental Economics and Management, 18:168-175.

a deterministic optimal control model is presented for a multiple use

forest, with specific consideration given to provision and maintenance costs associated with a flow of nontimber values. A relatively simple relationship is found that determines the optimal rotation length for such a forest.

Socioeconomic Panel (1993). "Report of the Socioeconomic Panel Meeting on Reef Fish." Briefing Book Addition, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, FL.

The social and economic implications of the 1993 Stock Assessments for reef fish are discussed and recommendations made for their management.

Socioeconomic Panel (1994). "Report of the Socioeconomic Panel Meeting on Reef Fish." Final report, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, FL.

The socioeconomic panel recommendations for the management of the reef fish fishery are presented in the paper based on a review of the stock assessment panel recommendations and the available economic and sociological data and analysis.

Socioeconomic Panel (1994). "Report of the Socioeconomic Panel Meeting on Reef Fish." Draft report, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, FL.

The socioeconomic panel recommendations for the management of the reef fish fishery are presented in the paper based on a review of the stock assessment panel recommendations and the available economic and sociological data and analysis.

Socioeconomic Panel (1995). "Report of the Socioeconomic Panel Meeting on Reef Fish." Final report, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, FL, November, 17 pp.

The socioeconomic panel recommendations for the management of the reef fish fishery are presented in the paper based on a review of the stock assessment panel recommendations and the available economic and sociological data and analysis.

Socioeconomic Panel (1995). "Report of the Third Coastal Migratory Pelagics Socioeconomic Panel Meeting." Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, Florida, April 18-20, 9 pp.

The socioeconomic panel recommendations for the management of the coastal migratory pelagic fishery are presented based on a review of the stock assessment panel recommendations and the available economic and sociological data and analysis.

Socioeconomic Panel (1995). "Report of the Fourth Coastal Migratory Pelagics Socioeconomic Panel Meeting." Gulf of Mexico Fishery Management Council, 5401 West Kennedy Boulevard, Tampa, Florida, April 13-14, 10 pp.

The socioeconomic panel recommendations for the management of the coastal migratory pelagic fishery are presented based on a review of the stock

assessment panel recommendations and the available economic and sociological data and analysis.

Socioeconomic Panel (1995). "Report of the Socioeconomic Panel Meeting on Evaluation of Existing Data on the Mackerel Fishery." Draft report, Gulf of Mexico Fishery Management Council, Tampa, FL.

The Socioeconomic Assessment Panel (SEP) met to evaluate existing social and economic data on the Gulf mackerel fishery.

Socioeconomic Panel (1996). "Report of the Socioeconomic Panel Meeting on Amendment 14 to the Reef Fish Fishery Management Plan." Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, FL, April, 6 pp.

The socioeconomic panel recommendations for the management of the reef fish fishery are presented in the paper based on a review of the stock assessment panel recommendations and the available economic and sociological data and analysis.

Socioeconomic Panel (1996). "Report of the Socioeconomic Panel Meeting on Amendment 9 to the Shrimp Fishery Management Plan." Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 331, 5401 West Kennedy Boulevard, Tampa, FL, June, 7 pp.

The report contains comments provided by the Socioeconomic Panel (SEP) on shrimp amendment 9 implementing bycatch reduction devices in the Gulf of Mexico shrimp fishery. While endorsing the modeling framework used in the regulatory impact review, a number of comments are provided to improve the amendment. The panel also endorsed the conclusion that without ITQs in the managed finfish fisheries, any potential benefits from bycatch reduction would be lost.

Socioeconomic Panel (1997). "Report of the Sixth Coastal Migratory Pelagics Socioeconomic Panel Meeting." Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL, April, 9 pp.

Review of the social and economic implications of the 1997 estimates of acceptable biological catch (ABC) for Gulf king and Spanish mackerel.

Socioeconomic Panel (1997). "Report of the Socioeconomic Panel Meeting on Reef Fish." Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL, October, 34 pp.

The socioeconomic panel recommendations for the management of the red snapper, gag, and updated information on gray triggerfish are presented in the paper based on a review of the stock assessment panel recommendations and the available economic and sociological data and analysis.

Socioeconomic Panel (1998). "Oct. 22-23 Reef Fish Stock Assessment Socioeconomic Panel Meeting." Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL, Oct.

A collection of biological and economic analyses used as background material for the socioeconomic panel meeting on reef fish including the stock assessment report, a summary of recreational landings data, economic review of

the Gulf of Mexico commercial fishery, and peer review report on red snapper management.

Socioeconomic Panel (1998). "Report of the Seventh Coastal Migratory Pelagics Socioeconomic Panel Meeting." Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL, March, 36 pp.

The social and economic implications of the 1993 stock assessments for king and Spanish mackerel were discussed and recommendations made for their management.

Socioeconomic Panel (1998). "Report of the Socioeconomic Panel Meeting on Reef Fish." Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL, August, 28 pp.

The social and economic implications of the 1998 stock assessments for vermilion snapper and gag were discussed and recommendations made for their management.

Socioeconomic Panel (1998). "Report of the Socioeconomic Panel Meeting on Reef Fish." Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL, October, 32 pp.

The social and economic implications of the 1998 stock assessments for vermilion snapper and gag were discussed and recommendations made for their management.

Socioeconomic Panel (1999). "Report of the Socioeconomic Panel Meeting on Draft Amendment for a Charter Vessel/Headboat Permit Moratorium." Gulf of Mexico Fishery Management Council, The Commons at Rivergate, 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL, October, 19 pp.

The panel generally endorses the adoption of regulations to limit charterboat participation in the Gulf of Mexico and to control the transfer of permits between fishermen. The discussion focuses on the different types of charter boat limited entry programs that could be implemented.

Solow, Robert M. (1974). "Intergenerational Equity and Exhaustible Resources." Review of Economic Studies, 3:29-45.

The max-min principle is applied to intergenerational equity using optimal capital accumulation as a guide beginning with a constant population, no technical progress, and no scarce natural resource case and adding complications one at a time.

Solow, Robert M. (1976). "Optimal Fishing with a Natural Predator." In Ronald E. Grieson (ed.) Public and Urban Economics, Chapter 13, Lexington Books, D.C. Heath and Company, Lexington, Massachusetts.

The author extends the standard fisheries economics problem to include the influence of a natural predator on the commercially harvested species. While some of the analysis appears to be missing, it should be easily replicated. Modifications of the model to reflect competitive and commensal situations are suggested, but not pursued.

Somers, Ian and You-Gan Wang (1995). A Bioeconomic Analysis of Seasonal Closures in Australia's Multispecies Northern Prawn Fishery. Draft report submitted to the North American Journal of Fisheries Management.

In Australia's northern prawn fishery, seasonal closures are used to manage the size composition of the commercial catch. While primarily aimed at short term economic benefits of improved yield per recruit, they are also used to help reduce the risk of recruitment over fishing. Until recent years, seasonal closures took the form of a single closed season in late summer to protect juvenile banana prawns (Penaeus merguensis) during months of peak recruitment. However, with the growing commercial importance of tiger prawns, (P. esculentus and P. semisulcatus) and concern for their recruitment over fishing, a second mid year closure was introduced to protect subadult tiger prawns until their main spawning season, which begins in August. In this paper, we use a simulation model of the northern prawn fishery to assess the biological and economic effectiveness of seasonal closures, specifically in yield, income, net operating income, and spawning stock indices. Because there is no reliable spawning stock recruitment relationship, recruitment was assumed to be constant; thus analysis was effectively per recruit. Our base model, with closures between 1 December and 1 April and between 25 June and 1 August, closely resembles the current seasonal closure regime in the fishery. Using this model, net operating income was found to increase by 3.7% with a single closed season between 28 November and 14 April, but tiger prawn spawning indices reduced by an average of 5.6%. A single closed season between 13 December and 8 May retained the same protection on subadult tiger prawns as the base model, but increased the net income by 2.3%. Net operating income was relatively insensitive to closure dates; any opening date between 17 March and 2 June would result in net operating income within 5% of the maximum.

Song, Yann-huei (1998). Comments Made In Relation to Management of Fishing Capacity. Associate Research Fellow, Institute of European and American Studies, Academia Sinica, Nankang, Taipei, Taiwan, Technical Working Group on the Management of Fishing Capacity, La Jolla California, U.S.A., April 15-18, 4 pp.

A list of important issues in relation to management of fishing capacity which need to be carefully addressed in the guidelines on fishing capacity.

Sonu, Sunee C. (1994). "The Japanese Market for U.S. Tuna Products." NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWR-029, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Region, Long Beach, California, September, 64 pp.

An assessment of the Japanese tuna market and the role that U.S. firms could play in meeting demand for fresh tuna products. Five strategies are suggested: (1) farming of bluefin tuna; (2) value added products; (3) direct sale of fresh tuna to the Tokyo central wholesale market; (4) sale to other wholesale markets; and (5) direct sales to supermarket chains.

Sonu, Sunee C. (1995). "The Japanese Sea Urchin Market." NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWR-030, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Region, Long Beach, California, September, 33 pp.

Japan is by far the world's largest importer and consumer of sea urchin roe. The United States has become the largest supplier of sea urchins and sea

urchin roe to Japan. Most fresh sea urchin roe are sold through auction at the Tokyo Central Wholesale Market. The tariff for sea urchin roe is higher than rates for most other seafood products imported into Japan and the tariff for U.S. exports is higher than the rate imposed on other major suppliers. The future market of U.S. sea urchins in Japan depends to a large extent on Japanese sea urchin harvests. Because sea urchin stocks appear to be declining, and domestic harvest is not likely to increase in the short term, increased export of U.S. sea urchins and their roe has significant potential especially if tariff rates can be reduced.

Sonu, Sunee C. (1996). "The Japanese Sablefish Market." NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWR-031, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Region, Long Beach, California, November, 52 pp.

This report provides a detailed examination of the Japanese sablefish fishery, imports, and market, to identify potential opportunities for export of U.S. products, and to identify strategies which may help increase such efforts.

South Atlantic Fishery Management Council (1981). "Profile of the Penaeid Shrimp Fishery in the South Atlantic." Final Report, Southpark Building, Suite 306, One Southpark Circle, Charleston, South Carolina 29407, November.

Review of the available data and a description of the shrimp fishery in the southern Atlantic states.

South Atlantic Fishery Management Council (1982). "Source Document for the Swordfish Fishery Management Plan." One Southpark Circle, Suite 306, Charleston, South Carolina, May.

This source document contains the detailed scientific, technical and other supportive documentation on which the Fishery Management Plan for Swordfish is based.

South Atlantic Fishery Management Council (1983). "Source Document for the Snapper-Grouper Fishery of the South Atlantic Region." One Southpark Circle, Suite 306, Charleston, South Carolina, February.

This source document is the background material for the Snapper-Grouper Fishery Management Plan of the South Atlantic Region, containing detailed supportive documentation on which the management regime for the snapper-grouper fishery is based.

South Atlantic Fishery Management Council (1983). "Fishery Management Plan, Regulatory Impact Review, and Final Environmental Impact Statement for the Snapper-Grouper Fishery of the South Atlantic Region." One Southpark Circle, Suite 306, Charleston, South Carolina, March.

This document presents a combined fishery management plan (FMP) for the snapper-grouper fishery of the South Atlantic Region, regulatory impact review (RIR) of the economic consequences of the proposed management measures, and final environmental impact statement (FEIS) describing the possible effects on the environment of implementing the plan.

South Atlantic Fishery Management Council (1985). "Fishery Management

Plan, Regulatory Impact Review, Initial Regulatory Flexibility Analysis, and Final Environmental Impact Statement for Atlantic Swordfish." Southpark Circle, Suite 306, Charleston, South Carolina, February.

The fishery management plan for swordfish in the south Atlantic region. The fishery is in or near a state of growth overfishing. Domestic landings are controlled by a variable season closure (VSC). Foreign fishing is prohibited and a bycatch in the foreign tuna fishery is restricted. Permits to fish are required and observer coverage of a sample of boats is made mandatory.

South Atlantic Fishery Management Council (1988). "Fishery Management Plan, Final Environmental Impact Statement, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis for the Atlantic Billfishes." 1 Southpark Circle, Suite 306, Charleston, South Carolina, March.

The proposed action will result in management of the billfish fishery in the Exclusive Economic Zone (EEZ) of the South Atlantic, Gulf of Mexico, Caribbean, Mid-Atlantic, and New England Councils. The species regulated are the sailfish, Istiophorus platypterus; the white marlin, Tetrapturus albidus; the blue marlin, Makaira nigricans, and the longbill spearfish, Tetrapturus pfluegeri. The objectives are to : 1) maintain the highest availability of billfishes to the U.S. recreational fishery; 2) optimize the social and economic benefits to the nation by reserving the billfish resource for its traditional use which on the continental U.S. is almost entirely a recreational fishery. In the Caribbean, the fishery is both a recreational and small scale handline fishery where billfishes are used as food; 3) increase understanding of the condition of the billfish stocks and the bill fish fishery. Optimum yield for billfishes is the greatest number of billfish that can be caught by the recreational fishery in the EEZ, consistent with the provisions of this fishery management plan, considering the biological limitations of the stock and the unavoidable incidental catches in other fisheries. Management measures proposed include a prohibition on the sale of billfish; a prohibition on possession by commercial longline and drift net vessels; minimum size limits; reporting requirements; permits for foreign vessels; and time and area restrictions on foreigners with a bycatch of billfish. The management actions will be implemented under the Magnuson Fishery Conservation and Management Act of 1976 (16 U.S.C. 1901, et seq.).

South Atlantic Fishery Management Council (1989). "Amendment #1 to the Fishery Management Plan for Atlantic Swordfish." Draft, 1 Southpark Circle, Suite 306, Charleston, South Carolina, December.

The fishery management plan (FMP) for Atlantic swordfish was approved on August 22, 1985. The FMP contained measures designed to cap the harvest of fish less than 50 pounds dressed weight at the 1980 level by implementing time/area closures (Variable Season Closures [VSC]). The closures were never implemented and on December 31, 1987 the VSC provision expired. Currently, the FMP contains only data collection provisions. This amendment will implement management measures designed to rebuild the spawning stock to a level that will reduce the likelihood of recruitment failure.

South Atlantic Fishery Management Council (1990). "Amendment 1 to the Fishery Management Plan for Atlantic Swordfish." 1 Southpark Circle, Suite 306, Charleston, South Carolina, October, 101 pp.

The objectives of this amendment are to manage the western North



Atlantic swordfish population under a constant harvest rate policy based on  $F_{0.1}$  (Phase 1). To initiate measures to stabilize or reduce the number of participants in the fishery (Phase 1). to encourage an international management regime that complements management measures adopted for the U.S. fishery (Phase 1). To increase yield per recruit by shifting fishing mortality to larger size fish (Phase 2).

South Atlantic Fishery Management Council (1990). "Wreckfish." Amendment Number 3, Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region, 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, August, 34 pp.

An amendment to the fishery management plan for wreckfish that includes wreckfish in the management unit.

South Atlantic Fishery Management Council (1991). "Final Amendment 5 (Wreckfish), Regulatory Impact Review, Initial Regulatory Flexibility Determination, and Environmental Assessment for the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region." 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, September, pp. 89.

Fishery management plan for wreckfish that institutes individual transferable quotas.

South Atlantic Fishery Management Council (1993). "Draft Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region." 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, 268 pp.

Draft fishery management plan for the south Atlantic shrimp fishery.

South Atlantic Fishery Management Council (1993). "Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region." 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, 320 pp.

Final fishery management plan for the south Atlantic shrimp fishery.

South Atlantic Fishery Management Council (1994). "Draft Decision Document for Amendment 1 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region (Rock Shrimp)." 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, 27 pp.

A discussion of management options for the rock shrimp fishery resource on the south Atlantic coast of the United States.

South Atlantic Fishery Management Council (1994). "Public Hearing Draft Amendment 1 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region (Rock Shrimp)." 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, September, 96 pp.

This amendment considers (1) adding rock shrimp to the management unit of the shrimp FMP, (2) limiting harvest area in EEZ from Duval through St. Lucie (Stuart) counties, (3) implementing minimum mesh size regulations for

rock shrimp, (4) establishing a license limitation program for the rock shrimp fishery, and (5) establishing a co-management program for the rock shrimp fishery.

South Atlantic Fishery Management Council (1994). "Public Hearing Draft Fishery Management Plan for Coral, Coral Reefs, and Live/Hard Bottom Habitats of the South Atlantic Region." 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, 88 pp.

The proposed management measures for coral, coral reefs, and live/hard bottom habitats in the south Atlantic region involves the following actions: (1) Establish a live rock aquaculture permit system for the South Atlantic Exclusive Economic Zone; (2) Prohibit octocoral harvest (North of Florida, North of Date County, or throughout the South Atlantic area of jurisdiction); and (3) Prohibit anchoring in the Oculina Bank Habitat Area of Particular Concern.

South Atlantic Fishery Management Council (1994). "Spanish Mackerel Controlled Access." 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, August.

This paper discusses possible options for managing the Spanish mackerel fishery under a controlled access regime. A brief description of the fishery is presented, followed by a discussion of the problems in the fishery that could be solved by a controlled access regime. A number of instruments that could be utilized under controlled access are discussed. These range from a no action situation, to instruments that could impose certain restrictions, and finally to what could be considered as the most free market situation. Some comments are provided on deciding the process of how to decide on initial eligibility and how to set the initial TAC

South Atlantic Fishery Management Council (1994). "Spanish Mackerel Controlled Access Scoping." 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, September, 18 pp.

This paper discusses possible options for managing the Spanish mackerel fishery under a controlled access regime. A brief description of the fishery is presented, followed by a discussion of the problems in the fishery that could be solved by a controlled access regime. A number of instruments that could be utilized under controlled access are discussed. These range from a no action situation to instruments that could impose certain restrictions, and finally to what could be considered as the most free market situation. Some comments are provided on determining the process of how to decide on initial eligibility, and how to set the initial TAC.

South Atlantic Fishery Management Council (1995). "Rock Shrimp Public Hearing Summary." Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina 29407-4699, May, 49 pp.

Adds rock shrimp to the fishery management plan for shrimp, minimizes impacts of the rock shrimp fishery on coral, coral reefs, and live/hard bottom habitat, and implements permit and reporting requirements for the fishery.

South Atlantic Fishery Management Council (1995). "Snapper Grouper Assessment Group Wreckfish Report." Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina 29407-4699, February, 16 pp.

This report presents the findings and recommendations of the Snapper

Grouper Assessment Group that reviewed the biological and fishery data on the condition of the wreckfish (Polyprion americanus) resource in the management unit.

South Atlantic Fishery Management Council (1996). "Snapper Grouper Assessment Group Wreckfish Report." Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina 29407-4699, February, 16 pp.

This report presents the findings and recommendations of the Snapper Grouper Assessment Group that reviewed the biological and fishery data on the condition of the wreckfish (Polyprion americanus) resource in the management unit.

South Atlantic Fishery Management Council (1996). "1996 Wreckfish Assessment Report." Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina 29407-4699, February, 5 pp.

The final wreckfish assessment report with attachments that discusses various options for continuing the management of the resource.

South Atlantic Fishery Management Council (1996). "Supplement to the Framework Seasonal Adjustment of Harvest Levels and Procedures Under the Fishery Management Plan for the Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico and South Atlantic Region." Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina 29407-4699, February, 5 pp.

Regulatory Impact Review, Social Impact Assessment, and Environmental Assessment of trip limits proposed for the king mackerel fishery.

South Atlantic Fishery Management Council (1998). "Final Amendment 9 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region." Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina 29407-4699, February, 246 pp.

Size limits and bag limits are established for red porgy, black sea bass, greater amberjack, vermillion snapper, gag, black grouper, etc. and set quotas and require escape vents and panels with degradable fasteners in black sea bass pots.

South Atlantic Fishery Management Council (1998). "Draft Comprehensive Habitat Amendment and Related Habitat Plan and Draft Comprehensive Sustainable Fisheries Act Amendment for Fishery Management Plans of the South Atlantic Region." Southpark Building, Suite 306, 1 Southpark Circle, Charleston, South Carolina 29407-4699, February, 5 pp.

This draft amendment addresses essential fish habitat requirements for FMPs approved for shrimp, red drum, snapper-grouper, coastal migratory pelagics, coral, coral reefs, live/hard bottom habitat, spiny lobster, and golden crab.

South Atlantic Fishery Management Council and Gulf of Mexico Fishery Management Council (1994). "Amendment 2 to the Fishery Management Plan for Coral and Coral Reefs, of the Gulf of Mexico and South Atlantic." South Park Building, 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, July, 140 pp.

The proposed management program for live rock in the South Atlantic region involves the following actions: (1) Define live rock and add it to the Coral FMP management unit; (2) Redefine allowable octocorals to mean erect, nonencrusting species of the subclass Octocorallia, except the prohibited sea fans Gorgonia flabellum and G. ventalina, including only the substrate covered by and within one inch of the holdfast; (3) Provide for different management in the jurisdictional areas of the two Councils by promulgating a separate set of management measures and regulations for the South Atlantic; (4) Prohibit all wild live rock harvest north of Dade County Florida, and prohibit chipping throughout the jurisdiction of the South Atlantic Council immediately. Cap wild harvest at 485,000 pounds annually until January 1, 1996 when all wild harvest will end; (5) Allow and facilitate aquaculture in the Exclusive Economic Zone; (6) Require harvest permits. Permits shall be limited to persons who have commercially landed and, where required, reported wild live rock landings prior to the control date of February 3, 1994; (7) Require a permit for the possession or harvest from aquaculture operations in the Exclusive Economic Zone. Harvest from the area may only be done by the permittee or his written designee and an administrative fee will be authorized for the permit; (8) Require a federal permit for harvest and possession of prohibited corals and prohibited live rock from the Exclusive Economic Zone for scientific, educational, and restoration purposes; and (9) Establish a optimum yield (OY) for wild live rock which is to be 485,000 pounds annually for the South Atlantic region where harvest is allowed during 1994 and 1995, after which it is to be zero except for that which may be allowed by permit.

South Atlantic Fishery Management Council, Gulf of Mexico Fishery Management Council, and Mid-Atlantic Fishery Management Council (1995). "Draft Regulatory Amendment for the Fishery Management Plan for Coastal Pelagics in the Gulf of Mexico and South Atlantic." South Park Building, 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, January, 31 pp.

This regulatory amendment to the coastal pelagics fishery management plan was developed to spread out the harvest of Atlantic migratory group king mackerel among the largest number of fishermen and to provide additional biological protection by implementing commercial trip limits.

South Atlantic Fishery Management Council, Gulf of Mexico Fishery Management Council, and Mid-Atlantic Fishery Management Council (1995). "Revised Final Regulatory Amendment for the Fishery Management Plan for Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico and South Atlantic Region." South Park Building, 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699, February, 46 pp.

This regulatory amendment to the coastal pelagics fishery management plan was developed to spread out the harvest of Atlantic migratory group king mackerel among the largest number of fishermen and to provide additional biological protection by implementing commercial trip limits.

Southeast Fisheries Science Center (1992). "Status of Fishery Resources off the Southeastern United States for 1991." NOAA Technical Memorandum NMFS-SEFSC-306, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, November, 75 pp.

This report summarizes the general status of fishery resources through 1991. The report is divided into three major sections: Fishery Trends, Resource Surveys, and Species Synopses.

Southeast Fisheries Science Center (1993). "Gulf of Mexico Shrimp Fishery Effort Report." National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, November, 37 pp.

This report provides a description of the data and data collection procedures used to collect statistics from the shrimp fisheries in the Gulf of Mexico and discusses recent trends in fishing effort.

Southeast Fisheries Science Center (199?). "Endangered Species Act, Section 7 Consultation, Biological Opinion." National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, Florida, 28 pp.

Consultation in accordance with Section 7(a) of the Endangered Species Act on the drift gillnet component of the directed swordfish fishery in the Atlantic Ocean, Gulf of Mexico, and the Caribbean and the drift gillnet component of the shark fishery identified in the secretarial Shark Fishery management Plan for the Atlantic Ocean (includes the Gulf of Mexico and Caribbean Sea).

Southeast Fisheries Science Center (1995). "Endangered Species Act, Section 7 Consultation, Biological Opinion." National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, Florida, 28 pp.

Consultation in accordance with Section 7(a) of the Endangered Species Act regarding the management activities under the final rule to establish the 1995 catch limits for the Atlantic swordfish fishery and continued operation of the longline and harpoon components of the directed swordfish fishery in the Atlantic Ocean, Gulf of Mexico, and the Caribbean.

Southeast Fisheries Science Center (1995). "1995 Shark Evaluation Annual Report." National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, April, 23 pp.

This report was prepared in support of the Atlantic Shark Fishery Management Plan. The information presented herein represents an update to the information presented in the Report of the Shark Evaluation Workshop held at the Southeast Fisheries Science Center, Miami Laboratory, 15-18 March 1994. The 1994 Workshop Committee, which focused on the large coastal shark grouping, found that for many species considered, shark abundance in waters off the U.S. Atlantic and Gulf of Mexico coasts is depressed due to fishing removals. The available catch rate information indicated that the abundance of many of the species and species groups could have declined by about 50 to 75% from the early 1970's to the mid 1980's. Results of the current analysis using updated and new information are similar. The Workshop Committee concluded that recovery of this resource to levels of the 1970's will be slow (perhaps 30 years or more in some cases), due to the relatively low intrinsic rates of increase exhibited by most shark species. The Workshop Committee also concluded that measuring recovery or decline under a TAC implemented in 1993, even with precise abundance indices, may not be possible for a decade or more. The additional information available for the 1995 evaluation is consistent with this conclusion. The present report provides updated catch and catch rate information. The report also provides a summary of management actions undertaken during the intervening year since the Workshop Committee met.

The 1994 Workshop committee concluded that the greatest impediments to improving shark stock assessments continue to be the general lack of species and size specific catch (landed and discarded) and effort data, as well as

only limited fishery independent measures of shark abundance and productivity. While notable improvements in species specific catch information has been made for a portion of the recent catches through observer data collections, improved assessment advise will only result if these efforts are increased and maintained for a reasonably long time period. In addition, improvements in fishery independent measures of species specific abundance are still required.

Southeast Fisheries Science Center (1996). "1996 Report of the Shark Evaluation Workshop." National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, June, 80 pp.

The available data indicate that the catch rates of many of the species and species groups have declined by 50 to 75% from the early 1970's to the mid 1980's. The most recent data indicate that the rapid rate of decline that characterized the stocks in the mid 1980's has slowed significantly. Abundance estimates from the more recent years are variable and a significant statistical trend, either up or down, cannot be detected. The fishery has been regulated for just three years and since the expected rates of change in shark abundance are low, and our measures of stock abundance are uncertain, sufficient observational data are not yet available to detect significant changes in stock size after management measures were implemented. Nevertheless, additional reductions in fishing mortality would improve the probability of stock increases for Large Coastal sharks. Analyses indicate that recovery is more likely to occur with reductions in effective fishing mortality rate of 50% or more. Reductions in effective fishing mortality can be achieved by a change in the basic quota, minimum sizes, strategies to differentially reduce fishing mortality on females, and seasonal closures to protect reproductive females and young of the year. Insufficient data is still the main impediment to improving shark stock assessments.

Southeast Fisheries Science Center (1996). "Summary Report on the Status of Bycatch Reduction Device Development." National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, January.

A compendium of reports made to the Gulf of Mexico Fishery Management Council on bycatch reduction device development. The goal of the gear development project is to develop shrimp trawl gear modifications and/or fishing tactics that are capable of reducing the bycatch of finfish with minimum loss of shrimp production. Specific objectives of the program were to evaluate existing bycatch reduction techniques, collect data on behavior of fish and shrimp in trawls, and to develop and evaluate new bycatch reduction techniques. The key species targeted for reduction are red snapper, weakfish, king and Spanish mackerel. Includes copies of overheads used in the Council presentation.

Southeast Fisheries Science Center (1996). "Technical Specifications and Minimum Requirements for the Extended Funnel, Expanded Mesh, and Fisheye BRDS. In Summary Report on the Status of Bycatch Reduction Device Development." National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, January.

A technical explanation of the bycatch reduction devices proposed to reduce finfish bycatch in the Gulf of Mexico shrimp fishery.

Southeast Regional Office (1994). "Wreckfish Report, 1993-1994 Season with Comparisons." National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL.

The report consists of twelve charts which depict the activities associated with the wreckfish ITQ program for the 1993-1994 season with comparisons with other years.

Southeast Regional Office (1995). "Cooperative Research Program Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries: A Report to Congress." National marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL, April 67 pp.

This report updates members of Congress and other interested parties on progress made in developing and implementing a cooperative shrimp trawl bycatch research program for the southeastern United States.

Southeast Regional Office (1995). "Migratory Coastal Pelagics Data." National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL.

Summarized data on the commercial and recreational fisheries for the migratory coastal pelagics fishery (mackerel).

Southeast Regional Office (1995). "Marine Fisheries Initiative (MARFIN)." Eighth Annual MARFIN Conference, November 28-29, Tampa Airport Marriott, Tampa, FL, National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL.

A list of abstracts of each MARFIN project presented to the Board by the principle investigators.

Southeastern Fisheries Association (1993). International Conference on Shrimp Bycatch, May 24-27, 1992, Lake Buena Vista, Florida. Final Report, NOAA Grant No. NA-90AA-H-MF745.

The primary objectives of the conference are to (1) summarize information on the status of the bycatch problem and alternative shrimp harvesting techniques for bycatch reduction; (2) identify future research needs for addressing bycatch; (3) obtain input from scientists, fishermen, fishery managers, and environmentalists on future management strategies; and (4) provide for the dissemination of research and conference recommendations for evaluation by representatives of the scientific, commercial, recreational, and environmental communities.

Southey, Clive (1972). "Policy Prescriptions in Bionomic Models: The Case of the Fishery." J. Polit. Econ., 80:769-775.

Efficiency in an open access fishery may involve a permanent increase in the total expenditure of factors employed in the fishery as opposed to a reduction in total fishing effort as proposed by Smith (1969). This result is obtained without modification of the basic ingredients of the fishery model. Using a somewhat different biological mechanism, a decrease in population under regulation is possible. Throughout the analysis, problems of mesh size and crowding are abstracted from, concentrating exclusively on the effect of effort on population using steady state solutions.

Southwick, Robert I. and David B. Rockland (1990). How To Conduct An Economic Impact Analysis. U.S. Fish and Wildlife Service, Federal Aid Division, Grant No.: 14-16-009-89-1210, The Sport Fishing Institute, January, 64 pp.

This manual is intended to provide state fish and game agencies with the ability to conduct economic impact analyses. However, the integration of economics and social science into fisheries management should not be accomplished by making biologists into economists, but should be accomplished through multi-disciplinary management teams, each member having an understanding of the other members science.

Spanos, Aris (1986). "Econometric Modelling, A Preliminary View."  
Chapter 1 in Statistical Foundations of Econometric Modelling.  
Cambridge University Press, Cambridge, U.K.

This text questions the existing approach of econometric modelling and suggests an alternative methodology for performing empirical analysis.

Spector, L. and M. Mazzeo (1980). "Probit Analysis and Economic Education." Journal of Economic Education, 11:37-44.

This paper introduces probit analysis to economic education for the study of teaching technique, student characteristics, and use of textbooks. An analysis using probit and OLS techniques is used to compare and contrast both sets of results. Probit is found to be the better approach for this type of analysis.

Sport Fishing Institute (1986). "A Research Agenda for the Economics of the King Mackerel Fishery." Report resulting from the Mackerels Economic Workshop, Southeast Regional Office, National Marine Fisheries Service prepared by the Sport Fishing Institute, 1010 Massachusetts Avenue, Suite 100, Washington, D.C., June.

This paper presents the proposed research strategies to overcome informational deficiencies that make decisions pertaining to the use of the king mackerel stock less certain.

Sport Fishing Institute (1980). "Economic Activity Associated with Marine Recreational Fishing in 1980." SFI, 608 13<sup>th</sup> Street, N.W., Washington, D.C. 20005.

The purpose of this report was to undertake a complete economic analysis of the marine recreational fishing industry and marine recreational fishing. Economic impact analysis was used to estimate value added, capital expenditures, employment, and wages and salaries as a function of sales. Total economic impact of the \$3.9 billion of recreational fishing retail sales was estimated at \$7.5 billion.

Sport Fishing Institute (1988). "Economic Activity Associated with Marine Recreational Fishing in 1985." Volume I - National and Regional Estimates. SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 103.

The purpose of this report was to undertake a complete economic analysis of the marine recreational fishing industry and marine recreational fishing. Volume I describes the national economic activity of the marine recreational fishing industry in the United States in 1985. In addition, the impacts are presented for each region under the jurisdiction of the regional fishery management councils. The multiplier effects of the marine recreational fishing industry are included. Changes in the industry from 1972 to 1985 are described and analyzed.

Sport Fishing Institute (1988). "Economic Activity Associated with



Marine Recreational Fishing in 1985." Volume II - State-Level and Species Level Estimates. Sport Fishing Institute, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, 122 pp.

This volume presents disaggregations of the economic activity associated with marine recreational fishing to the coastal states and to individual species of fish. These disaggregations were derived from the breakdowns of the national impacts to the jurisdictions of the regional fishery management councils as presented in Volume I, Section 5.0.

Sport Fishing Institute (1988). "Economic Activity Associated with Marine Recreational Fishing in 1985." Volume III in Future Participation in Marine Recreational Fishing. SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 103.

This volume of the report on the economic activity associated with marine recreational fishing in 1985 provides forecasts of marine recreational fishing participation to the year 2025. These forecasts are intended to serve as useful guides for future industry development and fisheries management by providing guidelines as to the levels of future demand for marine recreational fishing. However, like all forecasts, the estimates should be treated with caution. In particular, the more distant in the future, the greater the variability in the estimate, or the less confidence one can have in the number.

Sport Fishing Institute (1988). "The Economic Impact of Sport Fishing in the State of Alabama." SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 30.

The economic impact of sport fishing in Alabama.

Sport Fishing Institute (1988). "The Economic Impact of Sport Fishing in the State of Florida." SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 30.

The economic impact of sport fishing in Florida.

Sport Fishing Institute (1988). "The Economic Impact of Sport Fishing in the State of Georgia." SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 30.

The economic impact of sport fishing in Georgia.

Sport Fishing Institute (1988). "The Economic Impact of Sport Fishing in the State of Louisiana." SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 30.

The economic impact of sport fishing in Louisiana.

Sport Fishing Institute (1988). "The Economic Impact of Sport Fishing in the State of Mississippi." SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 30.

The economic impact of sport fishing in Mississippi.

Sport Fishing Institute (1988). "The Economic Impact of Sport Fishing in the State of North Carolina." SFI, Suite 100, 1010

Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 30.

The economic impact of sport fishing in North Carolina.

Sport Fishing Institute (1988). "The Economic Impact of Sport Fishing in the State of South Carolina." SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 30.

The economic impact of sport fishing in South Carolina.

Sport Fishing Institute (1988). "The Economic Impact of Sport Fishing in the State of Texas." SFI, Suite 100, 1010 Massachusetts Avenue, N.W., Washington, D.C. 20001, December, pp. 30.

The economic impact of sport fishing in Texas.

Sport Fishing Institute (1991). "Workshop on Wetland Valuation." May 24, 1991, National Marine Fisheries Service, Silver Springs, Maryland.

See Crookshank, Steven L. (1991). "The Economics of Wetland Valuation" report prepared for the National Marine Fisheries Service.

Springer, Steven C. (1993). "Monitoring High-Seas Fishing Vessel Operations By Satellite. Paper presented at the Workshop on Enforcement Measures, Organization for Economic Co-Operation and Development, Directorate for Food, Agriculture, and Fisheries, Committee for Fisheries, Paris, September 21-22.

This paper describes the implementation of the satellite system to monitor vessel locations and transmit catch, weather, and other data on a real time basis using that was agreed to by the U.S., Japan, Canada, Korea, and Taiwan.

Spulber, Daniel F. (1985). "The Multicohort Fishery Under Uncertainty." Marine Resource Economics, 1(3):265-282.

The multicohort fishery subject to random environmental disturbances is examined within a market framework. The free access problem is considered and optimal selective and proportional harvesting policies are discussed.

Squire, James L. (1987). "Pacific Billfish Angler Catch Rates for Key Area Stock Assessments." Marine Fisheries Review, 49(2):15-25.

The Pacific billfish Angler Survey was initiated in 1969 to measure the trend of angler CPUE annually. Survey respondents (1969-84) have reported 145,661 angler days catching 59,460 billfish, resulting in an average CPUE of 0.41 fish/day or 2.45 days of fishing per billfish. Annual totals of catch, effort, and resulting CPUE are given for many of the important recreational billfish fishing areas. A comparison of CPUE trends between the commercial longline and the recreational angler is made for the area about the southern tip of Baja California where high CPUE rates are common to both fisheries. The correlation between recreational and commercial CPUE is reasonable ( $Y_2=0.82$ ), and the recreational angler CPUE is negatively affected by the nearby commercial longline fishery.

Squire, James L. (1987). "Striped Marlin, Tetrapturus audax, Migration

Patterns and Rates in the Northeast Pacific Ocean as Determined by a Cooperative Tagging Program: Its Relation to resource Management." Marine Fisheries Review, 49(2):26-43.

Migration patterns and rates for striped marlin tagged and recaptured in the northeast Pacific Ocean during 1957-81 are reported by time period and analyzed. Few long range migrations and no trans-Pacific migrations were observed. Comparisons are made with other types of physical and biological data that might indicate seasonal movement (i.e. longline catch rates, areas of striped marlin spawning, movement of thermocline depth relative to fishing success). A tentative hypothesis describing the seasonal movement of striped marlin in the northeast Pacific and the total eastern Pacific is also proposed and presented in graphic form.

Squire, James L. (1987). "Relation of Sea Surface Temperature Changes During the 1983 El Nino to the Geographical Distribution of Some Important Recreational Pelagic Species and Their Catch Temperature Parameters." Marine Fisheries Review, 49(2):44-57.

Most literature on the effects of the warm period on fish catch involves descriptions of the geographical extent of distribution. Some west coast researchers have reviewed the catch of fish off California in relation to variable sea surface temperature, and others the effects of temperature changes in northern waters to catch. Here, I present information on mean sea surface temperature at the point of capture ("catch temperatures") that have been observed for several species common to southern California recreational fisheries, and on the geographical extension of these optimal catch temperature into the northern latitudes off the west coast during the 1983 period of intense warming.

Squires, Dale (1984). "Production Technology, Costs, and Multiproduct Industry Structure: An Application of the Long-Run Profit Function to the New England Fishing Industry." Draft, National Marine Fisheries Service, La Jolla, California.

The long run multiproduct profit function is developed to provide a more general procedure than the static minimum cost function to examine the technological and cost determinants of multiproduct industry structure and the likely form of any market equilibrium. In this approach, outputs are endogenous and the long run equilibrium levels of quasi-fixed factors are endogenously determined. The multiproduct structure of the multispecies New England fishing industry and the likely multiproduct form of any open access equilibrium are examined.

Squires, Dale (1987). "Fishing Effort: Its Testing, Specification, and Internal Structure in Fisheries Economics and Management." Journal of Environmental Economics and Management 14(3):268-282.

The concept of fishing effort is central to fisheries economics and management. However, effort is an aggregate index of inputs which can be consistently formed only under the condition of production technology of homothetic separability of inputs. This paper develops the conditions under which effort can be consistently formed. It then provides the first empirical test for effort and jointness in inputs in a fishery by estimating a multiproduct function for the New England otter trawl fleet. After not rejecting input-output separability and rejecting nonjointness in inputs, the construction of a superlative index for effort is demonstrated through estimating a translog production function., The implications of effort's internal structure for fisheries management are then considered.

Squires, Dale (1987). "Long-Run Profit Functions for Multiproduct Firms." American Journal of Agricultural Economics, 69(3):558-569.

A long run specification of the multiproduct profit function is developed from the restricted profit function. The multiproduct restricted profit function and the envelope condition are used to estimate the optimal, long run levels of the quasi-fixed factor. Formulas for long run Marshallian elasticities of substitution and transformation, economics of scope, product specific and overall economies of scale, and economic measures of capacity utilization are developed for the translog functional form. The methodology is illustrated by a case study of the New England otter trawl industry.

Squires, Dale (1987). "Public Regulation and the Structure of Production in Multiproduct Industries: An Application to the New England Otter Trawl Industry." Rand Journal of Economics, Vol. 18, No. 2, Summer.

This article considers the problem of managing multispecies fishing industries as one of regulating the production of individual multiproduct firms. The multispecies New England otter trawl industry is examined within this framework. Empirical results derived from estimating a multiproduct profit function indicate that management consistent with the structures of multiproduct production and costs would directly regulate inputs. Little support is provided for applying the traditional bioeconomic model to the fishery studied.

Squires, Dale (1988). "Index Numbers and Productivity Measurement in Multispecies Fisheries: An Application to the Pacific Coast Trawl Fleet." NOAA Technical Report NMFS 67, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, July, pp. 34.

This study is concerned with the measurement of total factor productivity in the marine fishing industries in general and in the Pacific coast trawl fishery in particular. The study is divided into two parts. Part I contains suitable empirical and introductory theoretical material for the examination of productivity in the Pacific coast trawl fleet. It is self-contained, and contains the basic formulae, empirical results, and discussion. Because the economic theory of index numbers and productivity is constantly evolving and is widely scattered throughout the economics literature, Part II draws together the theoretical literature into one place to allow ready access for readers interested in more details. This study recommends that the following types of economic index numbers be used: chain rather than fixed base; bilateral rather than multilateral; one of the class of superlative indices, such as the Tornqvist or Fisher Ideal.

Squires, D. (1991). "The Potential Effects of Individual Transferable Quotas in Multiproduct Pacific Fisheries." Draft report, NMFS, SWFC, La Jolla, California.

This paper ex ante analyzes a potential program of individual transferable quotas for one output in a multiproduct common property fishery with two size classes of vessels assuming that firms are revenue maximizers. The paper finds only moderate potential for resource rents and efficiency gains from quota trade and explicitly valuing the marginal user cost of the resource. The justification of an ITQ program as a system for generating resource rents net of regulatory costs is questionable. Limiting the number of vessels when production is joint is considered as an alternative.

Evaluating the incentives for disinvestment and industry exit after quota exchange indicated potential for a concentrated industry structure with the larger size class. Their quota market would potentially be thin, noisy, and noncompetitive, requiring restrictions on their quota transferability and concentration.

Squires, D. (1991). "Individual Transferable Quotas: Theory and an Application." NMFS, SWFC, Administrative Report LJ-90-16, La Jolla, CA.

A system of tradeable quotas can regulate production flows or reorganize an industry suffering from chronic overproduction, excessive numbers of firms, or overcapitalization. An overall production target is established and firms are allocated divisible rights to a quantity of the overall production. Firms maximize profits by adjusting production levels through trade of these quantitative restrictions while the overall quantity objective is satisfied. Firms with advantages in costs or capacity utilization can bid quota away from other firms. Through competition, equilibrium market prices for the quota develop, where these quota prices reflect the net discounted present value of the expected stream of future benefits. The initial recipients of tradeable quota who sell or lease to more efficient firms will enjoy this stream of future benefits, while the purchaser must pay full value. Both parties gain from exchange and arbitrage efficiency is realized.

Squires, Dale (1992). "Productivity Measurement in Common Property Resource Industries: An Application to the Pacific Coast Trawl Fishery." Rand Journal of Economics, 23(2):221-236.

This article measures total factor productivity in industries that exploit resources held in common. Particular attention is paid to the valuation and specification of in situ common property resources in a neoclassical production technology, catchability of the resource, and variations in economic capacity utilization. An empirical analysis of the open access Pacific coast trawl fishing industry demonstrates that disentangling the productivity residual from changes in resource abundance, its catchability, and variations in capacity utilization hones the productivity residual to finer precision, lowering mean productivity growth by about half. Removing biological noise from highly variable resources is also important. The results are related to a program limiting the number of vessels and can contribute to sustainable resource management whenever resources are held in common.

Squires, Dale (1992). "Individual Transferable Quotas." Draft report, National Marine Fisheries Service, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038, August, pp. 31.

This paper extends the virtual price framework of Neary and Roberts to allow trade of individual quotas and other quantitative restrictions on firms. The approach gives the expected equilibrium market price of the individual transferable quota, rents, and gains in arbitrage efficiency from quota trade. Information on costs and technology known best by firms is combined with overall quantity information known best by regulators to give a uniform price signal -- the quota price after exchange -- equivalent to a tax uniform across firms. The framework is also matched with recent advances in multiproduct capacity utilization to evaluate prospective changes in multiproduct industry structure following quota trade and implications for the quota market. The approach is applied to ex ante analyze a potential program of individual transferable quotas in a common property fishery.

Squires, Dale (1994). "Sources of Growth in Marine Fishing Industries." Marine Policy, 18(1):5-18.

Policy makers and fishery managers require accurate overviews of the performance of their harvesting sectors; trends in effective, as opposed to nominal, effort; and productivity creep due to unmeasurable factors. Traditional measures of nominal effort can lead to biased performance measures since fishing effort is a multidimensional concept not readily captured by nominal measures. This paper evaluates the sources of growth in catch over time according to its constituent components - the growth accounting framework - to measure trends in catch, nominal, and effective effort, and productivity or fishing power. An empirical study of the U.S. Pacific coast groundfish trawl fishery indicates that traditional measures of effort and fishing power can be biased and highlights the relative importance of growth in productivity or fishing power as an often overlooked and perhaps the most important source of growth.

Squires, Dale (1998). "Proposal for Continuation of Technical Working Group on Defining and Measuring Capacity in Fisheries." Draft report, National Marine Fisheries Service, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038, August, pp. 31.

Proposal calling for the continuation of a joint FAO, U.S., and Japanese technical working group meeting to define and measure excess capacity in world fisheries.

Squires, Dale and James Kirkley (1991). "Production Quota in Multiproduct Pacific Fisheries." Journal of Environmental Economics and Management, 21:109-126.

Assessing the individual firm's technology and costs in a multispecies fishery allows design of a more effective output quota prior to regulation by anticipating and controlling for the firm's regulation-induced responses. An empirical study of a Pacific coast trawl fishery indicates that the firm's flexibility of product decision is tightly constrained by its technology and cost structure. Hence, as the resource stock for the regulated species, sablefish, deteriorates and the trip quota progressively tightens, the firm cannot sufficiently reorganize its product bundle to preclude increasingly large sablefish disposal. This defeats the purpose of the production quota.

Squires, Dale and James Kirkley (1992). "Resource Rents from Single and Multispecies Individual Transferable Quota Programs." Draft report, National Marine Fisheries Service, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, California.

This paper ex ante analyses potential individual transferable quota (ITQ) programs for three fish species, two species of thornyheads and sablefish, in a common property bottom trawl fishery on the Pacific coast of the United States. Using a dual revenue function, the concept of virtual prices, and price endogenous, nonlinear mathematical programming, economic rents and gains in economic efficiency from trade associated with an ITQ program are evaluated. The paper finds only moderate potential for increased resource rents from an ITQ program for either single species. In addition, the potential benefits due to an ITQ program for both species are diminished by limitations in reorganizing joint production of fish under additional quota constraints. Justification of an ITQ program as a system for generating resource rents over and above regulatory costs is questionable.

Squires, Dale, Mohammad Alauddin, and James Kirkley (1992). "The

Potential Effects of Individual Transferable Quotas in the Fixed Gear Sablefish Fishery." Administrative Report LJ-92-08, NMFS, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038.

This paper ex ante analyzes a potential program of individual transferable quotas (ITQs) in a fishery to assess the prospective gains in economic rent from explicitly valuing the user cost of the resource and to evaluate the arbitrage efficiency from quota exchange. Incentives for disinvestment and industry exit after quota exchange, implications for structure of the industry and ITQ market, and policy implications are discussed. The simulation model of the ITQ market is based on pseudo data from linear programming models for each vessel in the pot and longline sablefish fleet off the Pacific coast of the United States.

Squires, Dale, Mohammad Alauddin, and James Kirkley (1994). "Individual Transferable Quota Markets and Investment Decisions in the Fixed Gear Sablefish Fishery." Journal of Environmental Economics and Management, 27:185-204.

This paper presents an ex ante analysis of an individual transferable quota (ITQ) program imposed on one species in a multispecies fishery. Utilizing mathematical programming, pseudo data, and Tobit regression, market demand for quota and prospective gains in economic rent and efficiency gains from quota trade are assessed for the pot and longline sablefish fleet off the Pacific coast of the United States. Incentives for disinvestment and industry exit after quota exchange, implications for structure of the industry and ITQ market, and policy implications are examined.

Squires, Dale, James Kirkley, and Clement A. Tisdell (1994). "Individual Transferable Quotas as a Fisheries Management Tool." Draft report presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, California, January.

Fisheries management faces a new era. Markets, in the form of individual transferable quotas (ITQs) and growing global integration of fish markets, will increasingly provide the organizing and regulatory principle for many fisheries. Whether ITQs and global markets are a panacea or Pandora's box for organizing and managing fisheries is, as yet, unclear, and requires additional experience to fully evaluate.

This paper reviews the workings and expected benefits of ITQs, the origin and concept of ITQs, the problems they were designed to address, worldwide experience and literature on ITQs, and the problems and prospects for ITQ management. Particular attention will be given to the growing importance of markets as the primary organizing principle for many fisheries, including the roles of ITQs and increased global integration of fisheries markets.

Squires, Dale, James Kirkley, and Clement A. Tisdell (1995). "Individual Transferable Quotas as a Fisheries Management Tool." Reviews in Fisheries Science, 3(2):141-169.

Fisheries management faces a new era. Markets, in the form of individual transferable quotas (ITQs) and growing global integration of fish markets, will increasingly provide the organizing and regulatory principle for many fisheries. Whether ITQs and global markets are a panacea or Pandora's box for organizing and managing fisheries is, as yet, unclear, and requires additional experience to fully evaluate.

This paper reviews the workings and expected benefits of ITQs, the origin and concept of ITQs, the problems they were designed to address, world-wide experience and literature on ITQs, and the problems and prospects for ITQ management. Particular attention will be given to the growing importance of markets as the primary organizing principle for many fisheries, including the roles of ITQs and increased global integration of fisheries markets.

Squires, Dale, Steven Freese, James Herkelrath, and Samuel F. Herrick, Jr. (1997). "Cost-Benefit Analysis of Pacific Whiting Allocation." Administrative Report LJ-97-05, National Marine Fisheries Service, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, California, April.

Cost-benefit analysis evaluated three alternatives to measure the net economic benefits to the nation of allocating Pacific whiting among three user groups. These groups were the offshore catcher-processors, catcher vessels delivering to motherships, and to catcher vessels delivering to onshore producers of surimi, headed and gutted, and fillets. Net economic benefits were measured as the present value of producer surplus and were evaluated over a twenty year time horizon starting in 1997. For the first time in fishery economics, an attempt was made to include fixed costs. However, data on fixed costs proved inadequate for a detailed analysis, and the analysis confined itself to net benefits measured using total revenues and variable (operating) economic costs.

Squires, Dale, Harry Campbell, Stephen Cunningham, Christopher Dewees, R. Quentin Grafton, Samuel F. Herrick, Jr., James Kirkley, Sean Pascoe, Kjell Salvanes, Bruce Shallard, Bruce Turris, and Niels Vestergaard (1998). Individual Transferable Quotas in Multispecies Fisheries. Marine Policy, 22(2):135-159.

This paper examines the multispecies harvesting technology; addresses discards, highgrading, and overages under ITQs and lists the possible solutions to the problems; details possible impacts of ITQs on other fisheries; discusses the effects of ITQs on the harvesting flexibility of fishers; examines how the prices of ITQ shares are formed in multispecies fisheries and the effect of the harvesting technology and transaction costs on quota share prices; evaluates how ITQs may affect economic efficiency and over-capitalization; describes the nature of the resource rents that may arise with ITQs; reviews problems with monitoring and enforcement; present options for setting ITQs; and provides concluding remarks.

Staniford, Andrew (1988). "The Effects of the Pot Reduction in the South Australian Southern Zone Rock Lobster Fishery." Marine Resource Economics, 4:271-288.

Previous research has shown that the South Australian Southern Zone rock lobster fishery is economically overexploited, implying that a reduction in fishing effort will improve economic efficiency in the fishery. A scheme, consisting of a mandatory pot reduction of 15% and the replacement of the pot/vessel allocation formula with minimum and maximum pot entitlements of 25 and 80, respectively, was introduced in the fishery in September 1984 for this purpose. Analyses of the effect of the scheme on fishing effort and the number of fishermen and some observations on the response of fishermen to the scheme are provided. While the pot reduction has had a small effect on fishing effort, it has failed to induce significant rationalization within the fishery. Remaining fishermen have responded by working a smaller number of pots more intensively than they had prior to the introduction of the scheme.



Stansby, Maurice E. (1987). "Nutritional Properties of Recreationally Caught Marine Fishes." Marine Fisheries Review, 49(2):118-121.

This paper discusses the nutritional properties of various species of fish caught by marine anglers. Most of the species mentioned are strictly marine, although a few are anadromous.

Statistical Surveys Branch (1985). "End-of-Year Reports: Annual Landings by Distance Caught from Shore - Southeast Region for 1984 (preliminary)." Miami Laboratory, Southeast Fisheries Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, June, 28 pp.

This publication is a preliminary report for 1984 on the commercial fisheries of the Southeast Region of the United States. These figures represent the best available data as of February 1985 that were submitted as input into "Fisheries of the United States, 1984" and are subject to revision.

Stavins, Robert N. (Project Director) (1991). "Project 88 Harnessing Market Forces to Protect Our Environment: Initiatives for the New President." A public policy study sponsored by Senators Timothy E. Wirth and John Heinz, Washington, D.C.

A study of the uses of market forces to correct environmental problems.

Stavins, Robert N. (Project Director) (1991). "Project 88 -- Round II Incentives for Action: Designing Market Based Environmental Strategies." A public policy study sponsored by Senators Timothy E. Wirth and John Heinz, Washington, D.C.

A study of the uses of market forces to correct environmental problems.

Stedman, Susan-Marine and Jeanne Hanson (1997). Wetlands, Fisheries & Economics in the South Atlantic Coastal States. Habitat Connections, 1(2): 1-4.

The summaries for the south Atlantic coastal states provide information about the contribution of commercial and recreational fisheries to local and state economies, the relationships between the important fish species and wetlands, and the status of wetland habitats.

Steenblik, Ronald P. (1998). Previous Multilateral Efforts to Discipline Subsidies to Natural Resource Based Industries. Draft report, Principle Administrator, Fishery Policies Division, Directorate for Food, agriculture and Fisheries, OECD 2 rue Andre -Pascal, 75775 Paris Cedex 16, France.

The main aim of this paper is to compare past attempts to discipline subsidies to primary industries and to search for lessons that might be able to inform current and future dialogues on subsidy issues.

Steenblik, Ronald P. and Gordon R. Munro (1998). Current International Work on Subsidies in Fisheries: A Survey. To be published in Overcapitalization and Subsidies in European Fisheries, Proceedings of the Concerted Action Workshop, Portsmouth, U.K., 28-30 October (A. Hatcher and K. Robinson, eds.) Forthcoming 1999.

This paper surveys current international work in the area of subsidies to the fisheries sector, with particular reference to ongoing activities in

the OECD, the FAO, APEC, and the WTO. Looked at broadly, it is clear that there is a considerable international interest in the topic. Significantly, many of the studies describe herein will be substantially completed by the end of 1999, and can be expected to inform the various multilateral discussions on fisheries capacity and trade expected to take place over the coming years.

Steele, John H. (1974). The Structure of Marine Ecosystems, Harvard University Press, Cambridge, Massachusetts.

The main aim of this analysis of marine ecosystems is to show how theory, observation, and experiment may be combined, and how closely each depends on the other. It also provides a basis for speculation about the effects of man's intervention in marine ecosystems and the way in which these differ from the consequences of his action on land. Our excessive fishing activities can greatly alter or destroy certain fisheries without any catastrophic changes in the rest of the system. On the other hand, eutrophication in fresh water, by altering the plant populations, appears to induce changes in the whole of the system. These examples can be fitted into the theoretical framework, and this framework can be used to approach recent or future problems of man's impact in the open sea.

Steimle, Frank W., Jay M. Burnett, and Roger B. Theroux (1995). A History of Benthic Research in the NMFS Northeast Fisheries Science Center. Marine Fisheries Review, 57(2):1-13.

The Northeast Fisheries Science Center of NOAA's National Marine Fisheries Service has a long history of research on benthic invertebrates and habitats in support of the management of living marine resources. These studies began in the 1870's under Spencer F. Baird's guidance as part of an effort to characterize the Nation's fisheries and living marine resources and their ecological interactions. This century and a quarter of research has included many benthic invertebrate studies, including community characterizations, shellfish biology and culture, pathology, ecosystem energy budget modeling, habitat evaluations, assessments of human impacts, toxic chemical bioaccumulation in demersal food webs, habitat or endangered species management, benthic autecology systematics, and other benthic studies. Here we review the scope of past and current studies as a background for strategic research planning and suggest areas for further research to support NOAA's goals of sustainable fisheries management, healthy coastal ecosystems, and protected species populations.

Steinback, Scott (1994). "Marine Recreational Economics Data Needs." Draft report presented at the Atlantic States Marine Fisheries Commission Workshop on Socio-Economic Data and Analysis for Recreational Fisheries Management in Annapolis, Maryland, July, 15 pp.

This document identifies and describes economic data items that are necessary for estimating marine recreational fishing benefits derived from the Nation's ocean resources and for measuring the impacts of fishery management decisions.

Steinback, Scott (1998). "Economic Impact of Maine's Party and Charter Service Industry." Draft report, Social Sciences Branch, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, Massachusetts, 22 pp.

Party and charter angler expenditure and for-hire vessel cost data, collected through add-ons to NMFS recreational fishing surveys in Maine in

1996, were incorporated into a regional input/output model using the IMPLAN modeling system. Trip related expenditures were analyzed separately for Maine residents and nonresidents and a linear production function representing average for-hire operating expenditures was estimated and integrated into the IMPLAN system. Results illustrate the direct, indirect, and induced economic contributions of total sales, income, and employment generated by the for-hire sector in Maine in 1996. In total, the \$1.07 million estimated to have been spent by nonresident party and charter anglers in 1996 resulted in \$1.41 million in sales, \$0.45 million in income and provided for approximately 43 jobs in Maine. The \$0.27 million in total expenditures by residents in 1996 was estimated to generate \$0.29 million in sales in Maine, \$0.09 million in income and resulted in approximately 12 jobs. The procedures and data sets applied here, if used in conjunction with future versions of the IMPLAN modeling system can serve as a foundation for updating the input/output model provided in this study and for developing economic impact assessments of recreational fisheries in other states.

Steinback, Scott and Jon O Neil (1996). Summary Report of Methods and Descriptive Statistics for the 1994 Northeast Region Marine Recreational Economics Survey. Social Sciences Branch, NOAA, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA and Department of Marine Affairs, University of Rhode Island, Kingston, RI.

Two sportfishing surveys were conducted during 1994 in the Northeast Region (Maine to Virginia). Data from the surveys provided demographic and economic information on marine recreational fishing participants from Maine to Virginia. The purpose of this report is to document the socio-economic characteristics of these participants and to identify their marine recreational fishing preferences and their perceptions of current and prospective fishery management regulations. This information will be used to estimate statistical models of the demand for marine recreational fishing for eight important recreational species in a subsequent phase of the research.

Stelle, William (1997). Pacific Salmon. Issue paper. Presented at the Marine Fishery Advisor (MAFAC) Meeting, July 7-10, Seattle, Washington.

Major issues, background, discussion, and recommendations are presented briefly.

Stephenson, Robert L., Stratis Gavaris, and Daniel E. Lane (1994). "The Scale of Management: An impediment to linking biological, social, and economic considerations in management." C.M. 1994/T:40, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 6 pp.

An examination of the biological, social, and economic aspects of fisheries suggests that differences in temporal and spatial scale may pose a major challenge to their successful integration in management. Management actions to date have been dominated by biological matters. Resulting fisheries management decisions have not always been successful and have led to questions of the appropriateness of the management scale. Interestingly, proposed solutions have resulted in the apparently inconsistent direction towards both smaller scale (e.g. consideration of separate spawning groups within stock complexes) and towards increased scale (e.g. multispecies or ecosystem approaches). Enhanced integration of economic and social

considerations compounds the complications of scale. The challenge for management will be to overcome the complication of scale by recognition of the implications of a mixture of scales.

Stevens, Robert E. (1984). "Recommendations for Action: Panel 5 Development and the Management Process." Chapter 24 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

A summary of the discussion on development and the management process. Recommendations are made that will improve the chances for marine recreational fisheries development.

Stollery, Kenneth (1986). "A Short-Run Model of Capital Stuffing in the Pacific Halibut Fishery." Marine Resource Economics, 3(2):137-153.

One of the predicted effects of regulation to curtail overfishing is "capital stuffing" where boats are overcapitalized to take maximum advantage of limited entry licensing or restrictions of the fishing season. The present paper utilizes a short run competitive fishery model to assess the effects of quotas and season restrictions in the Pacific halibut fishery. The results in this case show labor productivity (a proxy for capital intensity) to be less strongly related to the length of the fishing season than to the halibut price, implying that the main effect of the quota may be an indirect one, through restricting supply and raising the price.

Stollery, Kenneth (1986). "Monopsony Processing in an Open-Access Fishery." Marine Resource Economics, 3(4):331-351.

In a recent paper, Clark and Munro (1980) showed that monopsony processing more than offsets the effects of open access in the harvesting sector of a commercial fishery, and leads to over conservation of the resource. We show here that this conclusion depends critically on the cost of capacity and consequent ease of entry and exit from the harvesting sector. In particular, for low entry and exit speeds the monopsonist has a high degree of monopoly power and by depressing the price over conserves the natural resource relative to the social optimum, while as the adjustment speed approaches infinity a monopsonist employing a discount rate equal to the social rate of discount will be induced to behave optimally from the viewpoint of society. By means of a simulation employing parameters from the Pacific halibut fishery, we also show that a monopsonist subject to relatively sluggish entry or exit may reap profits considerably less than the resource rents accruing if the resource were optimally managed.

Stollery, Kenneth (1988). "Cooperatives as an Alternative to Regulation in Commercial Fisheries." Marine Resource Economics, 4:289-304.

the problem of fisheries regulation is essentially one of assigning property rights to a scarce resource. This paper investigates the effects of the establishment of a fishery cooperative as an alternative to limited entry licensing of a fishery, in effect transferring the property rights to the managers of the cooperative. The consequences of this for resource conservation are found to depend on the cooperative management policy. While a cooperative that is passive with respect to entry will behave in a manner identical to that of a competitive fishery, a cooperative that limits entry to maximize the existing members' share tends to over conserve the resource

relative to optimum fishing and processing and produce at excess cost in both sectors. The intermediate case of a cooperative that charges an entry fee may either over conserve or under conserve the stock. The results are illustrated by means of a simulation employing parameters from the Pacific halibut fishery.

Stone, Christopher D. (1997). The Maladies in Global Fisheries: Are Trade Laws Part of the Treatment? Working Paper No. 97-12, University of Southern California Law School, Los Angeles, CA.

The world capture fisheries are being over exploited. Across vast areas, a reduction in pressure, by providing stocks an opportunity to rebuild, would increase productivity and maximize revenues in the long run. Fisheries managers are utilizing an array of techniques, including restraints on time, place, gear, and catch, to dampen the level of harvest. But their efforts are resisted and undermined, even rendered counter productive, by excess sector specific capital and labor. There is no single remedy. But subsidies are a crucial culprit. Fishing subsidies, estimated at tens of billions of dollars annually world wide, lure and shelter the excessive catch capacity. As a consequence, fishery subsidies (and overcapacity ) are being called into question in a variety of fora. This paper proposes that trade disciplines should be more aggressively deployed in this campaign. Fish products constitute one of the major components in world trade. Many government programs designed to support fisheries appear to be in clear violation of the GATT. Hence, anti-subsidy disciplines and other trade related measures are response mechanisms already in place. There are, of course, major barriers to any assault on practices as widespread and entrenched as fishing subsidies. But inroads have been made, or are in the offing, even in the farm sector. In fishing, prospects for reform under the trade law are brightened by potential support of resource and environmental constituencies.

Stone, Christopher D. (1998). Can the Oceans be Harbored? A Four Step Plan for the 21<sup>st</sup> Century. Draft report prepared for presentation at the Conference, Towards the International Protection of the Oceans: From Rules to Compliance, Lisbon, 17<sup>th</sup> - 19<sup>th</sup> September, University of Southern California Law School, Los Angeles, CA.

A four step program to improve the exploitation of the oceans includes first, the removal of subsidies that underwrite and thereby accelerate ransacking of the ocean environment and its resources. Second, the imposition of charges for rivalrous uses of the oceans. Third, establishment of an oceans trust fund, financed through the use-charges, designed to maintain and repair the ocean s health. Fourth, the establishment of an Oceans Guardian to give voice to the ocean in legislative and judicial fora.

Stone, Christopher D. (1998). Fisheries Subsidies, Trade Law, and the WTO Subsidies Agreement. Presented at the Workshop on the Impact of Government Financial Transactions on Fisheries Management, Resources, and International Trade Sponsored by Pacific Economic Cooperation Council, fisheries Development and Cooperation Task Force, Manila, Philippines, 17<sup>th</sup> - 19<sup>th</sup> August, University of Southern California Law School, Los Angeles, CA.

A criticism of subsidies in fishing.

Stone, Richard B. (1985). "National Artificial Reef Plan." NOAA Technical Memorandum, NMFS OF-6, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Washington, D.C., November, 39 pp.

The National Fishing Enhancement Act of 1984 directs the Secretary of Commerce to develop and publish a long term National Artificial Reef Plan to promote and facilitate responsible and effective artificial reef use based on the best scientific information available. This plan has been developed to provide guidance or criteria on planning, siting, designing, types of materials, constructing, and managing artificial reefs. It includes reviews of existing information sources and discusses research needs. Other issues, such as liability and mitigation, are introduced; these issues should be addressed in more detail by groups of knowledgeable individuals from the Federal, State, university, and private sectors.

Stone, Richard and Rebecca Lent (1995). "NMFS Highly Migratory Species Integrated Science and Management Program: Science in Support of Management." National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Highly Migratory Species Management Division, Silver Spring, MD.

Highly migratory species management issues are complex, multi-disciplinary, and highly sensitive. An integrated research program ensures that the critical information for managing these fisheries will be available for decision makers as well as constituents to evaluate the socioeconomic and biological consequences of the various management options available. This integrated HMS research program unites researchers in several disciplines in the various NMFS offices, ensuring that the high priority management questions are addressed. This expanded, integrated research program not only fits in well with the NMFS reorganization, but also ensures that research responds to all basic management needs and that management decisions are based on the best possible science.

Stopher, Peter R. (1969). "A Probability Model of Travel Mode Choice for the Work Journey." Highway Research Record, 283:57-65.

This paper describes the derivation of a probability model of travel mode choice for the work journey in terms of the differences in costs and times between the modes available for each individual's journey. The work is based on surveys carried out at two offices in central London, with some test data from a survey of workers in central Leeds. Regression techniques were used to establish simple linear relationships between the probability of using a car and the cost and time differences between a car and the best available public transport route. Reasonable correlation coefficients were obtained. Limited tests of the models have reproduced existing mode choices to a high degree of accuracy. Relationships were also established between the regression coefficients and income. A generalized model is derived from these relationships. The basic model has a serious fault in that because it is linear, it permits values of probability to be obtained that exceed unity, or are less than zero. A logistic transformation is put forward to correct this and is used on the generalized model. The resulting model still appears to reproduce existing conditions to a similarly high degree of accuracy. The model appears to be reasonably behavioral, and could form the basis of a new and more accurate mode choice procedure.

Strand, Ivar E. (1987). "The Magnuson Fisheries Conservation and Management Act: An Economic Assessment of the First 10 Years. Discussion." Marine Fisheries Review, 49(3):12.

A critical discussion of Jon M. Conrad (1987). "The Magnuson Fisheries Conservation and Management Act: An Economic Assessment of the First 10 Years." Marine Fisheries Review, 49(3):3-12.

Strand, Ivar E., K.E. McConnell, and Nancy E. Bockstael (1991). Marine Recreational Fishing in the Middle and South Atlantic: A Descriptive Study." Cooperative Agreement #CR-811043-01-0, University of Maryland, Environmental Protection Agency, National Marine Fisheries Service, and National Oceanic and Atmospheric Administration, University of Maryland, College Park, August.

This report is the descriptive phase of a research project on the economics of marine recreational fishing along the middle and south Atlantic coast of the U.S. It describes the data from three large surveys on sportfishing, surveys that will form the basis of a subsequent phase of the research project. This first phase provides a broad brushed picture of saltwater fishing during the 1980's and serves as a foundation for a more comprehensive economic study yet to come.

Strand, Ivar E., K.E. McConnell, and Nancy E. Bockstael (1994). Commercial Fisheries Harvesting, Conservation and Pollution: Preferences and Conflicts, NMFS Contract NA-26FD-0135-01, National Saltonstall-Kennedy Program, Department of Agricultural and Resource Economics, University of Maryland, College Park, Maryland.

This report contains information regarding both the costs and benefits of protecting marine mammals and threatened marine species. The report is organized according to the explicit and implicit costs of restricting marine fishing and the economic value of marine mammals. The conflict between free trade and global marine resources is examined in light of two conflicts - the dolphin bycatch by tuna vessels in the Eastern Tropical Pacific and sea turtle bycatch by shrimpers in the Caribbean. The implicit costs to U.S. consumers from various policies restricting trade in tuna and explicit costs to U.S. tuna fishermen from avoiding dolphins in the ETP are presented. Substitution among animal protein sources in Japan is examined and adds to our understanding of how sanctions against food from the sea effect the terrestrial environment. Finally, a survey of Massachusetts citizens and scientists regarding their willingness to pay for the elimination of the bycatch of harbor porpoises in New England waters is presented. We provide estimates indicating that the costs of marine mammal protection, both to fishermen and consumers, are large, that the stated willingness to pay of Massachusetts citizens for the marine mammal protection is large, and that the preferences for the protection of harbor porpoises by scientists are not distinct from preferences of the general public.

Strickland, Dan (1994). "The IFQ Program, Insights and Updates." U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Alaska Region, National Marine Fisheries Service, Restricted Access Management Division, P.O. Box 21668, Juneau, Alaska, February, 15 pp.

This publication is intended to provide a simplified explanation of the individual fishing quota (IFQ) program as adopted by the Secretary of Commerce.

Stroud, Richard H. (ed.) (1984). Marine Recreational Fisheries. Volume 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

The symposium objectives are to achieve recognition of marine recreational fisheries as an important element of national policy; to identify

major marine recreational fisheries problems and develop fresh solutions thereto; and to foster effective management regimes for the conservation of living marine resources.

Stroud, Richard H. (ed.) (1989). Planning The Future of Billfish, National Coalition for Marine Conservation, Savannah, Georgia.

Proceedings of the Second International Billfish Symposium, Kailua-Kona, Hawaii. Without a better understanding of billfishes and of the impact of fishing activities on billfishes the world over, these magnificent and enormously valuable fishes have uncertain futures. We recognize, lacking more effective conservation and management, that the future for billfishes could be one of depleted fisheries and lost opportunities.

Sullivan, Carl R. (1984). "Recommendations for Action: Panel 2 The Marine Recreational Fishing Industry." Chapter 21 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Summary of presentations and recommendations for strengthening the marine recreational fishing industry and suggested actions by government agencies, private institutions, and individuals.

Sullivan, Kathryn (1995). Results of the Review of the NOAA Science Enterprise by the NOAA Chief Scientist. Office of the Chief Scientist, National Oceanic and Atmospheric Administration, Room 5128, 14<sup>th</sup> and Constitution Avenue, NW, Washington, D.C.

The document is the culmination of a broad scale review of NOAA's entire science enterprise, conducted by NOAA's Office of the Chief Scientist over a period of nearly two years.

Sullivan, Mary Margaret (1993). "Texas Closure Revisited." Draft report, Department of Agricultural Economics, Texas A&M University, January.

A draft report that analyzes the economic impacts of the Texas Closure regulation using the General Bioeconomic Simulation Model developed by Grant and Griffin.

Sumaila, Ussif Rashid (1995). Irreversible Capital Investment in a Two-stage Bimatrix Fishery Game Model. Marine Resource Economics, 10(3):263-283.

A two-stage, two-player noncooperative game model is developed (under an irreversible capital investment assumption) with the main aim of predicting the number of vessels that each player in such a game will find in his best interest to employ in the exploitation of the Arcto-Norwegian cod stock, given a noncooperative environment and the fact that all players are jointly constrained by the population dynamics of the resource. The predictions so obtained are then compared with (i) the sole owner's optimal capacity investments for the two players; (ii) the results in Sumaila (1994), where perfect malleability of capacity is assumed implicitly; and (iii) available data on the Arcto-Norwegian cod fishery.

Sumaila, Ussif Rashid (1997). Strategic Dynamic Interaction: The Case of Barents Sea Fisheries. Marine Resource Economics, 12(2):77-94.



This paper develops a bioeconomic model for two Barents Sea fisheries that attempts to capture the predator-prey relationships between cod and capelin, the two main species in the habitat. The aim is to analyze joint cooperative (versus separate noncooperative) management of this predator-prey system with a view to isolating the efficiency loss due to separate management. Using a game theoretic framework and a multicohort age-structured bioeconomic model, we compute joint and separate management equilibrium outcomes for the model and investigate the effects of changes in economic parameters on the computed results. In this way, we explore the economic consequences of the predator-prey relationships between cod and capelin and the externalities due to noncooperation. Results of the study tend to suggest that (i) under current market conditions, it is economically optimal to exploit both species (rather than just one of them) under joint management; (ii) in comparison with the separate management outcome, a severe reduction of the capelin fishery is called for under joint management; and (iii) the loss in discounted economic rent resulting from the externalities due to the natural interactions between the species is significant, reaching up to almost a quarter of what is achievable under separate management.

Summers, Charles (1995). Learning From Other Fleets. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

A discussion of the bycatch and discard problem in Oregon's shrimp fishery. Various designs of finfish excluder devices are being tested to reduce bycatch in what is already considered to be a very clean fishery.

Surdi, Richard and Mort Miller (1981). "Productivity in the Gulf of Mexico Shrimp Fishery." Draft report, NMFS, Office of Policy and Planning, Economic Analysis Staff, Washington, D.C.

This report examines productivity in the Gulf shrimp fishery, which has undergone considerable expansion in recent years. The general concepts and measures of productivity are discussed first. Then, the trend in shrimp production is reviewed. Third, trends in major inputs to the shrimp fishery are reviewed. This is followed by a review of several partial productivity measures that indicate a significant decline in productivity in the shrimp fishery. The report concludes that the increased investment in fleet capacity has resulted in lower productivity over time.

Sutherland, Donald (2000). "U.S. Fish harvesters Up on Financial Rocks." Lycos Environment News Service, April 26, 7 pp.

Commercial fishermen in the U.S. are in desperate financial straits as a result of poor fisheries management by NMFS aimed only at rebuilding depleted stocks.

Sutherland, Ronald J. (1982). "A Regional Approach to Estimating Recreation Benefits of Improved Water Quality." Journal of Environmental Economics and Management, 9:229-247.

Recreation demand and value are estimated with the travel cost method for fishing, camping, boating, and swimming on a site specific regional basis. The model is regional in that 179 sites are defined for the Pacific Northwest. A gravity model is employed to estimate the number of trips from each origin to each destination in the region, and these data are the basic input in the travel cost demand curves. The model is illustrated by estimating the recreation benefits that would result from meeting the national environmental goal of fishable and swimmable rivers. The main finding is that potential

recreation benefits are concentrated in a few select areas, that are accessible to large population centers.

Sutinen, J.G. (1979). "Fishermen's Remuneration Systems and Implications for Fisheries Development." Scottish Journal of Political Economy, 20(2):147-162.

This paper derives the conditions under which the share system of remuneration would be preferred by the relevant parties in the fishing industry. It also examines the implications for fisheries development under these derived conditions. The result is that the above arguments against the share system disappear. Instead, the share system of remuneration is viewed as making a significant positive contribution to the development of a fishing industry.

Sutinen, J.G. (1980). "Economic Principles of Allocation in Recreational and Commercial Fisheries." In Allocation of Fishery Resources, Proceedings of the Technical Consultation on Allocation of Fishery Resources held in Vichy, France, 20-23 April 1980 J.H. Grover (ed.) Food and Agriculture Organization of the United Nations, pages 432-436.

Basic economic concepts are introduced and applied to problems of managing recreational fisheries. Recreational users of a fishery resource are induced by economic factors to overexploit the resource under open access. Management policies for rational use of the resource are developed and explained. When commercial and recreational users compete under open access for the same fishery resource the paper shows how economic factors determine the levels of commercial and recreational effort. The economic principles are explained in nontechnical terms for determining the optimal allocation between commercial and recreational users when the fishery is rationally managed.

Sutinen, J.G. (1986). "Seasonality in Renewable Resource Models." Presented at the Annual Meeting of the Allied Social Science Associations, New Orleans, LA, December 28-31, 30 pp.

This paper is an extension of the work by Huppert (1979) and Anderson (1982) to incorporate exogenous seasonal variation in the bioeconomic model of a fishery.

Sutinen, Jon G. (1987). "Enforcement of the MFCMA: An Economist's Perspective." Marine Fisheries Review, 49(4):36-43.

This paper describes an applied benefit-cost framework for evaluating fisheries law enforcement and uses available data to illustrate its application to evaluation of MFCMA enforcement. The paper contains an overview of the regulations and enforcement programs under the Act, a basic paradigm for explaining the incidence of violations in a fishery, a model for measuring the effects of regulatory and enforcement policies on compliance and benefits, and the nature and magnitude of enforcement costs with some conclusions drawn in the final section.

Sutinen, Jon G. (1993). "Recreational and Commercial Fisheries Allocation with Costly Enforcement." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

This paper develops a model to determine the optimal allocation between recreational and commercial sectors in a fishery when enforcement is costly

and compliance is imperfect. The optimal allocation is shown to depend on, inter alia, the marginal enforcement cost of controlling catches in each sector. Optimal policies for total allowable catches, bag and trip limits, and the penalty schedule are also derived. The analysis is set in the context of the mackerel fishery in the Southeastern United States.

Sutinen, Jon G. (1993). "Recreational and Commercial Fisheries Allocation with Costly Enforcement." American Journal of Agricultural Economics, 75(5):1183-1187.

This paper addresses the problem of allocating total catch between recreational and commercial fishing sectors when enforcement is costly and compliance imperfect and variable between the two sectors.

Sutinen, Jon G. (1995). "Draft Synthesis Report for the OECD Study of Fishery Management." Department of Natural Resource Economics, University of Rhode Island, Kingston, Rhode Island.

A draft of a synthesis report for the study of fishery management in OECD countries.

Sutinen, Jon G. (1996). "Synthesis Report for the Study on the Economic Aspects of Management of Marine Living Resources." Organization for Economic Co-operation and Development, Directorate for Food, Agriculture and Fisheries, Fisheries Committee, February, 201 pp.

The aims of the study are to review the management practices and experiences in member countries with a view to identifying common problems and considering how economic instruments can be applied to improve the efficiency of the management of living marine resources; to consider the economic aspects of managing living marine resources, including aspects of structural adjustment, the management of fisheries with multiple species, highly migratory species, and straddling stocks; and to identify areas where international coordination and collaboration may prove useful.

Sutinen, Jon G. (1998). "Comments on the Economic Effects of Quota Reductions on the Atlantic Large Coastal Shark Fishery." Letter to Gary Matlock, Department of Environmental and Natural Resource Economics, 319 Lippitt Hall, University of Rhode Island, Kingston, RI, April, 5 pp.

Comments on the draft document entitled Consideration of the Economic Effects and Potential Alternatives to the 1997 Quotas on the Atlantic Large Coastal Shark Fishery. Given that existing data to adequately analyze the impacts of the proposed quotareduction is nonexistent, the proposed approach is a reasonable alternative.

Sutinen, Jon G. and James Anderson (1996). The Use of Closed Areas as a Fisheries Management Tool for the New England Groundfish Fishery: A Bioeconomic Analysis. Sea Grant Proposal, Department of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, R.I.

A proposal to analyze the economic impacts of closed areas in a stylized theoretical fishery model using state of the art economic modeling techniques and existing empirical data.

Sutinen, Jon G. and Peder Andersen (1985). "The Economics of Fisheries Law Enforcement." Land Economics, 61(4):1-14.

Cheung (1970) shows that externalities arise when exclusive property rights are absent. Cheung and others argue that the presence or absence of exclusive rights depends on the costs of defining and enforcing exclusivity. This paper explores this issue in greater depth with a formal model of fisheries law enforcement to show how fishing firms behave and fishery policies are affected by costly, imperfect enforcement of fisheries law. This is achieved by combining standard bioeconomic theory and the economic theory of crime and punishment (Becker, 1968).

Sutinen, Jon G. and John R. Gauvin (1988). "An Econometric Study of Regulatory Enforcement and Deterrence in the Commercial Inshore Lobster Fishery of Massachusetts." Prepared for presentation at the NATO Advanced Research Workshop on the Scientific Foundations of Rights Based Fishing, Reykjavik, Iceland, June 27 to July 1, pp. 36.

The inshore commercial lobster fishery of Massachusetts is used to determine the deterrence effect of enforcement in a rights based fishery. As predicted by theory, a lobstermen's perceived probability of detection and conviction affects their violation rate.

Sutinen, J.G., A. Rieser, and J.R. Gauvin (1989). "Compliance and Enforcement in Northeast Fisheries." A report for the New England Fishery Management Council, May, pp. 73.

This study seeks to identify practical ways to improve compliance with federal multispecies and scallop management regulations in the Northeast.

Sutinen, J.G., A. Rieser, and J.R. Gauvin (1990). "Measuring and Explaining Noncompliance in Federally Managed Fisheries." Ocean Development and International Law, 21:335-372.

This article focuses on measuring and explaining noncompliance in federally managed U.S. fisheries. Novel measurement techniques are used to characterize the extent and patterns of noncompliance in the northeast groundfish fishery. According to the authors's estimates, noncompliance increased substantially in 1986 and remained high through 1988 in the groundfish fishery. On Georges Bank during 1987, a quarter to half of all groundfish vessels were identified as frequent violators, committing closed area violations on about one-third of their trips and using illegal mesh on nearly all trips. Illegal earnings by a typical frequent violator operating in the groundfish fishery on Georges Bank amounted to \$225,000 per year in 1987.

A theory of compliance in fisheries is developed and applied to explain the trends and patterns of noncompliance in the northeast groundfish fishery. Biological and economic forces are shown to be dominant causes of the recent deterioration in compliance. Other contributing factors include weak sanctions and insufficient enforcement resources. The article concludes with a prognosis for the fishery and recommendations for improving compliance.

Swallow, Stephen K. (1990). "Depletion of the Environmental Basis for Renewable Resources: The Economics of Interdependent Renewable and Nonrenewable Resources." Journal of Environmental Economics and Management, 19:281-296.

This paper synthesizes familiar theories of nonrenewable and renewable resource economics in a two sector, partial equilibrium analysis of efficient trade offs between renewable resource production and environmental development. The irreversible impacts of coastal zone development provide a

motivating example. While development proceeds, the efficient harvest of renewable resources may exceed the sustainable rate. While development may involve several periods of growth and decline, once development begins it proceeds without significant interruptions. If a profitable renewable sector survives, development ceases before exhausting all profitable opportunities. Interdependent stocks reduce distinctions between resource types because each sector exhibits features of the other.

Swallow, Stephen K. (1994). "Intraseason Harvest Regulation for Fish and Wildlife Recreation: An Application to Fishery Policy." American Journal of Agricultural Economics, 76(4):924-935.

Resource managers often ignore economic information in decisions about recreational use of fish and wildlife resources. By evaluating within season harvest regulations, economists can identify strategies to improve recreational benefits without compromising management objectives represented in an annual harvest quota. Theoretical analysis raises a potential for bias in applied welfare analysis if regulations inefficiently trade off fishing quality and exogenous seasonality in anglers' demand. Simulations demonstrate that efficient regulations may limit daily harvests during the best fishing season or during the peak season of demand. Inadequate knowledge of recreationists' behavioral responses to quality and regulations currently limits policy assessments.

Swallow, Stephen (1994). Renewable and Nonrenewable Resource Theory Applied to Coastal Agriculture, Forest, Wetland, and Fishery Linkages." Marine Resource Economics, 9(4):291-310.

This paper addresses tradeoffs in wetland development using a framework that integrates economic theory of renewable and nonrenewable resources. The theory treats wetland development as use of a nonrenewable resource, while wetland preservation protects critical fishery habitat. The framework recognizes that wetland quality may vary for either development or fisheries. An illustrative application assesses tradeoffs in converting pocosin wetlands to agriculture rather than maintaining wetlands to protect salinity in estuarine nursery areas. Results reveal the marginal value of salinity protection may be substantial, while location may affect a wetland's value to an estuarine shrimp fishery. Comparisons between agricultural and forestry land uses show that ecological links may cause wetland values to depend upon the land use chosen for the developed state. Future assessments of other development may reveal additional impacts through impacts on salinity.

Swallow, Stephen K., Peter J. Parks, and David N. Wear (1990). "Policy-Relevant Nonconvexities in the Production of Multiple Forest Benefits." Journal of Environmental Economics and Management, 19:264-280.

This paper challenges common assumptions about convexity in forest rotation models that optimize timber plus nontimber benefits. If a local optimum occurs earlier than the globally optimal age, policy based on marginal incentives may achieve suboptimal results. Policy relevant nonconvexities are more likely if (i) nontimber benefits dominate for young stands while the optimal age depends primarily on timber benefits or (ii) nontimber benefits dominate for mature stands and also determine the optimal age. Nonconvexities may create either temporary or persistent difficulties. Policy makers may improve efficiency by exploiting the relationship between the timber only optimum and the global optimum.

Swallow, Stephen K., Thomas Weaver, James J. Opaluch, and Thomas S.

Michelman (1994). "Heterogeneous Preferences and Aggregation in Environmental Policy Analysis: A Landfill Siting Case." American Journal of Agricultural Economics, 76(3):431-443.

In many studies of nonmarket resources, economists have data to disaggregate results according to subpopulations within the full study population. Disaggregated results can increase the usefulness of economic analyses, improve public confidence in the results, and permit public officials to assess equity concerns. We outline an approach to obtain disaggregated results when characteristics of individuals may identify distinct preferences. The approach is applied to public preferences regarding landfill siting decisions. The discussion explores the implications of disaggregated results for policy decisions, for bias in aggregate willingness to pay estimates, and for nonmarket research methodologies.

Swartz, A. Nelson and Charles M. Adams (1979). "The Economics of Rockport Bay Texas Shrimping Vessels." Report, DIR 79-1, SP-6 Department of Agricultural Economics, Texas A&M University, August, 10 pp.

A cost and returns survey of Rockport, Texas shrimp fishermen that takes into account seasonal variation in abundance. The fall season is much more valuable to the shrimp fisherman than the spring season. However, a bay vessel operator could not economically survive in the long run without the spring season.

Sweeney, James L. (1977). "Economics of Depletable Resources: Market Forces and Intertemporal Bias." Review of Economic Studies, 44:125-142.

This paper theoretically models the extraction patterns of a finite depletable resource and systematically examines the effects of intertemporal bias stemming from various market forces on depletion patterns.

Swierzbinski, Joseph (1985). "Statistical Methods Applicable to Selected Problems in Fisheries Biology and Economics." Marine Resource Economics, 1(3):209-233.

The methods by which fishery scientists estimate fish populations size are reviewed. These include tagging, cohort analysis, random sampling and catch per unit of effort indexes. Elementary statistical considerations are introduced to discuss some of the properties of the methods. For example, we model the effect of spatial patchiness on random sampling and the effect of sample size on tagging estimates. Next, the Poisson, negative binomial, and gamma distributions and their interrelations are discussed. In particular, these three distribution form a do-it-yourself kit for making models of the fisherman's catch per trip.

One policy tool suggested for fishery regulation is the auction of licenses. Smiley has extended the bidding models of Wilson and Rothkopf and applied them to empirical data on offshore oil lease bids. We discuss Smiley's model, which could provide information about fishermen's expectations and learning about abundance, if and when auction schemes are implemented for fisheries. Finally, we review the application of logit estimation as a tool for studying the discrete choice behavior of fishermen.

Swierzbinski, Joseph and Robert Mendelsohn (1989). "Exploration and Exhaustible Resources: The Microfoundations of Aggregate Models." International Economic Review, 30(1):175-186.

Starting from a disaggregate model of the search for low cost deposits of an exhaustible resource, we derive the appropriate specifications for aggregate extraction and exploration cost functions and analyze the behavior of a competitive industry. The proper specification of the aggregate extraction cost function depends on the exploration technology and is generally different from the usual no discovery specification. The common practice of combining the no discovery cost function with exploration results in a misspecified model for which the total cost of extracting the resource is not well defined. The widely accepted prediction that the anticipated discovery of low cost deposits can result in a U-shaped price path appears to be an artifact of this misspecification. For our properly specified cost functions, the predicted resource price is always rising, in spite of the continued discovery of low cost deposits.

Swingle, Hugh A., Donald G. Bland, and Walter M. Tatum (1976). "Survey of the 16-foot Trawl Fishery of Alabama." Alabama Marine Resources Bulletin, 11(June):51-57.

Of the 19,120 owners of Class I and II boats registered in Mobile and Baldwin counties in 1972, 5,727 or 30% owned a 16-foot shrimp trawl. From 1972 to 1974, the estimated shrimp catch by these 16-foot trawls ranged from 204 to 291 thousand pounds (heads-on) or 15 to 25 percent of the total catch from the inside waters of Alabama.

Swingle, Wayne E. (1972). "Survey of the Live Bait Shrimp Industry of Alabama." Alabama Marine Resources Bulletin, No. 8, Alabama Marine Resources Laboratory, Dauphin Island, Alabama, June, 33 pp.

During 1968, there were 24 bona fide live bait shrimp dealers operating in Alabama who sold 1,544,000 live shrimp and 22,200 pounds of dead shrimp having a retail value of \$76,540. The capital investment per dealer was \$3,303 for facilities and equipment. No shrimp were exported from Alabama, and only a negligible amount was imported. Brown shrimp (Penaeus aztecus) and white shrimp (Penaeus setiferus) were the major species taken. Brown shrimp entered the estuaries first and were gradually replaced by white shrimp. The fishery normally operates from June through November. Length-weight relationships were determined for brown shrimp, white shrimp, and pink shrimp (Penaeus duorarum).

Swingle, Wayne E. (1991). "Shrimp Limited Entry Options Paper." Draft report, Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 881, 5401 W. Kennedy Blvd., Tampa, Florida, 133 pp., Appendix.

A draft of the options paper for a limited access system for the shrimp fishery.

Swingle, Wayne E. (1996). "Issues the Shrimp AP Requested be Addressed in Bycatch Amendment." Gulf of Mexico Fishery Management Council, Lincoln Center, Suite 881, 5401 W. Kennedy Blvd., Tampa, Florida, 6 pp.

Summary of problems that need to be addressed in an analysis of the proposed regulations to reduce finfish bycatch in the Gulf of Mexico shrimp fishery including incorporating ecological models in the economic-cost benefit analysis.

Sylvia, Gilbert (1989). "An Economic Policy Model for Net-Pen Salmon Aquaculture Development: A Dynamic Multilevel Approach."

Dissertation, Department of Resource Economics, University of Rhode Island.

The primary objectives of this research are (1) a global analysis of the codvelopment of the net-pen salmon aquaculture industry and related public institutions, (2) development of a conceptual, intertemporal, multilevel economic poly model, and (3) formulation and application of a numerical model capable of generating economic policy information for salmon aquaculture policy development.

Sylvia, Gilbert (1990). "Market Information and Fisheries Management: A Multiobjective Analysis." Draft report, Oregon State University, Coastal Oregon Marine Experiment Station, Hatfield Marine Science Center, Newport, Oregon.

Market related issues are often implicitly or explicitly treated as exogenous to the fisheries policy problem. Examples illustrate the relationship of market demand, variation in intrinsic and extrinsic seafood qualities, and regulatory policy. A dynamic multiobjective model is used to demonstrate how policy factors including market information, regulatory instruments, and fishery stock dynamics can impact the levels and distribution of social benefits. Socioeconomic policy information is summarized in the form of dynamic and capitalized policy frontiers.

Sylvia, Gilbert and Deqin Cai (1995). "Generating Policy Information for Fisheries Management: A Comparison of Alternative Approaches." Marine Resource Economics, 10(1):77-91.

The potential for economic policy modeling approaches under alternative theories of fisheries management are reviewed. Conceptual dynamic models are developed to illustrate the discussion. Results suggest that the class of multi objective models known as multi attribute utility theory are consistent with a fisheries policy process characterized primarily by principles of scientific management. Conversely, multi objective policy models based on generating techniques may be more appropriate when the policy process is driven by a pluralistic process. Conceptual and numerical models are used to demonstrate the potential for these approaches in incorporating environmental externalities. Dynamic and capitalized policy frontiers are generated for purposes of comparative analysis. The paper concludes by emphasizing the role that multi objective methods can play in improving the efficiency of the fisheries policy process.

Sylvia, Gilbert and Roberto R. Enriquez (1994). "Multiobjective Bioeconomic Analysis: An Application to the Pacific Whiting Fishery." Marine Resource Economics, 9(4):311-328.

A multiobjective bioeconomic policy model was developed for the United States Pacific whiting fishery. Pareto optimal solutions for three policy objectives-rents, production, and female spawning biomass-were developed and analyzed using "hybrid" generating technique. Three policy instruments were considered: harvest quotas, fleet capacity limits, and allocation between shore based and offshore fisheries. Results indicate that Pareto optimal allocations to shore based and at sea industries will depend on the spatial and temporal characteristics of the stock and the assumptions regarding the harvesting and processing characteristics of each fleet. The analysis also suggests approaches for measuring opportunity costs associated with misidentifying "biological risk" and operationalizing the concept known as "optimum yield".



Sylvia, Gilbert and Sherry L. Larkin (1995). "Firm-Level Intermediate Demand for Pacific Whiting Products: a Multi-Attribute, Multi-sector Analysis." Canadian Journal of Agricultural Economics, 43(3):501-518.

Variation in seafood prices resulting from differences in product characteristics are often obscured by highly aggregated data or data representing only upstream sectors. This can lead to myopic commodity-based analysis that fails to identify how changes in public and private fisheries management may impact product characteristics, market development, and long run social benefits. Given these problems, alternative methods are needed to complement traditional demand, supply, and cost-benefit analysis. Mail and personal surveys of seafood wholesalers were conducted to determine preferences for Pacific whiting products. The relative importance of fillet and headed and gutted product characteristics were determined using conjoint analyses and factorial based market experiments. Estimation of relative profitability, probability of purchase, and sort run conditional demand models revealed the importance of wholesaler characteristics, physical product characteristics, and contractual arrangements. Marketing margins and demands for improved products were also estimated. Implications for private and public resource management are discussed.

Sylvia, Gilbert, Robert Hannah, and Michael Morrissey (1997). Bioeconomic Analysis of the Pink Shrimp Fishery. Proposal, Coastal Oregon Marine Experiment Station, University of Oregon, Newport, Oregon.

The objective of the proposed analysis is to integrate the harvesting and processing sectors of the Oregon pink shrimp industry and evaluate economic impacts of altering the mix of product sizes, product recoveries, and product quality; to evaluate the impacts of growth overfishing and economic yield per recruit within an integrated bioeconomic model; to evaluate the economic benefits of using finfish excluder devices; to develop a model that incorporates these objectives and evaluate alternative management policies of the pink shrimp fishery; and to disseminate research results through publications and presentations to industry, managers, and scientists.

Takeuchi, Kunio and Tadashi Yamamoto (1993). "Change in Demand Pattern of Salmons in Japan with the Advent of Farmed Salmon." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

In the present study an attempt is made to clarify how an increase in the farmed salmon production affects the demand pattern of salmon in Japan.

Talvitie, Antti (1972). "Comparison of Probabilistic Modal-Choice Models: Estimation Methods and System Inputs." Highway Research Record, 392:111-120.

Twelve models were formulated by segmenting the total travel time and total travel cost by rapid transit and by automobile in different ways or by leaving them out completely and including only socioeconomic variables in the model. These models were then estimated by using logit, probit, and discriminant analyses. The results were evaluated in two respects: (1) are there differences in performance among the methods of estimation and (2) are there differences in performance among the twelve model specifications? The results indicate that there are no statistically significant differences either among the methods of estimation or among the model specifications themselves. A model that uses only two user characteristics, income and the number of working household members, and one system related variable, a dummy

variable for walk access to the transit station, performs no worse than a model that uses a whole set of system characteristics in addition to those three variables. Values of time significantly lower than those previously reported were found; the best estimate in this study is only twelve percent of the wage rate.

Tamm, George R. (1980). "Spiny Lobster Culture: An Alternative to Natural Stock Assessment." Fisheries, 5(4):59-62.

Routine culture of larvae has not yet been achieved, whereas it has for juveniles and adults. A long and complex larval life, inadequate knowledge of nutritional needs, and the maintenance of high water quality standards are major constraints in larval culture. Growth in older animals, although naturally slow, can be enhanced by environmental manipulation. Several species appear well suited for advanced culture efforts including poly culture. Coordinated programs of aquaculture and fisheries management appear feasible.

Tang, Qisheng (1985). "Modification of the Ricker Stock Recruitment Model to Account for Environmentally Induced Variation in Recruitment with Particular Reference to the Blue Crab Fishery in Chesapeake Bay." Fisheries Research, 3:13-21.

A modification has been made to the simple Ricker stock recruitment model to account for density-independent mortality through fluctuating environmental conditions as well as density-dependent mortality. The modified model is applied to the blue crab fishery data from Chesapeake Bay, Maryland. The model results in a family of stock recruitment curves that assist in the understanding of a complex relationship between spawning stock and recruitment, thereby providing a better basis for recruitment prediction and fishery management. A management strategy for a fishery subject to fluctuating levels of recruitment is also discussed.

Taniguchi, A. Keith (1987). "A Survey of the Domestic Tuna Longline Fishery Along the U.S. East Coast, Gulf of Mexico, and Caribbean Sea." Prepared for the South Atlantic Fishery Management Council, 1 Southpark circle, Suite 306, Charleston, South Carolina 29407-4699, November, 50 pp.

This survey assesses the status of the rapidly developing domestic longline fishery for yellowfin and bigeye tuna.

Tashiro, Joseph E. (1979). "Annotated Bibliography and Subject Indices for Western Atlantic Snappers (Lutjanidae)." NOAA Technical Memorandum NMFS-SEFC-8, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida, October.

This annotated bibliography contains references to literature published from 1896 to 1977 pertaining to fishes of the family Lutjanidae and the snapper fisheries. Seventeen common species in the genera Apsilus, Etelis, Lutjanus, Ocyurus, Pristipomoides, and Rhomboplites are covered. The geographic area concerned is the Gulf of Mexico, Caribbean Sea, and other areas of the western Atlantic Ocean from 35° to 8° S lat. Subject indices of snapper fisheries and biology, and snapper species are included.

Taylor, Barbara L. (1993). "Monitoring Conservation Actions: A Case Study of Sea Turtles." Draft report submitted to the Journal of

### Wildlife Management.

Due to world wide declines in sea turtle populations, efforts are being made to mitigate effects on humans on turtle mortality. This paper shows conservation efforts can be interpreted only with population monitoring and an understanding of population dynamics. The example used investigates whether we can detect changes in nesting turtle numbers from reduced turtle mortality through use of Turtle Excluder Devices (TEDs) on shrimp trawls. An age specific model of the Little Cumberland Island, Georgia population of loggerhead sea turtles (Caretta), concludes that the two largest sources of uncertainty, unknown age of first reproduction (AFR) and unknown history of survival rate changes, have large effects on future population trajectories. Unless estimates of AFR are improved, it will be impossible to interpret the effect of TED use in the next decade. Models must account for population history. Use of time invariant survival rates leads to overestimation of our ability to detect the effect of TED use. Caution is advised when interpreting results obtained from equations that use only population size, particularly when data represent a portion of the population.

Taylor, David L. (1979). "Preliminary Stock Assessment, North Carolina: Rock Shrimp (Sicyonia brevirostris).". North Carolina Department of Natural Resources and Community Development, Division of Marine Fisheries, Morehead City, NC, December, 19 pp.

During October, 1979, the R/V Dan Moore utilized a conventional shrimp trawl at 22 locations offshore North Carolina from south of Cape Hatteras to southwest of Cape Fear in search of rock shrimp. Data were compiled on distribution, relative abundance, size and sex composition, and cull rates. Rock shrimp were found to be more abundant in Long Bay than in Onslow and Raleigh Bays, and it was evident that catches decreased in numbers as latitude increased. Although the vast majority (94.8%) of rock shrimp captured were of commercial size, nowhere were they located in commercially significant concentrations. Males averaged slightly smaller in total length than females and females became more numerous than males in the larger size categories. Sex ratio did not vary significantly from 1:1.

Taylor, Keri H., Fred J. Prochaska, and James C. Cato (1982). "Economic Returns in Operating Florida Atlantic Coast Charter and Party Boats, 1980-81." Sea Grant Project No. R/L-1, Grant No. NA80AA-D-00038, Marine Advisory Bulletin MAP-28, Florida Sea Grant College Program, August, 15 pp.

This bulletin attempts to provide individual charter boat and party boat owners/captains with basic economic information with which they can compare their own operations and compare the economic characteristics of the charter boat industry on the north and south Florida Atlantic coasts. This has been accomplished by providing a description of the general characteristics of charter boats and party boats in the fleet, an analysis of fishing activity and costs and returns, and a comparison of the differences in charter boat operations between north and south Florida.

Taylor, C. Robert (1984). "Stochastic Dynamic Duality: Theory and Empirical Applicability." American Journal of Agricultural Economics, 66(3):351-357.

This paper explores duality relationships for a broad class of stochastic dynamic production problems. Assuming that the decision maker maximizes the expected present value of profit, it is shown that product supply, negative factor demand, and negative quasifixed factor acquisition

equations cannot be directly obtained by partial differentiation of the indirect profit function if price expectations have a Markovian structure. Consequently, empirical application of duality to many stochastic dynamic problems is quite complex and may be more difficult than a primal approach to the problem.

Taylor, Timothy G. and Michael J. Monson (1985). "Dynamic Factor Demands for Aggregate Southeastern United States Agriculture." Southern Journal of Agricultural Economics, (December):1-9.

A four equation input demand system for aggregate Southeastern United States agriculture consistent with dynamic optimizing behavior is specified and estimated. Labor and materials are considered as variable inputs while land and capital are treated as quasi-fixed inputs. It is found that the adjustment rates for capital and land differ considerably and are interdependent. Further, the data appear consistent with the existence of an aggregate production technology and the hypothesized optimizing behavior.

Taylor, Timothy G. and Fred J. Prochaska (1985). "Fishing Power Functions in Aggregate Bioeconomic Models." Marine Resource Economics, 2(1):87-107.

A method of estimating fishing power in the Beverton-Holt tradition in the absence of firm level data is developed. This enables the construction of a standardized measure of fishing effort that can facilitate the analysis and implementation of various management alternatives. The methodology is applied to the Gulf of Mexico Reef Fish Fishery.

Taylor, Tim, Chuck Adams, and Jeffrey Rodrick (1995). "Economic Effects of Swordfish Management Policy on Swordfish and Tuna Fisheries in the Gulf of Mexico." Draft Final MARFIN Project Report, MARFIN Project Number NA-37FF0055, Food and Resource Economics Department, P.O. Box 110240, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.

In June 1991, domestic and international fishery management agencies imposed quotas and minimum size requirements on participants in the North Atlantic swordfish fishery in an attempt to reduce the high rate of fishing mortality that threatens the future commercial viability of the swordfish fishery. However, findings from a 91-92 MARFIN report (Thunberg, et. al., 1992) indicate that management objectives designed to limit swordfish harvest may initiate a redirection of effort toward the many commercially valuable tuna species. Tuna may be landed with essentially the same gear and vessels that are used in the pursuit of swordfish. Therefore, the management initiatives imposed in 1991 have implications for both swordfish and tuna stocks. The objectives of this study were 1) to analyze the economic interrelationships between swordfish and tuna in the south Atlantic and Gulf of Mexico region, in particular to attempt to determine the importance of exvessel prices in conditioning the direction of effort between these two potential target species, and 2) to estimate the effect of swordfish management policy on longline fishing effort and landings in this region. To accomplish these goals, a dual based revenue function was specified, from which effort supply functions were derived and estimated. These functions related directed effort with exvessel prices and a composite input, and were used to test for non-jointness in inputs, i.e. the output of one species is determined independently of the price of the other species in a multi-product fishery. Results indicate that nonjointness is rejected for swordfish and tuna, implying an economic interrelationship does exist. This finding calls into question the ability to manage swordfish as a single species. Further,

the models detected a statistically significant redirection of effort from swordfish to tuna since the imposition of management measures. This evidence suggests that the problems of recruitment failure and declining average size per harvested fish due to overfishing which now characterize the swordfish fishery should be anticipated with respect to tuna stocks and addressed in future management measures.

Taylor, Tim, Chuck Adams, and Jeffrey Rodrick (1995). "An Economic Analysis of Effort Supply Relationships Between the Swordfish and Tuna Fisheries in the South Atlantic and Gulf of Mexico." Final MARFIN Project Report, MARFIN Project Number NA-37FF0055, Food and Resource Economics Department, P.O. Box 110240, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.

In June 1991, domestic and international fishery management agencies imposed quotas and minimum size requirements on participants in the North Atlantic swordfish fishery in an attempt to reduce the high rate of fishing mortality that threatens the future commercial viability of the swordfish fishery. However, findings from a 91-92 MARFIN report (Thunberg, et. al., 1992) indicate that management objectives designed to limit swordfish harvest may initiate a redirection of effort toward the many commercially valuable tuna species. Tuna may be landed with essentially the same gear and vessels that are used in the pursuit of swordfish. Therefore, the management initiatives imposed in 1991 have implications for both swordfish and tuna stocks. The objectives of this study were 1) to analyze the economic interrelationships between swordfish and tuna in the south Atlantic and Gulf of Mexico region, in particular to attempt to determine the importance of exvessel prices in conditioning the direction of effort between these two potential target species, and 2) to estimate the effect of swordfish management policy on longline fishing effort and landings in this region. To accomplish these goals, a dual based revenue function was specified, from which effort supply functions were derived and estimated. These functions related directed effort with exvessel prices and a composite input, and were used to test for non-jointness in inputs, i.e. the output of one species is determined independently of the price of the other species in a multi-product fishery. Results indicate that nonjointness is rejected for swordfish and tuna, implying an economic interrelationship does exist. This finding calls into question the ability to manage swordfish as a single species. Further, the models detected a statistically significant redirection of effort from swordfish to tuna since the imposition of management measures. This evidence suggests that the problems of recruitment failure and declining average size per harvested fish due to overfishing which now characterize the swordfish fishery should be anticipated with respect to tuna stocks and addressed in future management measures.

Teisl, Mario F., and Kevin J. Boyle (1997). Needles in a Haystack: Cost-Effective Sampling of Marine Sport Anglers. Marine Resource Economics, 12(1):1-10.

An obstacle to conducting economic studies of marine sport anglers is the difficulty and expense in drawing a representative sample. Unlike inland fishing, where licenses are required in all states, only selected states require a marine sport fishing license and these license usually only cover selected marine fishing activities. Currently, there are no low cost methods of obtaining a representative sample of marine anglers because they are generally not licensed, use multiple access points, and represent a small proportion of the general population. The difficulty and expense of drawing a representative sample may have stifled attempts to study marine anglers. We test alternative sampling strategies by comparing the characteristics of a

representative sample of experienced marine anglers with the characteristics of two other samples using multivariate and univariate analysis techniques. We conclude a sample of marine anglers drawn from the population of licensed inland anglers is not significantly different from the representative sample of experienced marine anglers.

Teisl, Mario F., Brian Roe, and Robert L. Hicks (1997). Can Eco-Labels Tune a Market? Evidence from Dolphin-Safe Labeling. Draft, U.S. Food and Drug Administration, 200 C Street SW, Washington, DC, May, 18 pp.

In this paper, the impact on consumers from the dolphin-safe labeling program are measured in two ways. First, a demand system for the canned protein market is estimated by using retail level data to identify whether dolphin-safe labels alter consumer purchases of tuna. Second, the estimated demand system is used to provide a lower bound on the welfare effects of the dolphin-safe labeling policy using the assumption that any shifts in demand resulting from the dolphin-safe labels would reflect a type of non-use value. Hypothetical approaches (e.g., contingent valuation) are commonly considered the only means of eliciting non-use values. However, dolphin-safe labeling policies would seem a case in which public non-use values for a resource could be deduced from observable behavior.

Teisl, Mario F., Kevin J. Boyle, Daniel W. McCollum, and Stephen D. Reiling (1995). Test-Retest Reliability of Contingent Valuation with Independent Sample Pretest and Posttest Control Groups. American Journal of Agricultural Economics, 77(3):613-619.

Test-retest, the standard method used to investigate reliability of contingent valuation, is limited because when the time period between the two surveys is relatively short the study may exhibit testing recall. Conversely, when the time between the two surveys increases there is an increased chance the true value will change. The test-retest design cannot isolate these effects. Independent pretest and posttest control groups allow testing of reliability even when recall occurs or the true value changes. Using this design, we found ex post estimates of Hicksian surplus are reliable regardless of whether respondents have direct experience with an activity.

Temple, Robert F. (1973). "Shrimp Research at the Galveston Laboratory of the Gulf Coastal Fisheries Center." Marine Fisheries Review, 35(3-4):16-20.

A review of the history and present research responsibilities of the Galveston Laboratory.

Terkla, David G., Peter B. Doeringer, and Philip I. Moss (1988). Widespread Labor Stickiness in the New England Offshore Fishing Industry: Implications for Adjustment and Regulation. Land Economics, 64(1):73-82.

Sticky labor and diverse labor adjustment processes are characteristic of the New England offshore fishing industry that arose because of kinship institutions that now dominate both ports. They are further reinforced by more traditional sources of labor immobility - fishermen's ties to their local communities, the fragile economic structure of port economies, and the strong attachment of fishermen to their occupation. This argument is documented with a case study of two large and economically diversified ports, Gloucester and New Bedford, that account for around two-thirds of the total New England fishing industry catch and are home to the bulk of the offshore fleet.

Terry, Joseph M. (1994). "Characteristics of Fisheries Appropriate for ITQ and Other Controlled Access Management." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Alaska Region.

Copies of overheads used in a presentation on the characteristics of fisheries that tend to result in the success or failure of ITQ, license limitation, and other types of controlled access programs. Good outline of the limited access concerns for fishery managers.

Terry, Joseph M. (1994). "Consolidation Limits." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Alaska Region.

Copies of overheads used in a presentation on the limits to consolidation under individual transferable quotas and other limited entry programs. The objectives of such limits is to ensure economic efficiency, the distribution of benefits, and maintain the level of participation by existing fishermen and new entrants.

Terry, Joseph M. (1997). Comments on the Draft Guidelines for National Standard 9 (Bycatch). Alaskan Regional Office, Seattle, Washington.

Comments on National Standard 9 concerning NMFS policy on bycatch reduction where the concern is expressed that the underlying economic principles are not being address.

Terry, Joseph M. (1997). A Plan to Improve the Data and Models Available to Support Economic Analyses of the Alaska Groundfish and Halibut Fisheries. Draft, Alaskan Regional Office, Seattle, Washington, July, 7 pp.

This plan identifies three projects that would result in substantial progress in implementing the cost, earnings, and employment program, improve usefulness of existing data collection programs, and the model and technique development program for fisheries off Alaska for with the North Pacific Fishery Management Council and the National Marine Fisheries Service have the principal management responsibilities.

Terry, Joseph M. (1997). Research Plan for the Socioeconomic Assessments Task. Draft, Alaskan Regional Office, Seattle, Washington, July, 4 pp.

The primary mission of the Socioeconomic Assessments Task is to provide economic information that will assist, NMFS, the North Pacific Fishery Management Council (NPFMC) and the Pacific Fishery Management Council (PFMC) in meeting their responsibilities; (1) measure the annual economic performance of the fisheries under their jurisdiction; (2) track changes in economic performance over time; (3) estimate the economic performance effects of existing fishery management measures; (4) project the economic effects of alternative management measures; and (5) develop fishery management policies and measures which will increase the long-term economic and social benefits to the nation from sustainable fisheries. The secondary missions are (1) to provide related economic information to other Federal and state agencies, foreign and international agencies, the fishing industry, other interest groups, and the general public; and (2) to respond to NMFS requests for other types of economic information.

Terry, Joseph M. and Lewis E. Queirolo (1989). "U.S. Fisheries Management and Foreign Trade Linkages: Policy Implications for

Groundfish Fisheries in the North Pacific EEZ." Marine Fisheries Review, 51(1):23-27.

A review of the Alaskan fisheries, market characteristics, and profitability given the reduced presents of foreign fishing fleets in the EEZ and the development of joint fishing ventures off U.S. shores.

Terry, Joseph M., Gilbert Sylvia, Dale Squires, Wes Silverthorne, James Seger, Gordon Munro, Richard Marasco, Douglas Larson, James Kirkley, Larry Jacobson, Samuel Herrick, John Gauvin, Amy Buss Gautam, Steven Freese, and Rebecca Baldwin (1996). "Fixed Costs and Joint Cost Allocation in the Management of Pacific Whiting - A Workshop Report -. NOAA-TM-NMFS-SWFSC-234, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, September, 29 pp.

The workshop s purpose was to decide how to treat fixed costs and how to allocate fixed and variable costs in benefit-cost analyses of options for allocating the harvest of Pacific whiting (Merluccius productus) in the Pacific coast groundfish fishery.

Tetty, E.O. (1983). "The Gulf of Mexico Shrimp Fishery: An Econometric Analysis of Real Net Investment in Fishing Vessels." Dissertation, Department of Agricultural Economics, Texas A&M University, College Station, 140 pp.

The real net investment in fishing vessels in the Gulf of Mexico shrimp fishery is analyzed employing an econometric model. The model is simulated over a 17 year period to examine the short and intermediate run impacts of changes in such policy variables as the real rate of interest, cost of equity capital, investment tax credit and income tax on investment behavior in fishing vessels. A forecast over a 5 year period (1978 - 1982) for real net investment in fishing vessels is also developed.

Investment tax credit stimulates investment expenditure in the Gulf shrimp fishery. However, income tax exerts the greatest influence on investment decisions in the fishing industry. While both steel and wooden vessels are expected to show continuous growth from 1978 to 1982, the stock of steel vessels should grow about three times as fast as wooden ones over this period.

Tetty, E.O., and W.L. Griffin (1984). "Investment in Gulf of Mexico Shrimp Vessels, 1965-77." Marine Fisheries Review, 46(2):49-52.

This study examines implications of investment patterns in the Gulf shrimp fishery. Historical trends in capital stock of different vessel types are estimated for 1965-77 for use with landings and sales data. Specifically, annual trends in total and per vessel shrimp landings and sales are examined. Shrimp landings and sales per dollar of investment in fishing vessels are evaluated. Apparently, the perceived value of landings per vessel increased on average at a faster rate than production costs per vessel causing excess profit to exist. This created an incentive for investments, although there may be other reasons for stimulating investment. This expansion was interrupted only by poor economic conditions, such as in 1970 and 1973-75. Although data were not available to estimate real capital stock beyond 1977, other information suggests that substantial declines (large negative real investment) occurred in 1979-80.

Tetty, E.O., W.L. Griffin, and J.B. Penson (19??). "Real Net



Investment in Gulf Shrimp Fishing Vessels." Technical Article No. TA-20803, Texas Agricultural Experiment Station, Department of Agricultural Economics, Texas A&M University, College Station, 18 pp.

An econometric model of annual real net investment in fishing vessels in the Gulf is developed to determine how the cost of equity and debt capital as well as other factors affect investment decisions in this industry. The cost of capital plays an important role in influencing investment decisions in the Gulf shrimp fishing industry. High real interest rates were found to depress real net investment in this fishery. Investment responses to changes in macroeconomic policy are greatest for steel vessels because steel vessels contribute the most to the productivity of the Gulf shrimp fishery. Finally, while low real interest rates are desirable for stimulating investment activities in the general economy, they would add to the overcapitalization problem that currently exists in the Gulf shrimp fishing industry. This suggests that expansionary policies designed to boost the growth of the general economy may actually lead to undesirable results for the Gulf shrimp fishing industry.

Tettey, Ernest, Christopher Pardy, and Wade Griffin (1982). "Economic Analysis of Investment Alternatives for the Gulf of Mexico Shrimping Vessels." Draft Report, Department of Agricultural Economics, Texas A&M University, College Station, Texas 77843.

The effects of inflation on the returns to investment and profitability in the shrimp industry is observed by analyzing investments in 1971, 1977, and 1979. Steel vessels generally did better in terms of financial performance than wooden ones and medium sized vessels were the most efficient vessels to operate in the Gulf of Mexico. This draft report also includes summarized raw data as a handwritten appendix.

Tettey, E.O., W.L. Griffin, J.B. Penson, and J.R. Stoll (1986). "Implications of Tax Policy on Investment in a Common Property Resource." North American Journal of Fisheries Management, 6:100-104.

This study employs a financial model to examine the aggregate investment expenditures for Gulf of Mexico shrimp vessels. Specifically, the impacts of tax policies - investment tax credits and income taxes - on investment decisions in the Gulf shrimp fishery are evaluated. Contractionary tax policy is an effective tool in limiting entry to the shrimp fishery and, thereby, controlling the problem of overcapitalization. Decreases in the investment tax credit rate, increases in the income tax rate, or a combination of both policies will curtail investment activities in the fishing industry. Implementation of such tax schemes should raise total revenues of vessel owners, in the long run, from what they otherwise would have been.

Tettey, Ernest, Christopher Pardy, Wade Griffin, and A. Nelson Swartz (1984). "Implications of Investing Under Different Economic Conditions on the Profitability of Gulf of Mexico Shrimp Vessels Operating Out of Texas." Fishery Bulletin, 82(2):365-373.

Due to the inflationary trend in recent years coupled with fluctuating shrimp prices, the shrimp business has become a highly uncertain undertaking. The financial performance of a sample of the Gulf of Mexico shrimping fleet, operating out of the Texas coast, was examined over a 10 year period (1971-80). The results indicate that investments made in the early part of the 1970's performed better than those made in the latter part. Periods of low

inflationary levels appeared to be more favorable to investments in the shrimp fishery than periods of high inflationary levels. In terms of economic profits, steel vessels generally did better than wooden ones. Medium sized vessels (18.6 - 20.0 m in overall length) were the most efficient vessels to operate in the Gulf of Mexico.

Texas Parks and Wildlife (1991). "The Texas Shrimp Fishery, A Report to the Governor and the 72nd Legislature." Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744.

This report reviews the current status and recent developments that affect the Texas shrimp fishery.

Thabault, Michael G. (1990). "Southwest Region Seafood Dealers Guide, 1990 Edition." Administrative Report SWR-90-02, National Marine Fisheries Service, Southwest Region, 300 S. Ferry Street, Terminal Island, CA, January, 93 pp.

This directory contains information concerning companies dealing in fisheries products in Arizona, California, Nevada, Hawaii, Guam, and American Samoa. This directory also contains information on Federal, State, and private organizations that may be of service to people in the seafood industry.

Thacker, Sayra G. and Wade L. Griffin (1994). "Indoor Intensive Red Drum Aquaculture: A Stochastic Sensitivity Analysis." Journal of the World Aquaculture Society, 25(1):86-100.

This research uses stochastic sensitivity analysis to examine an indoor intensive red drum aquaculture facility. Important biological and economic factors are varied one at a time to determine the chances of survival and success. Results indicate that this type facility is very stable since all but one scenario had a 100% chance of surviving. This stability occurs because harvesting is spread uniformly through the year. Chances of being an economic success range from 0 to 100% depending on the investor's required rate of return and the assumed level of biological and economic factors considered in this analysis. An investor's interest in red drum farming will depend on his individual required rate of return, his management capabilities, the market conditions, and his willingness to take a risk. It is certain, however, that a 0% chance of economic success will occur for a red drum farm under poor management.

Theberge, Bartlett and Carol Furman (1984). "Recommendations for Action: Panel 3 Angler Needs Marine Recreational Fisheries: A Potential Political Colossus in Search of Itself?" Chapter 22 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Commercial and recreational fishermen share the same resources and must cooperate to derive the greatest benefits for both groups. The protection and preservation of the habitat necessary to ensure continued commercial and recreational fishing should be a common goal. Each industry's contribution to the nation's economy is substantial, and federal and state governments and the industries must recognize the wisdom of working together to establish and maintain an equitable balance between recreational and commercial fisheries.

Theil, Henri (1967). "Economic Relations Involving Conditional

Probabilities." Chapter 3 in Theil, Henri (1967). Economics and Information Theory. North-Holland Publishing Company, Amsterdam.

This chapter is devoted to various uses of conditional probabilities in economic problems.

Theil, Henri (1970). "On the Estimation of Relationships Involving Qualitative Variables." The American Journal of Sociology, 76:103-154.

This article is concerned with the specification and estimation of relationships whose dependent variable is qualitative in nature (such as "yes" or "no"). It discusses logit equations with and without interaction, and the estimation procedure is generalized least squares. Part I deals with dependent variables that take only two values, part II with variables taking more than two values, and part III describes informational measures for the explanatory power of the determining factors. The discussion of more advanced technical matters is contained in various appendixes.

Theiling, Dale L. (1977). "South Carolina's 1976 Shrimp Trawler Season." South Carolina Marine Resources Center, Technical Report Number 24, December, 31 pp.

Data concerning the shrimp trawler fishery of South Carolina were collected during the 1976 season by the Marine Resources Division. Of 62 shrimp buyer and shipper license holders, 37 were considered full time shrimp packers and were located on charts. Six hundred thirty two single rig and 497 double rig trawlers were registered. Length, horsepower, and other data on trawlers were compiled by home port and county along with age, race, and location information on captains. Owners' motivation (i.e. commercial or recreational) and locations were evaluated. Catch, effort, value, and location data on shrimp landings were summarized for use by shrimpers, dealers, and researchers. The 1976 season was reviewed on a monthly basis.

Theiling, Dale (1988). "Assessment of Participation and Resource Impact of Shrimp Baiting in Coastal South Carolina During 1987." South Carolina Marine Resources Center, Technical Report Number 69, September, 41 pp.

An estimated 21,735 South Carolinians utilized 6,406 boats to catch 1.8 million pounds of shrimp during the 1987 season of mid-August through mid-December. The typical shrimp baiting trip saw two people shrimping for 4 hours from a 14 foot boat using 12 to 15 bait marking poles and catching 30 to 35 quarts of shrimp (heads-on measure).

Thomas, J. Stephen, G. David Johnson, and Catherine Riordan (1994). "Executive Summary of Year One." In "Decision-Making by Shrimp Fishermen as Reasoned Action: Behavioral Determinants of Bycatch Characteristics and Projected Effects of Bycatch Regulations on Labor Decisions." Presentation, Gulf of Mexico Fishery Management Council, Shrimp Trawl Bycatch Session, Corpus Christi, May, 5 pp.

This material represents initial efforts to understand the potential effects of bycatch regulations on shrimp fishermen and are derived solely from Alabama. This research has two primary objectives, the first of which is to project fishermen's labor market decisions in light of proposed regulatory actions to reduce bycatch. To assess this, questions were constructed premised on the theory of reasoned action. The theory of reasoned action seeks to explain behavior on the basis of individual intentions to carry out

the behavior in the future. In the case of shrimp fishermen, we test their intentions to remain or leave shrimp fishing given the possibility of future bycatch regulations. Secondly, with this research we are able to establish baseline data characterizing the economic, social, and psychological well being of shrimp fishermen first from Bayou La Batre, Alabama, and eventually for shrimp fishermen Gulf wide. Finally, we are able to compare data from this first year with data collected in a similar survey from 1987. Thus, we are able to discuss in this summary three major sets of findings: demographic comparisons for 1987 and 1993-94; well being comparisons for 1987 and 1993-94; and perceived effects of regulations on fishermen's intent concerning their future as fishermen.

Thomas, J. Stephen, Cecelia M. Formichella, G. David Johnson, and Catherine Riordan (1995). "Shrimp Fishermen on the Eve of Bycatch Regulations: A Report to the Gulf of Mexico Fishery Management Council." Draft report, College of Arts & Sciences, University of South Alabama, Mobile, AL.

The data presented here describes the current social conditions among shrimp fishermen, the perceptions fishermen have about how bycatch regulations may effect them, and provides an opportunity to suggest the potential consequences for fishermen should the current social conditions persist or worsen as a result of new regulations. To do this the following will be presented: 1. Background of the research and the methods used; 2. Basic demographic characteristics of fishermen; 3. Economic characteristics; 4. Occupational features; 5. Physiological and psychological indicators of health; 6. Perceptions fishermen have of the future; and 7. Conclusions, consequences and recommendations.

Thomas, J. Stephen, G. David Johnson, Cecelia M. Formichella, and Catherine Riordan (1993). "Perceived Social and Economic Effects of Current Management Policies on Red Snapper Fishermen Operating in the Gulf of Mexico: A Report to the Gulf of Mexico Fishery Management Council." Draft report, College of Arts & Sciences, University of South Alabama, Mobile, AL.

This report presents findings from a study of red snapper fishermen in the Gulf of Mexico who own and operate their own boats and have received 2,000 pound trip endorsements. Focus group interviews with fishermen volunteers were held in Alabama, Florida, and Louisiana during March and April, 1993. A telephone survey of endorsed owner operators was conducted from May to July, 1993. Interviews were completed with 79 percent of the population (n=75).

Thomas, J. Stephen, G. David Johnson, Cecelia M. Formichella, and Catherine Riordan (1995). "Shrimp Fishermen on the Eve of Bycatch Regulations: A Final Report." MARFIN Report #NA37FF0049, College of Arts & Sciences, University of South Alabama, Mobile, AL.

The purposes of the study are (1) To describe the current social, economic, and health status of boat captains operating in the Gulf of Mexico shrimp fishery; (2) To describe their perceptions concerning the likely effects of new regulations; (3) To solicit shrimp boat captains opinions regarding bycatch regulations; and (4) To anticipate potential consequences for fishermen of additional regulatory actions. Comparisons among three samples of shrimp fishermen are made: Alabama 1987, Alabama 1994, and Gulf-wide 1994. Changes observed for the Alabama fishermen are described and generalizations across the entire Gulf of Mexico are suggested.

Thompson, Grant G. (1994). "A General Diffusion Model of Stock-

Recruitment Systems with Stochastic Mortality." C.M. 1994/T:18, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 29 pp.

Diffusion models provide a rigorous yet highly tractable means of representing the behavior of stochastic systems. In this paper, attention is focused on developing functional forms for the stationary (long-term) probability density functions of stock size and other quantities of interest in systems governed in part by a stock recruitment relationship (SRR). First, a general classification of SRRs is developed and a number of well known stock recruitment relationships are rescaled so as to exhibit two parameters in common, namely their resilience and their recruitment carrying capacity. Second, a general diffusion model is presented in which the stationary distribution of stock size can be written explicitly as a function of four parameters (usually rescaled linearly as a function of one or both of the basic stock recruitment parameters): 1) the total mortality rate, 2) the net rate of density independent migration (if any), 3) the magnitude of stochastic perturbations in the system, and 4) the degree to which the influence of those perturbations is a function of stock size. Third, the fishing mortality rates that maximize expected stationary yield are compared across SRRs and parameter values and their potential impacts on expected recruitment are explored. Finally, the implications of alternative forms of the stock recruitment relationship and alternative approaches to risk analysis ("frequentist" versus "decision-theoretic") are examined. The possibility of stock collapse is incorporated through use of a depensatory SRR as one of the examples.

Thompson, John R. (1967). "Development of a Commercial Fishery for the Penaeid Shrimp Hymenopenaeus Robustus Smith on the Continental Slope of the South-Eastern United States." Proceedings of the Symposium on Crustacea, Part IV: 1454-1459.

In the early 1950's, the U.S. Bureau of Commercial Fisheries vessel Oregon found large concentrations of royal red shrimp, Hymenopenaeus Robustus, in the northern Gulf of Mexico on the continental slope off the Mississippi River Delta. This finding was one result of a long term series of explorations for resources of commercial worth that began on the continental shelf of the northern Gulf and has since encompassed the shelf and slope from Cape Hatteras, North Carolina to Brazil in the Gulf, Caribbean, and Western Atlantic proper. Potentially commercial quantities of the royal red shrimp have been found on Florida's east coast, off the Dry Tortugas, and in the northern Gulf. Lesser quantities of the shrimp have been found throughout the area explored with some potential off Venezuela and Colombia in the Caribbean and off the Guianas in the Atlantic. By trawling the grounds where large concentrations occurred off the U.S., and making demonstration landings as well as publishing the results of the findings, the U.S. fishing industry has been encouraged to make use of the new resource. Vessels of the Bureau have fished alongside the commercial fleet on the new grounds to encourage them, and at present a growing interest and a small scale continuous utilization is being seen.

Thompson, Mark, Kenneth J. Roberts, and Perry W. Pawlyk (1984). "Structural Changes in U.S. Shrimp Markets." In Proceedings of the Workshop on Shrimp and Prawn Markets. International Institute of Fisheries Economics and Trade and the South Carolina Wildlife and Marine Resources Department, Charleston, South Carolina, July 26-27.

The research outlined in this paper is a more complete specification of the shrimp market interactions that incorporate recent data. A monthly seven-equation model was formulated as a closer approximation of the relationships that are endogenous to the shrimp market. More emphasis in this respect was placed on sources of supply than evident in previous simultaneous models (Doll, 1972; Batie, 1974).

Thompson, Nancy (1988). "The Status of Loggerhead, Caretta; Kemp's Ridley, Lepidochelys kemp; and Green, Chelonia mydas, Sea Turtles in U.S. Waters." Marine Fisheries Review, 50(3):16-23.

Available information on the ecology and status of stocks is summarized for the loggerhead, green, and Kemp's ridley sea turtles found in U.S. waters. These species are listed as threatened, endangered in Florida waters, and endangered respectively. The most conspicuous and abundant species is the loggerhead turtle that appears to have been relatively stable in numbers since 1982. The green turtle, that once supported a significant U.S. fishery, appears to be increasing in Florida. It is not known if this increase in the number is from an expansion of range of Caribbean stocks or if there is a real increase in the number of turtles in the U.S. stock. The Kemp's ridley that once nested in Mexico in the tens of thousands has been reduced to a nesting population of less than 600 females. If the status quo remains, this species will be reduced to 100 nesting females within 60 years.

Thompson, Nancy (1998). Characterization of the Dolphin Fish (Coryphaenidae, Pices) of the United States Western North Atlantic Ocean. Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL, February, 21 pp.

Fishery dependent data from various commercial and recreational sampling programs in the U.S. form the basis for characterizing the fishery for dolphin fishes (Coryphaenus hippurus) in the waters of the Gulf of Mexico and off the southeastern U.S. coast. Many states in the region have implemented size and bag limits for dolphin fishes, however, there are no federal regulations in place at this time. Commercial landings in metric tons have been relatively small in comparison to recreational landings for the time series of data available from 1984 through 1996. In 1995, however, commercial landings in the Atlantic Ocean of the southeastern U.S. were almost twice in weight of the previous years. The average weight per fish was calculated for each water body and fishing sector and there appear to have been large increases in the average weight of fish landed both in the commercial and recreational sectors in the Atlantic and Gulf of Mexico. Catch per unit of effort is measured as numbers of fish caught per angler per hour in the recreational fishery. In the Gulf of Mexico, recreational CPUE appears to fluctuate and appears to be decreasing since 1985. CPUE appears to have been increasing in the Atlantic particularly from 1984 to 1991 and appears to have been decreasing since 1991.

Thompson, Peter C. (1974). "Institutional Constraints in Fisheries Management." J. Fish. Res. Board Can., 31(12):1965-1981.

The management of the Canadian Fisheries is under the authority of both federal and provincial governments. While it is common to the Canadian confederation that both levels of government have dual roles in many areas of Canadian life, the situation with respect to the fisheries tends to be more complicated in the intricacies of federal-provincial jurisdiction. The result has led at times to genuine confusion as to the management prerogatives over the Canadian fisheries.

To manage the resource it is considered requisite to have an understanding of the legislative prerogatives of the federal and provincial

agencies responsible for Canadian fisheries. Such an understanding will serve to outline institutional constraints imposed upon fisheries management.

This paper examines a unique aspect of the fisheries resource that being the nature of the governmental responsibilities in the management of the fisheries. This is achieved through the examination of the evolution of the Canadian federation, the constitution, the legal aspects of the fisheries, and the leading judicial decisions on Canadian fisheries.

Thompson, Richard B. (1984). "Marine Recreational Fisheries - Update 1984." Chapter 4 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

In 1974, the National Marine Fisheries Service (NMFS) began specific surveys of marine anglers; these surveys did not cover all U.S. contiguous coastal areas until the latter half of 1979. Alaska, Hawaii, and the U.S. Caribbean areas have not been covered consistently by the NMFS surveys. Thus, some of the information presented here are the "best adjustments" of published data.

Thompson, Russell G., Richard W. Callen, and Lawrence C. Wolken (1970). "Optimal Investment and Financial Decisions for a Model Shrimp Fishing Firm." TAMU-SG-70-205, Texas A&M University Sea Grant Program, April, 49 pp.

In this study, the shrimp industry is briefly reviewed historically, and some of the factors influencing the demand for shrimp as well as some of the factors affecting the supply are discussed. The need for better aids for investment planning is pointed out. This is followed by the development of a mathematical investment financial model for the shrimp fishing firm. Each facet of the model is discussed with a rigorous statement of the complete decision making model. It is then shown how this first model may be transformed into a form for computational purposes: a sequential linear programming model. An economic interpretation is provided for the possible corner solutions to this problem.

Thompson, R.G., M.D. George, R.J. Callen, and L.C. Wolken (1970). "A Stochastic Investment Model for a Survival Conscious Fishing Firm." TAMU-SG-70-218, Institute of Statistics Texas A&M University, Texas A&M University Sea Grant Program, July, 22 pp.

This study develops mathematical aids for investment-financial decision making in shrimp fishing. The model developed allows for random prices and catches per vessel and takes into account all of the information known to the decision maker at each time of decision. Vagrancies in landings per vessel seem to be much more important to the survival of the firm than unexpected variations in price.

Thompson, R.G., M.D. George, R.J. Callen, and L.C. Wolken (1973). "A Stochastic Investment Model for a Survival Conscious Firm Applied to Shrimp Fishing." Applied Economics, 5:75-87.

An operational stochastic capacity expansion model for a survival conscious firm is developed and applied to shrimp fishing in which the entrepreneur evaluates all the information known to him at the time of the decision. The results show the effect of survival on the growth in net worth of a firm making sequential and irreversible purchases of physical capital

with uncertain future yields. The survival model is applied to shrimp fishing on the Texas Gulf coast and the results are compared to those of a simple model in which survival is not considered. Bankruptcy could clearly result from the use of the simple model; survival of the firm is guaranteed by use of the survival model.

Exit from the fishery may be restricted (sticky downward) because fishermen's attitudes toward risk are not symmetric with regard to favorable and unfavorable yields and prices. Low prices and small catches in fishing may be dreaded much more than high prices and large catches are desired. In the model, the firm maximizes expected net worth at the end of a finite planning period subject to the restriction that the only allowable purchases of capacity are those for which there is no chance of incurring bankruptcy. It is assumed that the firm is unwilling to assume any risk of failure. Thus, the survival restriction prohibits purchases of capacity which would lead to bankruptcy during the planning period if the worse possible yields or output prices occur in the future. Survival considerations may result in modest growth of capacity of a fishing firm, even if the expected profit of additional capacity is relatively large.

Thomson, Cynthia J. and Daniel D. Huppert (1987). "Results of the Bay Area Sportfish Economic Study (BASES)." NOAA-TM-NMFS-SWFC-78, NOAA Technical Memorandum NMFS, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Center, La Jolla, CA, August, 70 pp.

This report contains the results of a descriptive analysis of saltwater anglers residing in selected Central and Northern California counties. The report provides estimates of economic value associated with hypothetical changes in salmon/striped bass catch rates. These values were obtained by a direct elicitation technique known as the contingent valuation method (CVM).

Thorvik, Thorbjorn (1993). "Control and Enforcement in the Norwegian Fisheries." Paper presented at the Workshop on Enforcement Measures, Organization for Economic Co-Operation and Development, Directorate for Food, Agriculture, and Fisheries, Committee for Fisheries, Paris, September 21-22.

The Norwegian system of data collection from the commercial fisheries is presented. The regulations concerning control and enforcement at sea as well as on shore are discussed.

Thunberg, Eric M. (1994). "The Consumer's Interest in Limited Access Fishery Management." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA, October.

Limited access fisheries management does not address the problems of product quality that are important to the final consumer of fishery products. ITQs implicitly address the quality of fish by reducing fishing effort levels, increasing the fishing season, and, therefore, causing a better quality (fresh) product to be delivered to the marketplace.

Thunberg, Eric (1995). Bio-Economic Analysis of Alternative Selection Patterns in the United States Atlantic Silver Hake Fishery. In, Bio-Economic Modelling in the EU, Concerted Action Coordination of Research in Fishery Economics, Working Document Nr: 7, (AIR CT94 1489), Workshop, Edinburgh, October: 100-128.



In this paper a bioeconomic simulation of the U.S. fisheries for silver hake, Merluccius bilinearis, is presented. The model design combines elements of age structured population and harvest yield models with the economics of the silver hake fishery. The analysis evaluates both biological and economic effects of interest to managers, such as future yields or rebuilding of parental stock as well as future revenues and net returns to vessels. The bioeconomic model is used to evaluate the economic implications of tradeoffs between alternative selection patterns in the U.S. Atlantic silver hake fishery. Throughout the study, a selection pattern is defined as the suite of age specific selection coefficients that are applied to a fish population over time. Of particular interest is exploration of whether trade offs among segments of a fish population can result in increased resource value. This question is explored within the context of whether a limited juvenile fishery can co-exist with traditional fisheries without jeopardizing silver hake stocks and if so, under what conditions might such a fishery operate.

Thunberg, Eric and James L. Seale (1992). "Economic Analysis of United States Demand for Swordfish and the Economic Effects of Effort Reduction on the Gulf of Mexico Swordfish Fishery." Final Project Report, MARFIN, Department of Food and Resource Economics, P.O. Box 110240, University of Florida, Gainesville, FL 32611-0240.

In an attempt to reduce fishing mortality on the North Atlantic swordfish fishery, domestic and international management agencies have cooperated in a multilateral effort to establish quotas and minimum size requirements. These restrictions can have significant economic consequences on the participants in the fishery. However, little information on the economic relationships of the swordfish fishery is available. The objectives of this study were to develop an economic model of the U.S. swordfish markets including swordfish demand and supply functions from each of four different sources of supply, estimate changes in consumer and producer surplus associated with harvest reduction measures in the North Atlantic, examine the indirect effects of North Atlantic swordfish on tunas, and nonmanagement unit swordfish stocks. A general equilibrium modeling approach was adopted to construct an economic model of swordfish supply and demand. Predicted consumer surplus losses are \$3.4 million annually, while producer surplus losses to domestic North Atlantic swordfish fishermen are \$5.98 million. These results are based on an analysis in which supplies of swordfish from nonmanagement unit stocks were allowed to respond to predicted price changes following the imposition of quotas in the North Atlantic. Consumer surplus losses were estimated to be slightly higher if this supply response was not taken into account. The results showed that changes in swordfish prices do affect tuna markets, hence, North Atlantic swordfish management may have unintended effects on effort directed toward tuna as a substitute species. Further, supply responses from nonmanagement unit were found to be greater than that for management unit stocks suggesting that North Atlantic swordfish management could have implications for harvest effort and management concern toward other stocks.

Thunberg, Eric and Scott Steinback (1996). A Simulation Model to Evaluate the Impacts of Recreational Fishery Bag and Size Limits. Draft report, Social Sciences Branch, Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA.

A stochastic simulation approach is presented to assess the recreational fishing impacts of Amendment 7 to the Northeast Multispecies Fishery Management Plan. Impacts are presented by mode (party/charter and private/rental boat) and area (North: Maine, New Hampshire, and Massachusetts, and South: Connecticut, Rhode Island, and New York). To account for

uncertainties due to a lack of empirical data and inherent variability in number of trips, keep rates, release mortality, compliance rates, and behavioral changes, probability distributions were assigned and a Monte Carlo simulation with 1,000 iterations run. The simulation results indicate that the combined impact of the bag and size limit management measures will result in an expected 25% reduction in cod and haddock recreational fishing mortality. However, due to differences in size and catch distribution, the management measures have a greater impact on anglers in the North. Nearly two-thirds of the reduction in landings may be attributable to reductions in the Northern area party/charter and private/rental boat modes.

Thunberg, Eric and Scott Steinback (1996). CCF SAS Program. SAS Program, Social Sciences Branch, Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA.

A SAS program written to combine the Capital Construction Fund data set with other information to create a combined data set from which cost data could be inferred for vessels operating in the northeast region.

Thunberg, Eric, Edward Bresnayan, and Charles Adams (1993). "Economic Analysis of Technical Interdependencies and the Value of Effort in a Multi-Species Fishery." Draft report, Food and Resource Economics Department, University of Florida, Gainesville.

The paper reports on the results of an analysis of the economic interrelationships in Florida's commercial near shore fishery. A dual based revenue function is specified to estimate own price and cross price elasticities of supply for selected key species and to estimate the marginal value of effort. Empirical findings indicate the fishery is characterized by joint production among all species pairs and that the complementarity of production is strongest for mullet as compared to any other species. This finding implies that effective management of the near shore species complement may be possible through management measures designed to reduce the harvest of mullet. The paper concludes by demonstrating the potential effect that restricting harvest on mullet might have on landings of other near shore species. The amount of compensation payments required to leave commercial harvesters as well off with the management change as without it are also presented.

Thunberg, Eric, Edward Bresnayan, and Charles Adams (1995). "Economic Analysis of Technical Interdependencies and the Value of Effort in a Multi-Species Fishery." Marine Resource Economics, 10(1):59-76.

The paper reports on the results of an analysis of the economic interrelationships in Florida's commercial near shore fishery. A dual based revenue function is specified to estimate own price and cross price elasticities of supply for selected key species and to estimate the marginal value of effort. Empirical findings indicate the fishery is characterized by joint production among all species pairs and that the complementarity of production is strongest for mullet as compared to any other species. This finding implies that effective management of the near shore species complement may be possible through management measures designed to reduce the harvest of mullet. The paper concludes by demonstrating the potential effect that restricting harvest on mullet might have on landings of other near shore species. The amount of compensation payments required to leave commercial harvesters as well off with the management change as without it are also presented.

Thunberg, E.M., T.E. Helser, and R.K. Mayo (1994). "An Age-Structured

Bioeconomic Model to Evaluate Changes in Fishing Mortality in the United States Atlantic Silver Hake Fisheries." Economics Investigation and Population Dynamics Branch, Northeast Fisheries Science Center, National Marine Fisheries Service, 166 Water Street, Woods Hole, MA, 21 pp.

In this paper, a bioeconomic model of the USA whiting fishery is developed. The biological component incorporates age-structured models of whiting stocks while an economic component accounts for size based pricing. A revenue response surface is derived that gives the maximum revenue obtainable from systematically varying fishing mortality and age specific selection patterns. A stochastic recruitment function is used that permits assessment of revenue and yield trajectories over time, as well as their associated probability distributions.

Thunberg, E.M., T.E. Helser, and R.K. Mayo (1994). "An Age-Structured Bioeconomic Model to Evaluate Changes in Fishing Mortality in the United States Atlantic Silver Hake Fisheries." C.M. 1994/T:7, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, St. John's, Newfoundland, Canada, September, 21 pp.

Silver hake or whiting (Merluccius bilinearis) range from Newfoundland to South Carolina. The resource has traditionally supported a U.S.A. fishery on the adult component of the stock. However, with developing markets for juveniles and the possibility of increased effort, managers and industry have expressed concern over the health of whiting stocks that are already considered to be fully exploited. Market prices for whiting are based upon its size and therefore, managers are concerned not only with the overall fishing mortality rate but with how a directed fishery on juveniles may affect the age structure of the population.

Age structured models can be used to evaluate changes in population structure. However, without an understanding of the economic value of different size components, biological models alone provide incomplete management guidance. In this paper, a bioeconomic model of the USA whiting fishery is developed. The biological component incorporates age-structured models of whiting stocks while an economic component accounts for size based pricing. A revenue response surface is derived that gives the maximum revenue obtainable from systematically varying fishing mortality and age specific selection patterns. A stochastic recruitment function is used that permits assessment of revenue and yield trajectories over time, as well as their associated probability distributions.

Thunberg, E.M., T.E. Helser, and R.K. Mayo (1996). "Bioeconomic Analysis of Alternative Selection Patterns in the United States Atlantic Silver Hake Fishery." Social Science Branch and Population Dynamics Branch, Northeast Fisheries Science Center, National Marine Fisheries Service, 166 Water Street, Woods Hole, MA.

In this paper, a bioeconomic simulation of the U.S. fisheries for silver hake, Merluccius bilinearis, is presented. The model design combines elements of age-structured population and harvest yield models with economics of the silver hake fishery. The analysis evaluates both biological and economic effects of interest to managers, such as future yields or rebuilding of parental stock as well as future revenues and net returns to vessels. The bioeconomic model is used to evaluate the economic implications of tradeoffs between alternative selection patterns in the U.S. Atlantic silver hake

fishery. Throughout the study, a selection pattern is defined as the suite of age-specific selection coefficients that are applied to a fish population over time. Of particular interest is exploration of whether tradeoffs among segments of a fish population can result in increased resource value. This question is explored within the context of whether a limited juvenile fishery can co-exist with traditional fisheries without jeopardizing silver hake stocks and if so, under what conditions might such a fishery operate.

Thunberg, Eric, T.E. Helser, and R.K. Mayo (1998). Bio-Economic Analysis of Alternative Selection Patterns in the United States Atlantic Silver Hake Fishery. Marine Resource Economics, 13:51-74.

In this paper a bioeconomic simulation of the U.S. fisheries for silver hake, Merluccius bilinearis, is presented. The model design combines elements of age structured population and harvest yield models with the economics of the silver hake fishery. The analysis evaluates both biological and economic effects of interest to managers, such as future yields or rebuilding of parental stock as well as future revenues and net returns to vessels. The bioeconomic model is used to evaluate the economic implications of tradeoffs between alternative selection patterns in the U.S. Atlantic silver hake fishery. Throughout the study, a selection pattern is defined as the suite of age specific selection coefficients that are applied to a fish population over time. The results indicate that shifting fishing pressure to younger age classes could result in short run gains in economic value that may not be sustainable due to longer run declines in biomass, hence lowered fishery yield and value. By contrast, strategies to delay age at first capture may improve economic value over current levels with only modest reductions in short run fishery yield.

Thunberg, Eric, Charles Adams, Darrell Brannan, and Timothy Taylor (1991). "Commercial Fishing Revenue Losses Under Harvest Restrictions: The Case of the Florida Red Drum." Staff Papers Series, SP 91-4, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

The red drum (Sciaenops ocellatus) was effectively removed from Florida's nearshore commercial fishery in January, 1989. Fishing revenue losses may be mitigated through redirection of effort from the restricted species to other unrestricted species. A revenue function is specified for two time periods over which two different harvest regulations for red drum were effective. The empirical results indicate that fishermen were able to compensate for lost revenue due to the harvest restrictions although the ability to do so differed by gear and regional considerations.

Thunberg, Eric, Charles Adams, Darrell Brannan, and Timothy Taylor (1993). "Commercial Fishing Revenue Losses Under Harvest Restrictions: The Case of the Florida Red Drum." Society and Natural Resources, 6:181-194.

The red drum (Sciaenops ocellatus) was effectively removed from Florida's nearshore commercial fishery in January, 1989. Fishing revenue losses may be mitigated through redirection of effort from the restricted species to other unrestricted species. A revenue function is specified for two time periods over which two different harvest regulations for red drum were effective. The empirical results indicate that fishermen were able to compensate for lost revenue due to the harvest restrictions although the ability to do so differed by gear and regional considerations.

Thunberg, Eric, James L. Seale, Jr., Charles M. Adams, and E. Lee Bouchelle III (1993). "Effect of North Atlantic Swordfish Management On Swordfish and Tuna Markets." RI-93-106, URI/OSU Research Paper Series, A USDA Cooperative State Research Service Joint Research Project Between The University of Rhode Island and Oregon State University, September, 15 pp.

In 1991, the National Marine Fisheries Service and the participating nations of the International Commission for the Conservation of Atlantic Tunas (ICCAT), placed multilateral restrictions on the harvest of swordfish from North Atlantic stocks. These restrictions were necessary to reduce fishing mortality on what were deemed to be overfished stocks. A multi-market approach is used to estimate consumer welfare changes in swordfish and tuna markets as both markets adjust to changes in swordfish management. The results of this analysis are compared and contrasted with that of a partial equilibrium approach in which market price of substitute species are held constant. The study findings indicate that the partial equilibrium approach ignores the price effects of market interactions and results in incomplete analysis of fishery management policy.

Thunberg, Eric, Scott Steinback, Gerry Gray, Amy Gautam, and Maury Osborne (1998). Summary Report of Methods and Descriptive Statistics for the 1994 Northeast Region Marine Recreational Fishing Participation Survey. Draft report, Social Sciences Branch, NOAA, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA, 39 pp.

Two marine sportfishing surveys were conducted during 1994 in the Northeast Region (Maine to Virginia). Data from the surveys provided demographic and economic information on marine recreational fishing participants and nonparticipants. In an earlier report (Steinback and O Neil) the socioeconomic characteristics, recreational fishing preference and perceptions of current and prospective fishery management regulations were documented for a sample of saltwater recreational anglers that were on intercepted fishing trips. This report serves as a companion to the Steinback and O Neil report. The purpose of this report is to document the socioeconomic characteristic or recreational fishing participants and nonparticipants from a sample of households in the Northeast Region. Additionally, the results of a statistical model to project recreational fishing participation rates are reported and forecasts of recreational fishing participation to the year 2010 are developed for each of the 10 states in the study.

Thurman, Walter N. (1991). "Applied General Equilibrium Welfare Analysis." Paper presented at the 1991 meetings of the American Agricultural Economics Association in Manhattan, Kansas.

With the current and increasing interest in applying general equilibrium welfare measurements, it seems useful to review what is known and to discuss some of the issues applied researchers must face. The first half of my paper demonstrates, through example, the variety of circumstances in which general equilibrium welfare analysis works. The second half explores the limits of its generality.

Thurman, Walter N. and J.E. Easley, Jr. (1990). "Economic Models for Fishery Resource Allocations: Valuing Changes in Commercial Harvests." Draft report, Department of Economics and Business, North Carolina State University.

This paper reviews a conceptual model for estimating consumer and

producer surplus in markets other than the harvesting sector and presents some preliminary empirical results for the Gulf red drum fishery. The conceptual model and empirical results are based on the idea of general equilibrium welfare measurement.

Thurman, Walter N. and J.E. Easley, Jr. (1991). "Valuing Changes in Commercial Fishery Harvests: A General Equilibrium Derived Demand Analysis." Draft report.

This paper presents a conceptual model for estimating surpluses from these related markets and present empirical estimates for the Gulf of Mexico red drum fishery. The conceptual model and empirical results employ general equilibrium derived demand functions. The general equilibrium derived demand for an input conceptually accounts (in a single market) for surpluses in related markets and economizes on data requirements in estimation.

Thurman, Walter N. and J.E. Easley, Jr. (1992). "Valuing Changes in Commercial Fishery Harvests: A General Equilibrium Derived Demand Analysis." Journal of Environmental Economics and Management, 22(3):226-240.

This paper presents a conceptual model for estimating surpluses from these related markets and present empirical estimates for the Gulf of Mexico red drum fishery. The conceptual model and empirical results employ general equilibrium derived demand functions. The general equilibrium derived demand for an input conceptually accounts (in a single market) for surpluses in related markets and economizes on data requirements in estimation.

Thurman, Walter N. and Michael K. Wohlgenant (1989). "Consistent Estimation of General Equilibrium Welfare Effects." American Journal of Agricultural Economics, 71(4):1041-1045.

A general equilibrium demand curve is appropriate for measuring the surplus changes in several markets induced by a policy intervention in one market. Guidelines for the identification and consistent estimation of such a demand curve are discussed. Specifically, conditions are stated under which the dropping of prices of related goods yields a consistent estimate of the slope of the general equilibrium demand curve. Also, a method similar to Leamer's is proposed to provide consistent bounds for the general equilibrium demand slope when the slope is underidentified.

Thurow, Lester C. (1971). "The Income Distribution as a Pure Public Good." Quarterly Journal of Economics, (May):327-336.

This paper concentrates on the income redistribution that occurs because the distribution of income itself appears in individual utility functions. In short, the income distribution meets all of the tests of a pure public good. Exclusion is impossible, consumption is nonrival; each individual must consume the same quantity. The same problems also occur. Each individual has a vested interest in disguising his preferences concerning his desired income distribution to avoid paying his optimal share of the necessary transfer payments.

Tillman, Michael F. (199?). Bycatch The Issue of the 90s. Presentation, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1335 East-West Highway, Silver Spring, Maryland.

Presentation made at the Southeast Fisheries Association conference on bycatch in Orlando Florida.

Timmerman, James A., Jr. (1984). "Institutional Constraints On Marine Recreational Fisheries Development." Chapter 18 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

A presentation promoting the use of state and federal funds to expand recreational fishing structures and programs.

Tisdell, Clem (1986). "Conflicts about Living Marine Resources in Southeast Asian and Australian Waters: Turtles and Dugong as Cases." Marine Resource Economics, 3(1):89-109.

This paper considers conflicts that arise and socioeconomic problems involved in managing fugitive resources, especially transborder or transfrontier ones when economic development occurs. To do this it concentrates on the situation of turtles and of dugong in Southeast Asian and Australian waters. Particular attention is given to turtle farming and to zone as conservation strategies and the use of marine parks for resource management. Questions are raised about the responsibilities of developed countries such as Australia for conserving species that migrate to less developed countries.

Tisdell, Clem and James M. Broadus (1989). "Policy Issues Related to the Establishment and Management of Marine Reserves." Coastal Management, 17(1):37-54.

Several hundred marine reserves now exist and their number is growing. The demand for additional marine reserves can also be expected to grow, especially since they seem to be relatively undersupplied compared to terrestrial biosphere reserves. Basic socioeconomic reasons are given to why governments should establish marine reserves. Management problems are illustrated by reference to the Great Barrier Reef Marine Park and to the National Oceanic and Atmospheric Administration's (NOAA) governing of Title III of the Marine Protection, Research and Sanctuaries Act. The nature, clarity, and precision of objectives as set out in legislation are discussed, and the importance for management of public and political support is considered. Using economic analysis, an approach different to that used by some ecologists for determining the optimal size of reserves is outlined and the view of Soule' and Wilcox favoring many large reserves is modified. The natural difficulties involved in mandating marine reserves are highlighted by comparison with land based parks. Zoning and multiple use are common features of marine reserves and require important management and policy decisions to be made about optimal (or at least satisfactory) zoning and multiple use arrangements. Issues that ought to be taken into account and techniques for making such decisions are discussed, and it is suggested that there should be greater input from the social sciences in the management of marine reserves.

Tkacz, Bob (1995). Bycatch Guidance, Practical Book Written for Alaska Longline Fishermen. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

A review of Janet smoker s Fishermen s Guide to Catch and Bycatch that shows longliners where and how to avoid bycatch in the longline fisheries for sablefish (black cod), halibut, and turbot for the Gulf of Alaska and Bering Sea.

Tkacz, Bob (1995). Proof, allocation are Hurdles for Bycatch Innovators,

three Gear-Based Approaches in Alaska. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

A low bycatch scallop harvester, pot traps for cod that reduce halibut bycatch, and, trawl mesh panels to exclude juvenile pollock from groundfish trawls are discussed as means to make fishing gear more selective in harvesting fish in directed fisheries.

Tobin, James (1958). "Estimation of Relationships for Limited Dependent Variables." Econometrica, 26:24-36.

A model of a hybrid of probit analysis and multiple regression is developed in this paper.

Tomasi, Theodore D., Carol A. Jones, and Stephanie W. Fluke (1995). Public and Private Claims in Natural Resource Damage Assessments. Draft, Resource Valuation Branch, damage Assessment Center, National Oceanic and Atmospheric Administration, Silver Spring MD, July 13, 40 pp.

In this paper, we consider the distinctions between public and private claims for injuries to public resources and analyze areas of potential overlap.

Toussaint, W. D. (1992). "The Flue-Cured Tobacco Program." AG-476, North Carolina Cooperative Extension Service, College of Agriculture & Live Sciences, North Carolina State University.

The tobacco program began in the 1930's but has changed over time to adapt to changes in the industry. The program now operates at no cost to the government except for some general administrative costs and provides foreign and domestic buyers with a dependable quantity of tobacco. Quota owners receive higher net incomes because of the program and the year to year variability of prices received by growers is reduced.

Townsend, Ralph E. (1985). "On "Capital Stuffing" in Regulated Fisheries." Land Economics, 61(2):195-197.

As almost uniform experience in fisheries managed by limited entry has been the increased use of capital by each firm. This is widely regarded as an undesirable loophole in programs to limit fishing effort. Closer examination indicates that the increased use of capital by firms is produced by at least six different incentives. Moreover, not all of these incentives are economically undesirable. The net effect of "capital stuffing" is ambiguous and can only be evaluated empirically.

Townsend, Ralph E. (1986). "A Critique of Models of the American Lobster Fishery." Journal of Environmental Economics and Management, 13:277-291.

A number of studies have used the American lobster fishery to raise theoretical and empirical issues in the economic application of Schaefer yield-effort models. The present research shows that both published variants of the Schaefer yield-effort model are poor predictors of landings in the lobster fishery. The analysis suggests that minimum size rules in the lobster fishery make the Beverton-Holt dynamic pool model more appropriate to the lobster fishery than the Schaefer yield-effort model.

Townsend, R.E. (1990). "Entry Restrictions in the Fishery: A Survey of the Evidence." Land Economics, Vol. 66, No. 4, Nov., pp. 359-378.



A survey of existing limited entry programs found that (1) the restrictiveness of the program is correlated to its economic success, (2) an inverse relationship exists between the complexity of a fishery and the success of management, ceteris paribus, (3) the social and political environment affects the success of limited entry plans, (4) limited entry has generated economic benefits more often by reducing short run externalities than by eliminating long run stock externalities, (5) no evidence exists that weak limited entry plans evolve into strong, successful plans, (6) the rents created by limited entry are often politically problematic, and (7) the rights under restricted access have proven to be quite different from the terrestrial property rights. Also, management costs are an important component of the social costs of managing a fishery.

Townsend, Ralph E. (1995). Transferable Dynamic Stock Rights. Marine Policy, 19(2)153-158.

Individual transferable quotas (ITQs), while solving many short run externalities, provide limited incentives for individual fishers to conserve the resource. All decisions that determine harvests are made by the government, and the shares of future harvests that are allocated to any particular fisher are not affected by that fisher's actions. For example, there is no incentive for the individual fisher to avoid catches of smaller fish. In fact, the incentives for discarding and high grading may be worse under ITQs than under other forms of management. This analysis proposes a transferable dynamic stock right (TDSR), under which rights are allocated to fishers as life cycle shares of each year class that can be harvested. Year class allocations would change each year to reflect catches, growth and natural mortality. Allocations of newly recruited fish would be in proportion to the share of the rights to the breeding stock held by each fisher. Under TDSRs, the fisher would internalize the economic decision about whether to catch a given year class as small fish or as a larger tonnage of large fish. TDSRs provide the fisher with incentives to harvest in ways that maximize the value of the catch from a given year class.

Townsend, Ralph E. (1997). Peer Review of the Economics of the Management Strategies for Red Snapper in the Gulf of Mexico. Draft report for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Department of Economics, University of Maine, Orono, ME, September, 28 pp.

This paper is a peer review of the appropriateness of management measures in the fishery management plan for red snapper in the gulf of Mexico for conserving and managing the resource and a consideration of the cost and benefits of all reasonable alternatives to an individual fishing quota program for the red snapper resource.

Townsend, Ralph E. and Samuel G. Pooley (1994). "Comprehensive Property Rights: Fishery Trusts." C.M. 1994/T:6, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 9 pp.

A true property rights scheme, a fishery trust, is proposed. A fishery trust is a corporation that has comprehensive management authority. The fishery trust is owned through corporate ownership rules. Owner shares in the trust are distributed initially to some group, who then vote those shares to determine the fishery governance structure. Shares are freely transferable. The responsibility of the trust would be comprehensive, including

responsibility for the cost of administration and enforcement as well as management decisions. Because the ownership rights in the trust are permanent and transferable, owners have every incentive to husband the resource. Although comanagement has been suggested as a vehicle for greater fisher involvement in management, a corporate ownership structure has long term incentives that are clearly superior to those under collective or cooperative management rules.

Transportation Research Board (1974). "Travel Demand Forecasting."  
Seven reports prepared for the 53rd Annual Meeting of the Highway  
Research Board, National Research Council, Washington, D.C.

This RECORD presents findings from leading researchers in the field on interactions between travel behavior assumptions and the resulting travel models and forecasts made with these assumptions.

Trent, Lee, Anna Avrigian, and Rosalie Shaffer (1997). Recreational Fishery Surveys Conducted by Personnel of the National Marine Fisheries Service Panama City Laboratory, 1970-1996. Panama City Laboratory Contribution No. 97-4, February, 25 pp.

This paper provides information about studies that have been proposed, started, completed, or continued by Panama City Laboratory (PCL) personnel that involve the collection of recreational fisheries data. Specific objectives are to provide brief descriptions, details for some survey methods and how well the methods worked, and a pre-evaluation of the proposed pilot surveys (log book and telephone) that are to begin in 1997.

Trent, Lee, William A. Fable, Jr., Sandra J. Russell, Gilbert W. Bane, and Barbara Jayne Palko (1987). "Variations in Size and Sex Ratio of King Mackerel, Scomberomorus cavalla, off Louisiana, 1977-85. Marine Fisheries Review, 49(2):91-97.

Data from over 27,000 king mackerel collected from Grand Isle, Louisiana during 1977-85 were analyzed to evaluate temporal variations in size and sex compositions. The fish were caught by recreational and commercial hook and line fishermen. Groups of king mackerel from Louisiana were composed of a greater portion of large fish than were populations from other areas in the southeastern United States with the possible exception of south Carolina and Georgia. Large (greater than 120 cm fork length) king mackerel were caught off Louisiana throughout the year. For both males and females, catches were composed of the smallest fish in April through October and the largest fish between November and March. Females dominated catches in most months and comprised a greater portion of the recreational than the commercial landings. Female percentage was usually lower in the warmer than in the colder months. In general, female percentage increased with an increase in fish size.

Trent, Lee, Barbara Jayne Palko, Mark L. Williams, and Harold A. Brusher (1987). "Abundance of King Mackerel, Scomberomorus cavalla, in the Southeastern United States Based on CPUE Data from Charterboats, 1982-85." Marine Fisheries Review, 49(2):78-90.

In 1982, a survey was initiated to obtain daily catch and effort data on fishes commonly caught by charterboats in the southeastern United States. Boat effort and king mackerel CPUE data obtained from 1982 through 1985 were analyzed. The offshore fishing zone (>10 fathoms) received the highest amount of trolling and other fishing (nontrolling) efforts; the nearshore fishing zone (<=10 fathoms) received the second highest trolling effort and lowest other fishing effort; the estuarine fishing zone received the lowest trolling

effort and the second lowest other fishing effort. Data to evaluate seasonal fluctuations in fishing effort were provided for 15 areas of the southeastern United States and for the U.S. Caribbean. Annual CPUE of king mackerel by other fishing was much lower than trolling for most areas and years. CPUE was higher in the nearshore or offshore zone than in the estuarine zone for all area year combinations except North Carolina in 1983. CPUE values were highest in the nearshore zone about as often as in the offshore zone. Highest catch rates occurred in areas in both the U.S. south Atlantic and gulf of Mexico when all years were evaluated; high catch rates occurred in North Carolina, Georgia, northwest Florida, Louisiana, and Texas. Seasonal patterns of CPUE along the U.S. south Atlantic coast varied among areas in such a way as to show that a temperature dependent migration (north in the warm months and south in the cold months) was not indicated; king mackerel were high in abundance off North Carolina and the southern areas of Florida in late fall and early winter. In the Gulf of Mexico, it appeared that in the spring and early summer some groups of king mackerel simultaneously migrated northward along the east and west Gulf of Mexico coasts. Highest CPUE for king mackerel occurred in 1983 or 1985 when all areas were considered. Evaluation of the historical data bases in northwest Florida indicated cyclical patterns of abundance over a 20 year period.

Tse, E. and A. Khilnani (1989). "An Integrated System Model for a Fishery Management Process - I." Computers Math. Applic., 17(8/9):1329-1343.

This paper describes the use of a system model in the support of a fishery management process. The system provides an integrated framework for describing the dynamic interactions among fish resources, fishermen, processors, and consumers through the notion of market equilibrium. In addition to giving a complete detail on the system components and the integration mechanism, the paper also describes how the integrated system can be used in supporting fishery management processing required by the Fishery Conservation and Management Act of 1976.

Tse, E. and A. Khilnani (1989). "An Integrated System Model for a Fishery Management Process - II. A Case Study." Computers Math. Applic., 18(6/7):675-690.

This paper describes the use of a fishery management system in policy analysis studies to support the shrimp fishery management process in the Gulf of Mexico. The studies were performed during the period 1979-1983 by a joint effort between a research team at Stanford and staff analysts at the Southeast Fisheries Center. The paper gives a brief account of the results for the 5 year period, as well as the insights derived through the process of using a mathematical economic model in support of the policy process.

Tse, Edison T.S., Arvind Khilnani, and Jim S.C. Tom (1980). "Integrated Approaches to Fishery Policy Analysis: A Case Study of the Tortugas Shrimp Fishery." Executive Summary from the Final Report on Implementation of the Fisheries System Management Model for the Southeast Shrimp Fishery, Contract No. NA79-GA-C-00006, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami, Florida, Stanford University, Department of Engineering-Economic Systems, Stanford, CA, January, pp. 14-20.

The executive summary summarizes the management characteristics and adaptability of a Fisheries System Management Model (FISYS) as applied to the Tortugas shrimp fishery off the southwest coast of Florida.

Tsoa, Eugene, William E. Schrank, and Noel Roy (1982). "U.S. Demand for Selected Groundfish Products, 1967-80." American Journal of Agricultural Economics, 64(3):483-489.

The expansion of national fisheries jurisdiction to the two hundred mile limit enabled maritime nations to allocate increased shares of the fish catch off their shores to their own fishermen. The Atlantic groundfish catches of Canada and the United States are sold primarily on the American market. A Nerlovian inventory adjustment price expectations model is estimated for the American demand for groundfish. Income and price elasticities are perverse. The ability of the American market to absorb the increased anticipated catches are therefore limited, and benefits of extended fisheries jurisdiction will be lost unless marketing arrangements are substantially changed.

Tsoa, Eugene, William E. Schrank, and Noel Roy (1986). "U.S. Demand for Selected Groundfish Products, 1967-80: Reply." American Journal of Agricultural Economics, 68(4):1025-1027.

A reply to criticisms raised by Crutchfield (1986) and Lin, Johnston, and Rettig (1986) about their paper on U.S. demand for groundfish (1982).

Tuininga, Chris (199?). The Groundfish Industry in the Denmark. Draft report, Department of Agricultural and resource Economics, Oregon State University, Ballard Extension Hall #205, Corvallis, Oregon, 20 pp.

A review of the groundfish industry in Denmark including landings, production, trade, fleet characteristics, the domestic market, fishery policy, and its economy.

Tuininga, Chris and Richard Johnston (199?). The Groundfish Industry in the Netherlands. Draft report, Department of Agricultural and resource Economics, Oregon State University, Ballard Extension Hall #205, Corvallis, Oregon, 21 pp.

A review of the groundfish industry in the Netherlands including landings, production, trade, fleet characteristics, the domestic market, fishery policy, and its economy.

Turnbull, Deborah (1980). "Provisional Bibliography: Fish By-Catch From Shrimp Trawling." Prepared for Round Table on Non-Traditional Fishery Products for Mass Human Consumption, September 15-19, Washington, D.C. Compiled by I.D.R.C. 5990 Iona Drive, U.B.C., Vancouver, B.C. V6T1L4, Canada.

Many of the listed papers are part of the holdings of the IDRC fisheries library in Vancouver, B.C., Canada. The citations are listed alphabetically according to the author's name. The citations are numbered to facilitate the use of the subject and geographical indices.

Turner, Matthew A. (1996). Value-based ITQ s. Marine Resource Economics, 11(2):59-69.

There is empirical and theoretical evidence indicating that quota induced high grading is a problem in weight based ITQ programs. This paper examines value based ITQ programs as a possible solution to this problem. It is shown that value based ITQ programs do not provide an incentive to high grade and may achieve a target harvest with greater accuracy than weight based ITQ programs. Two ways of administering value based ITQ programs are suggested. Though both are arguably more difficult to administer than a

weight based ITQ program, a value based ITQ program may be less complicated than a weight based ITQ program coupled with the sorts of taxes, landings restrictions, or multiple quotas, that have been proposed as remedies for quota induced high grading.

Turris, Bruce R. (1994). Canada's Pacific Halibut Fishery: A Case Study of an Individual Quota Fishery. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

The halibut fishery is one of the oldest commercial fisheries in the North Pacific, dating back to the 1890's. In Canada, as in most competitive fisheries around the globe, by the late 1980's the halibut fishery was becoming increasingly unsafe, overcapitalized, wasteful, and difficult to manage. As the number of fishing days diminished annually, product quality worsened, and landed price fell, fishermen started wondering if there was not a better way to manage the halibut fishery. Their quest for an alternative management approach for the halibut fishery resulted in the implementation of individual quotas in 1991.

This presentation will discuss the Canadian Pacific halibut fishery before and after the introduction of individual quotas. The presentation addresses the problems and concerns in the fishery that led to a change in management, provides details of how the program was implemented, and describes the benefits of the system to date.

Turvey, Ralph (1964). "Optimization and Suboptimization in Fishery Regulation." American Economic Review, 56:207-218.

The purpose of this article is to show that fishery regulation is one of those spheres of economic policy where what is the best thing to do depends on what can be done. What follows is a static analysis of a single trawl fishery where there is only one fish stock, fished from ports that supply a common competitive market and that are equidistant from the fishing ground with free and easy entry by new firms. The purpose is to provide an interesting and important example of the notions of optimization and suboptimization and of the proposition that coping with external diseconomies will sometimes involve interfering with the nature as well as the scale of private productive activities.

Twomley, Bruce (1994). "License Limitation in Alaskan Salmon Fisheries." In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Information from Alaska's license limitation program in its salmon fisheries may help participants address the two questions posed at the conference: (1) is limited access appropriate and effective and (2) if so, what form limited access works best for a particular fishery?

Upton, Graham J.G. and Bernard Fingleton (1985). "Regression and Autoregression." Chapter 5 in Spatial Data Analysis by Example, John Wiley & Sons, New York.

This chapter focuses attention on certain aspects of regression analysis that come to the fore with spatial data.

Upton, Harry (1992). "Problems in the Gulf of Mexico Shrimp Fishery." Chapters 4 and 5 of a draft report, Center for Marine Conservation, 1725 DeSales St, NW, STE 500, Washington, D.C.

Problems associated with the Gulf shrimp fishery can be divided into two general categories. Those relating directly to the Gulf shrimp harvesting sector and those relating to other natural and human-induced changes occurring in the Gulf of Mexico coastal zone. The seven basic problems are: overcapitalization and overcapacity, incidental bycatch, overfishing, habitat loss, management/enforcement problems and gaps in research, increasing imports that are competing with domestic production, and introduction of alien species of shrimp or viruses. Problems in research and management may be tied to both of these categories.

Upton, Harry, Peter Hoar, and Melissa Upton (1992). The Gulf of Mexico Shrimp Fishery: Profile of a Valuable National Resource. Center for Marine Conservation, 1725 DeSales Street, NW, Washington, DC 20036.

This report provides an overview of the Gulf of Mexico shrimp fishery - its biology, habitat, economics, and management - and to show how these elements interact. After the overview, the primary problems of the fishery are defined and summarized. The final chapter provides some management alternatives and recommendations for solving some of the problems facing the fishery.

United Nations (1995). Draft Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks. United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, Sixth Session, New York, 24 July - 4 August 1995.

The objective of this agreement is to ensure the long term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the Convention.

United States Department of Commerce (1989). Style Guide, Regional Fishery Management Councils, Other Applicable Law, Guidelines for Council Operations and Administration. Federal Register, January 17, 54(10):1700-1720.

NOAA issues this rule to revise regulations and guidelines concerning the operation of Regional Fishery Management Councils under the Magnuson Fishery Conservation and Management Act. This action implements parts of Title 1 of Pub. 1, 99-659, which amends the Magnuson Act, clarifies instructions of the Secretary of Commerce on other statutory and regulatory requirements affecting the Councils and adjusts the fishery management planning and development procedures in line with recommendations of two fishery management studies commissioned by NOAA in 1986. This action includes the uniform standards for the operation of the Councils required by the Magnuson Act.

United States Department of Commerce (1989). Guidelines for Fishery Management Plans. Federal Register, July 24, 54(140):30826-30844.

NOAA issues this rule to revise the advisory guidelines for two of the seven national standards for fishery conservation and management set forth in section 301(a) of the Magnuson Fishery Conservation and Management Act. Standards 1 requires conservation and management measures to prevent overfishing on a continuing basis. Standard 2 requires conservation and management measures to be based on the best scientific information available. The revised guidelines stipulate that : (1) Each existing and future FMP

specify, to the maximum extent possible, an objective and measurable definition of overfishing for each managed stock or stock complex, with an analysis of how the definition was determined and how it relates to biological potential; and (2) the Secretary is responsible for assuring that a Stock Assessment and Fishery Evaluation (SAFE) report is prepared and updated as necessary, for each fishery.

United States Department of Commerce (1995). Atlantic Swordfish Fishery. 50 CFR Part 630, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, September, 20 pp.

An unofficial compilation of federal regulations for the swordfish fishery, proposed rules, public hearing announcements, and updates.

United States Department of Commerce (1995). Atlantic Tuna Fishery. 50 CFR Part 285, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, September, 60 pp.

An unofficial compilation of federal regulations for the Atlantic tuna fishery, proposed rules, public hearing announcements, and updates.

United States Department of Commerce (1995). Atlantic Sharks. 50 CFR Part 678, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, October, 15 pp.

An unofficial compilation of federal regulations for the Atlantic shark fishery, proposed rules, public hearing announcements, and updates.

United States Department of Commerce (1996). Atlantic Swordfish Fisheries: Limited Access Program. 50 CFR Parts 600 and 678, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 31 pp.

The National Marine Fisheries Services proposes to implement a limited access system contained in Amendment 1 to the Fishery Management Plan for Atlantic Swordfish that would redefine permits as directed or incidental, develop eligibility criteria for these permits based on historical participation, and specify rules for transferability of permits.

United States Department of Commerce (1996). Atlantic Swordfish and Shark Fisheries: Establishing an Interim Rule. 50 CFR Parts 630 and 678, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, July, 9 pp.

NMFS proposes to amend those regulations governing the Atlantic swordfish and Atlantic shark fisheries by establishing a limited access system and defining criteria for participation in both fisheries. Amendment 1 to the Fishery Management Plan for Atlantic Swordfish and Amendment 1 to the Fishery Management Plan for Atlantic Sharks describe the proposed action in detail. NMFS proposes to institute a limited access system for the fisheries, develop eligibility criteria for participating in the fisheries based on historical participation, specify rules for transferability of permits, and prohibit the possession or sale of swordfish or sharks caught incidentally as bycatch in fisheries targeting other species (e.g., tuna). The intent of this regulation is to cap commercial harvesting capacity at recent historic levels to prevent additional vessels from entering these fisheries thus leading to additional overcapitalization.

United States Department of Commerce (1996). Fisheries of the Caribbean, Gulf, and South Atlantic. 50 CFR Part 622, National Oceanic and

Atmospheric Administration, National Marine Fisheries Service, November, 85 pp.

An unofficial compilation of federal regulations for the southeast region fisheries, proposed rules, public hearing announcements, and updates.

United States Department of Commerce (1996). Magnuson-Stevens Fishery Conservation and Management Act. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, NOAA Technical Memorandum NMFS-F/SPO-23, December, 121 pp.

An act to provide for the conservation and management of the fisheries and for other purposes.

United States International Trade Commission (1976). Shrimp. USITC Publication 773, Washington, D.C., May, 111 pp.

This study analyses the impact of shrimp aquaculture imports on the domestic, open access fishery in the Gulf of Mexico and the south Atlantic. The commission determined that shrimp, fresh, chilled, frozen, prepared, or preserved is being imported into the United States in such increased quantities as to be a substantial cause of serious injury to the domestic industry catching and landing shrimp.

United States International Trade Commission (1985). Conditions of Competition Affecting the U.S. Gulf and South Atlantic Shrimp Industry. USITC Publication 1738, August, 277 pp.

This study analyses the impact of shrimp aquaculture imports on the domestic, open access fishery in the Gulf of Mexico and the south Atlantic.

Urner Barry (1995). "U.S. Imports of Shrimp (All Types) by Country." Fishery Market News Report, 5:10, Wednesday, January 25.

Table of imports of shrimp by country comparing November 1993 to November 1994 with cumulative totals.

Valatin, Gregory (1992). The Relationship Between Fleet Capacity and Fishing Effort. Fifth IIFET Conference, Paris, Sea Fish Industry Authority, 10 Young Street, Edinburgh EH2 4JQ, United Kingdom, July, 12 pp.

It appears by no means a simple task to quantify how fleet capacity is translated into effort and catches of the particular stocks of interest. Some of the important considerations entailed in the use of structural policies to reduce fleet capacity and effort are highlighted.

Valencia, Mark J. And James Barney Marsh (1986). Southeast Asia: Marine Resources, Extended Jurisdiction, and Development. Marine Resource Economics, 3(1):3-27.

This paper is an analytical survey of the supply and demand for marine resources in Southeast Asia region. Of particular interest are the net resource gains or losses to specific countries resulting from extended maritime jurisdiction and the impact these changes may have on development. First approximation estimates are presented as to the growth rates of demand for specific resources (hydrocarbons, living resources, etc.) and the net value of the resources to the various countries.

van Kooten, G. Cornelis (1995). Climatic Change and Canada's Boreal Forest:



Socio-economic Issues and Implications for Land Use. Canadian Journal of Agricultural Economics, 43(1):133-148.

This paper reviews the effect of climate change and policies to sequester carbon on forest land use. Efficient mitigation strategies often require the conversion of agricultural land to forestry in order to sequester carbon, but such strategies could be wrong for Canada's boreal forest region if global warming is inevitable. It is argued that, from both an economic and a social perspective, conversion of the southern boreal forest to grassland or agriculture might be a better policy.

Van Meter, Victoria Brook (1987). Florida's Sea Turtles. Florida Power and Light Company.

An overview of the marine turtle for the general public.

Vannuccini, Stefania (1995). World Production and Trade in Small Pelagics (1988-95) Statistical Survey. Food and Agriculture Organization of the United Nations, GLOBEFISH, Fishery Industries Division, Viale delle Terme di Caracalla, 00100 Rome, Italy, June.

The world market for small pelagic species is reviewed in tabular and graphic form. The major species groups covered are mackerel, jack and horse mackerel, herring, sprat, pilchard, sardine and sardinella. Landings are reported by species and by major countries, by production and major producing countries and by product type; exports and imports are broken down by product type and by country of origin and destination.

Varaiya, P.P. (1972). Notes on Optimization. Van Nostrand Reinhold Company, New York.

The objective of these notes is to present the main concepts and techniques of mathematical programming and optimal control to students having diverse technical backgrounds. An understanding of this material should enable the reader to follow much of the recent technical literature on nonlinear programming, deterministic optimal control, and mathematical economics.

Varian, Hal R. (1984). Microeconomic Analysis. 2<sup>nd</sup> edition, Chapters 0, 1, 2, 3, and 8. W.W. Norton & Company, New York.

A description of economics, the theory of the firm, the theory of the market, the theory of the consumer, and topics in the economics of information are included.

Vaughan, Douglas S. and James M. Nance (1998). "Estimates of Bycatch of Mackerel and Cobia in U.S. South Atlantic Shrimp Trawls." Report for Gulf of Mexico and South Atlantic Fishery Management Councils, National Marine Fisheries Service, Beaufort Laboratory, 101 Pivers Island Road, Beaufort, North Carolina, February, 25 pp.

Estimates of bycatch of king and Spanish mackerel and cobia were requested to be made for inclusion in the 1998 stock assessments of these species by the Gulf and South Atlantic Fishery Management Councils using two approaches to expand bycatch finfish samples with shrimp trawl catch and effort information to obtain estimates of total finfish bycatch withing larger temporal/geographic strata. First, expansion by trip and the second, finfish to shrimp catches withing strata.

Vaughan, Douglas S. and James R. Waters (1994). "Comparison of Weighted Nonlinear Regressions on the Von Bertalanffy Growth Curve Using Data with Unequal Numbers at Age." Draft report, National Marine Fisheries Service, Beaufort Laboratory, 101 Pivers Island Road, Beaufort, North Carolina.

When estimating parameters of the von Bertalanffy growth curve from length-at-age data for marine fishes, often most length measurements are from younger fish, with fewer measurements of older fish. Plots of observed and predicted lengths or comparisons of the estimated parameter  $L_{\infty}$  with maximum lengths observed may suggest that poor estimates of  $L_{\infty}$  were obtained. In this study, growth in length of individual fish was simulated from a von Bertalanffy growth curve with known parameters, with the number of fish sampled at each age depending on the instantaneous mortality rate,  $Z$ . Methods of weighted nonlinear regression, applied to simulated growth data, included: (1) unweighted; or weighted by the inverse of (2) the numbers of fish measured at each age ( $1/N_i$ ), (3) the standard error of the mean length at each age ( $1/SE_i$ ), and (4) the estimated standard deviation in length at each age ( $1/\sigma$ ). Less accurate and precise estimates of  $L_{\infty}$  and  $K$  were obtained with increasing  $Z$  for all weighting methods; except for large  $K$ , when more accurate parameter estimates were obtained with increasing  $Z$ . Weighting by  $1/N_i$  yielded more precise estimates of the growth parameter than the other weighting methods. In practice, the advice of looking for patterns in the residuals should be followed before making the final choice among estimation methods.

Vaughan, Douglas S., Joseph E. Powers, and Gerald P. Scott (1990). "Preliminary Production Model Analysis of the North Atlantic Swordfish Resource." ICCAT Working Document, SCRS/90/, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Beaufort Laboratory, Beaufort, North Carolina.

The status of the North Atlantic swordfish resource is considered using production model analysis. Sensitivity of the production model fits to stock hypotheses, model parameters, and equilibrium assumptions as well as error in measures of effective effort are considered in the analysis. When the catch and effort time series is of short duration compared to the life span of the fish species (as with swordfish), simulation results suggest that traditional production model fits to data representing non-equilibrium (transitional) conditions in a fishery may give spurious results and can form a poor basis for management decisions.

Vaughan, Douglas S., John V. Merriner, Charles S. Manooch III, and Jennifer Potts (1995). "Assessment of Southeastern U.S. Atlantic Wreckfish Stock for Fishing Years 1988-1994." Report for Snapper Grouper Assessment Group, South Atlantic Fishery Management Council, National Marine Fisheries Service, Southeast Fisheries Science Center, Beaufort Laboratory, 101 Pivers Island Road, Beaufort, North Carolina, January, 32 pp.

The material included in this report updates that provided in the February 1994 report (Vaughan et al., 1994) to the South Atlantic Fishery Management Council's (SAFMC) Snapper Grouper Assessment Group. Included are the latest analysis of length at age data, a summary of landings and length frequency data from the fishery for 1988 through 1994 fishing years, application of separable virtual population analysis to two catch at age matrices, and analysis of yield and spawning stock biomass per recruit. Appendix A presents a sensitivity analysis of the VPA by including limited data recently obtained from the eastern North Atlantic. Complete landings for

January of the 1994 fishing year (January, 1995) were not available at the time this analysis was undertaken.

Vaughan, Douglas S., John V. Merriner, Charles S. Manooch III, and Jennifer Potts (1996). "Assessment of Southeastern U.S. Atlantic Wreckfish Stock for Fishing Years 1988-1995." Report for Snapper Grouper Assessment Group, South Atlantic Fishery Management Council, National Marine Fisheries Service, Southeast Fisheries Science Center, Beaufort Laboratory, 101 Pivers Island Road, Beaufort, North Carolina, January, 35 pp.

The material included in this report updates that provided in the February 1995 report (Vaughan et al., 1995) to the South Atlantic Fishery Management Council's (SAFMC) Snapper Grouper Assessment Group. Included are the latest analysis of length at age data, a summary of landings and length frequency data from the fishery for 1988 through 1995 fishing years, application of separable virtual population analysis to two catch at age matrices, and analysis of yield and spawning stock biomass per recruit. Complete landings for January of the 1995 fishing year (January, 1996) were not available at the time this analysis was undertaken. hood methods (Kmenta, 1971).

Vaughan, William J. and Clifford S. Russell (1982). "Valuing a Fishing Day: An Application of a Systematic Varying Parameter Model." Land Economics, 58(4):450-463.

The objective of this study is to estimate the value in average willingness to pay terms of a day of freshwater recreational fishing differentiated by fish species sought. The approach employed involves the estimation of a varying parameter travel cost model from cross sectional data on fee fishing sites. This refinement of the traditional travel cost model attempts to account for the influence of site characteristics - especially the fish species available for capture - on the demand function for fishing days.

Vaughan, William J., Clifford S. Russell, and Michael Hazilla (1982). "A Note on the Use of Travel Cost Models with Unequal Zonal Populations: Comment." Land Economics, 58(3):400-407.

In this comment, we show, using data from Bowes and Loomis (1980), that misspecification of functional form can produce distorted estimates of consumers' surplus and commensurate errors in estimates of site value. Further, we suggest that estimating a linear visitation-travel cost relationship when the true relationship is nonlinear can produce variance in the residuals that could be erroneously diagnosed as heteroskedasticity if either a constructive (Park, 1966) test is applied to the OLS residuals or if the heteroskedasticity parameter is estimated directly using maximum likeli(1981). "Research Priorities in the Gulf Shrimp Industry." Mississippi State University, Mississippi Cooperative Extension Service, Sea Grant Advisory Services, 4646 W. Beach Blvd., Suite 1-E, Biloxi, MS 39531.

Nominal grouping is used to arrive at a list of priorities and a consensus of their importance. The ten items that were considered to be most important are (1) high cost of fuel, (2) market research to increase per capita consumption, (3) research on the impact of foreign shrimp imports and alternative solutions to minimize this impact, (4) excessive governmental regulation, (5) research on the impact of uniform conservation laws for all national and international fisheries, (6) pollution of estuaries, (7) increased utilization of bycatch, (8) loss of the fishing area (Texas closure), (9) the impact of high interest rates on vessels and inventory, and

(10) possible overcapitalization of the shrimp fleet. A brief description of each problem by a technical specialist is provided.

Veal, C. David and John R. Kelly (1983). "Fuel Conservation in the Gulf and South Atlantic Shrimp Fishing Fleet." Report VIII in Assessment of Shrimp Industry Potentials and Conflicts, Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August, 62 pp.

The problems associated with improving fuel efficiency in the Gulf and south Atlantic shrimp fishing fleet are complex. While the technology exists, the data necessary to do an adequate job of designing fuel efficient technologies for each vessel do not exist since they were not constructed in shipyards using marine engineers or naval architects. The authors propose the formation of a number of task forces and delivery mechanism that should provide adequate information to allow each individual vessel owner to make appropriate decision on fuel saving technologies that affect him.

Veal, David, Ron Lukens, and Dave Burrange (1984). "Structure, Strategy and Fuel Consumption in the Mississippi Alabama Shrimp Fleet." Final report, NMFS Award No. NA82-GA-H-00007, GASAFDFI Project No. 21-04-15000, January, 27 pp.

This study develops a base of information on present fuel use patterns and gear characteristics in the Mississippi and Alabama shrimp fleets as examples of operations that demand high mobility and are fuel intensive. The information can be used in planning fuel use patterns that may be more efficient and in the evaluation of potential needs for research and fuel conservation technology.

Veal, David, Mac V. Rawson, Jr., and William Hosking (1981). "Structure, Strategy and Fuel Consumption in the Gulf Shrimp Fleet." The Society of Naval Architects and Marine Engineers, No. 3. Papers to be presented at Fishing Industry Energy Conservation Conference, Seattle, WA, October 26-27, 1981.

For the Gulf fleet, fuel and oil account for 40-54 percent of total operating cost for vessels over 15 m (50 ft.). The Gulf shrimp fleet consumes 33 percent of the diesel fuel used by the U.S. fishing industry; the shrimp industry is second only to the Maine lobster industry in energy inefficiency per unit of protein produced.

Veal, C. David, Gary Graham, J.E. Easley, and J.R. Kelly (1983). "Gear Development, Harvesting Strategies and Fleet Capacity of the Gulf and South Atlantic Shrimp Industry." Report II in Assessment of Shrimp Industry Potentials and Conflicts, Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August, 74 pp.

A discussion of limited entry options for the south Atlantic and Gulf of Mexico shrimp fisheries.

Veim, Anne Kjos, Knut Sunnana, Per Sandberg, and Peter Gullestad (1994). "Bycatch of Juvenile Fish in the Shrimp Fishery - Management Based on Bioeconomic Criteria." C.M. 1994/T:14, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, St. John's, Newfoundland, Canada, September, 14 pp.

The bycatch of juvenile fish can be a major problem in fisheries with small meshed trawls, such as fisheries for shrimp, (Pandalus borealis). A sorting grid that effectively removes most of the undersized fish has been developed for shrimp trawls and it is not legal to fish for shrimp in the Barents Sea without the use of this sorting grid. Apart from this, the existing catch regulation of the shrimp fishery in the Barents Sea is the closing of shrimp fisheries on fishing grounds when the bycatch of juvenile fish exceeds the criteria for allowable bycatch in numbers per ton of shrimp set by the Norwegian - Russian Fishery Commission.

In this paper, a new method for the calculation of a criteria for closing shrimp fisheries based on both biological and economic considerations is established. This bioeconomic approach is an alternative to the existing biological approach. The main concept in the bioeconomic approach is that if the expected future value of the bycatch exceeds the value of the shrimp catches, the shrimp fishery should be closed. In this paper, a joint criteria for allowable bycatch is developed and calculated, including all the commercially interesting species whose juveniles are caught as bycatch in the shrimp fisheries in the Barents Sea.

Vestergaard, Niels (1996). Discard Behavior, Highgrading, and Regulation: The Case of the Greenland Shrimp Fishery. Marine Resource Economics, 11(4):247-266.

A formal economic analysis of the discarding problem is presented, focusing on the individual fisherman and the effect of different regulations on the fisherman's incentives to discard. If the marginal trip profit of an extra fishing day is greater than the average trip profit in a nonregulated multispecies or single species/multisize fishery constrained only by the hold capacity and the length of the season, the fisherman may have rational incentives to discard/highgrade. Regulation by TAC does not change the incentives to discard. However, under individual nontransferable quotas (INTQs) and individual transferable quotas (ITQs), the incentives to discard increase. The incentives to discard decrease under ITQs compared to INTQs, if the unit quota price is smaller than the shadow price of the quota. The model is applied to the Greenland shrimp fishery, where it demonstrates the reported discard behavior in the fishery. Finally, different regulations of discard are applied and discussed in the model. The analysis suggests that regulation of fishing days could be a promising alternative to usual suggested measures like tax/subsidies and landings obligations.

Vestergaard, Niels (1998). Property Rights Based Regulation of Fishery: Applications and Theory. Ph.D. Dissertation, ROD Serie, nr. 50, Okonomisk Institut, Kobenhavns Universitet, December, 92 pp.

A collection of papers on the application of ITQs in the cod, shrimp, multispecies, and Danish fisheries as well as sunk costs and entry-exit decisions.

Vieira, Luis Fernando (1987). "Forecasting with Multivariate Time Series Models: An Application to the Sea Scallop Fishery." Dissertation, Department of Resource Economics, University of Rhode Island, Kingston, RI.

The objective of this research is to develop time series forecasting models for economic variables characterizing the U.S. Atlantic sea scallop fishery, namely, ex-vessel prices, effort, and landings. The proposal is included with the dissertation.

Voiland, Michael P., Jr. (1984). "Coastal Fishing Access: Needs And New

Initiatives." Chapter 12 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

The need to develop coastal fishing activities is examined in terms of its capacity to satisfy myriad human needs. The Lake Ontario experience suggests a scenario of processes and initiatives that bring about improvements to access in coastal settings in the future.

Vondruska, John (1981). "Drop in Shrimp Prices and Shrimp Business Survival." Memorandum, United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Washington, D.C., August, 4 pp.

A market situation and outlook report for 1981 covering 1973 to 1981 with special emphasis on July to August, 1981.

Vondruska, John (1983). "Fishery Commodity Report: Sea Scallops and American Lobster." National Marine Fisheries Service, Office of Utilization Research, August, pp. 8.

Report of the landings and imports trends of sea scallops and American lobsters for 1983.

Vondruska, John (1983). "Fishery Commodity Report: Shrimp." National Marine Fisheries Service, Office of Utilization Research, August, 9 pp.

Report of the landings and imports of shrimp for 1983.

Vondruska, John (1985). "Market Trends and Outlook for Surimi-Based Foods." Report for the International Symposium on Engineered Seafoods, Seattle, Washington, November 19-21, pp. 59.

The U.S. market for surimi-based foods reached 70 million pounds in 1984, mostly imitation crab products containing 0 to 35 percent crab meat. This report presents the market trends and outlook for surimi-based foods in the U.S.

Vondruska, John (1986). "Shrimp Situation and Outlook." National Marine Fisheries Service, 9450 Koger Blvd., St. Petersburg, FL, August, 2 pp.

Situation and outlook for the shrimp processing and harvesting industries including landings, imports, inventories, consumption, prices, Japan's imports, and the outlook for the near future.

Vondruska, John (1986). "Investment in the Fishing Industry." Draft report, NMFS, SERO, 9450 Koger Blvd., St. Petersburg, FL 33702.

Estimated investment in U.S. commercial fishing increased sharply in the late 1970's, but has subsided in the 1980's. The smaller growth in number of vessels than in investment in vessels indicates that larger, more expensive vessels were being added to the fleet.

Vondruska, John (1987). "An Assessment of Gulf Shrimp Landings Data Published in New Orleans Market News Report." Report, National

Marine Fisheries Service, Southeast Regional Office, 9450 Koger Blvd., St. Petersburg, FL, November, 5 pp.

An assessment of market news data for 1987 that seemed to indicate some errors in data collection.

Vondruska, John (1987). "The Gulf Shrimp Industry." Report presented at the Gulf States Marine Fishery Commission's Industry Advisory Committee Meeting, NOAA, NMFS, SERO, St. Petersburg, FL.

A review of harvesting and processing sector employment, production, and investment trends for 1986.

Vondruska, John (1989). "Shrimp Situation and Outlook -- 1988." National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Blvd., St. Petersburg, FL 33702.

A review of harvesting and processing sector employment, production, and investment trends for 1988.

Vondruska, John (1990). "Swordfish Market Issues." Draft report, NMFS, SERO, 9450 Koger Blvd., St. Petersburg, FL 33702.

Respecting draft Amendment 1 to the Fishery Management Plan for Atlantic Swordfish of December 1989, several hypothetical situations are assessed. This is followed by some background information dealing with some aspects of the assessment.

Vondruska, John (1990). "Shrimp Situation and Outlook - 1990." Draft report, NMFS, SERO, 9450 Koger Blvd., St. Petersburg, FL 33702.

A review of harvesting and processing sector employment, production, and investment trends for 1990.

Vondruska, John (1991). "Data for Shark Plan Update." Memorandum for Paul Leach, NMFS, SERO, 9450 Koger Blvd., St. Petersburg, FL 33702.

Landings data for 1989 and 1990 and an analysis of trends in the shark fishery is provided.

Vondruska, John (1991). "International Swordfish Market and Fishery Issues Revisited." Draft report, NMFS, SERO, 9450 Koger Blvd., St. Petersburg, FL 33702.

The international market and fishery effects of the drastic Council proposed U.S. catch and import quotas for swordfish are assessed.

Vondruska, John (1991). "Trends in World Production and Major Markets for Shrimp." Draft report, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL.

Trends in production, trade, and consumption are described for the world's three major shrimp markets; the U.S., Japan, and European Economic Community. Trends in world production are also described, including breakdowns for farmed shrimp and cold water shrimp.

Vondruska, John (1991). "World Shrimp Situation 1990: Effects on Southeast Harvesting." U.S. Department of Commerce, National

Oceanic and Atmospheric Administration, National Marine Fisheries Service, NOAA Technical Memorandum, NMFS-SERO-294, October, 22 pp.

U.S. shrimp landings and use fell slightly in 1990. Use was up slightly for Japan, Europe, and the world. Prices and production problems continued to plague shrimp farms that accounted for most of the growth in world supplies over the past decade. Shrimp fishermen faced problems too. Whether the price strength of larger shrimp will be overcome by supplies of farmed black tiger shrimp over the long haul as in 1988-89 is unclear, but along with the long-term downward trend in real prices this could affect decisions by fishery and business managers.

Vondruska, John (1992). "Economic Assessment, Florida Spiny Lobster Fishery." Draft report, National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Blvd., St. Petersburg, FL.

This report updates previous economic assessments of the spiny lobster fishery of the southeastern continental United States, that now occurs mostly on the southern tip of Florida. The assessment is for the commercial fishery. Data on the sport fishery is scant, but a 1991 survey suggests that its catch is more significant than once thought.

Vondruska, John (1992). "Economic Assessment for Red Drum." Report, National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL.

Economic assessment of the red drum fishery in the Gulf of Mexico and south Atlantic. This report updates previous analysis of trends in Atlantic and Gulf coast Commercial and recreational landings, ex-vessel prices and supplies, using data mostly for 1962-90.

Vondruska, John (1992). "Southeast Shrimp Fishery Market Conditions, 1991-1992." Preliminary draft report, National Marine Fisheries Service, Southeast Regional Office, December, 16 pp.

Prices, market supplies, and aquaculture trends facing the shrimp wholesale market and harvesting industry for 1991 and 1992.

Vondruska, John (1993). "Economic Assessment for Coastal Pelagic Fish." Draft report presented at the Socio-economic Panel Meeting, April 13-14, Gulf of Mexico Fishery Management Council, Tampa FL, National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL.

Economic assessment of the coastal migratory pelagic stocks in the Gulf of Mexico and south Atlantic.

Vondruska, John (1994). "Southeast Shrimp Fishery Market Conditions, 1993." Preliminary draft report, National Marine Fisheries Service, Southeast Regional Office, December, 9 pp.

Prices, market supplies, and aquaculture trends facing the shrimp wholesale market and harvesting industry for 1993.

Vondruska, John (1997). "List of Tables on Commercial Fishing Activity, Coastal Migratory Pelagic Species." Socioeconomic Panel Report, National Marine Fisheries Service, Southeast Regional Office, April, 10 tbs.



Landings, real exvessel value, prices, by region, species, month, and gear for the migratory coastal pelagic fishery management plan socioeconomic panel meeting.

Vondruska, John (1997). "Some Discussion of Data on Commercial Landings of Coastal Migratory Pelagic Species and Federal Fishing Permits." Socioeconomic Panel Report, National Marine Fisheries Service, Southeast Regional Office, April.

Summaries of commercial landings and value of coastal migratory pelagic species and their value. Attributes of vessels and boats and a cross tabulation of permit records is also provided.

Vondruska, John (1998). "Some Discussion of the Methods and Potential Use of Federal Fishing Permits Data in Descriptive Fishery Analysis, with Emphasis on Commercial Fishing for Mackerels." SERO-ECON-98-11, National Marine Fisheries Service, Southeast Regional Office, Fisheries Economics Office, December, 48 pp.

Permit data, while imperfect, is the only means to describe boats in the commercial mackerel and some other managed fisheries. Among the 6,177 boats with federal fishing permits in 1996, net income could be computed for 3,045 boats. Using medians, the average boat was 31 feet, 240 horsepower, grossed \$19,000 from fishing, incurred \$13,000 in fishing expense, and had about \$4,000 in net income from fishing. In 1996, 3,432 boats had permits for commercial fishing for mackerel. For the most part, they engaged in more than one fishing activity, three or four on average, according to cross-tabulations of boats by permit, fish sold, or gear used. Using data on fish sold and gear used as a qualitative indicator of participation in commercial fishing for king mackerel, Spanish mackerel, or both, an estimate of 40 to 2900 boats is obtained, compared with 3,432 boats that had permits.

Vondruska, John (1998). "Description of Boats with Federal Fishing Permits in 1997." SERO-ECON-98-14, National Marine Fisheries Service, Southeast Regional Office, March, 50 pp.

This report provides descriptive statistics for some 6000 boats with federal fishing permits administered in the NMFS Southeast Regional Office, excepting golden crab, wreckfish and coral permits.

Vondruska, John (1998). "Commercial Landings of Coastal Migratory Pelagic Fish, East and Gulf Coasts, 1962-1997." SERO-ECON-98-16, National Marine Fisheries Service, Southeast Regional Office, Fisheries Economics Office, March, 42 pp.

This report summarizes data on commercial landings of coastal migratory pelagic fish for the east and Gulf coasts (Maine to Texas) in calendar years 1962 to 1997.

Vondruska, John and Jeffrey Cunningham (1985). "Southeast Finfish Situation and Outlook - 1984." National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Boulevard, St. Petersburg, FL, May.

This report describes market trends for selected finfish landed in southeastern U.S. ports from North Carolina to Texas. Including these and other finfish, landings of all finfish in southeastern ports totaled 2.58 billion pounds (live weight) in 1984, valued at \$207 million, according to preliminary data. This represents an increase from the 1983 landings of 2.44

billion pounds, valued at \$173 million. Much of the increase in the overall total was for menhaden, which reached 2.33 billion pounds, compared with 2.24 billion pounds in 1983 and a 1979-83 average of 1.93 billion pounds. Landings of other selected finfish declined in 1984. They were off 7 percent to 105 million pounds, and down 6 percent in value to \$79 million, compared with a 1979-83 average of 132 million pounds.

Vondruska, John and Mark Godcharles (1995). "Use of Social and Economic Data in the Development and Implementation of Federal Regulations for the Spanish Mackerel Fishery -- a Case Study." Draft report for the Atlantic States Marine Fisheries Commission Workshop on Socio-Economic Data and Analysis for Recreational Fisheries Management, July 11-12, 1994, Annapolis Ramada Inn, 173 Jennifer Road, Annapolis, MD. National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL.

Social and economic data is used at several points of decision in the development and implementation of Federal fisheries management regulations. This case study is concerned primarily with the economic data contained in official fishery management plan documents for Spanish mackerel. The efficacy of arguments developed from this data and their impact on the decision making process, however, is indeterminable.

Vondruska, John and Steve Holiman (1995). "Availability of Information for Commercial Fisheries For Coastal Migratory Pelagic Species." Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive N., St. Petersburg, FL, February, 5 pp.

A description of ongoing federal and state statistical and administrative data collection activities for use in economic analysis of commercial fisheries. Includes a discussion of recreational data as well.

Voss, Gilbert L. (1955). "A Key to the Commercial & Potentially Commercial Shrimp of the Family Penaeidae of the Western North Atlantic & the Gulf of Mexico." M.L. 10017, The Marine Laboratory, University of Miami, Coral Gables, Florida, May, 23 pp.

This paper provides a key for nineteen of the 20 commercially valuable shrimp in the hopes that it may be of use to the field worker or fisherman in the identification of shrimp in their catches.

Wade, Robert (1988). Village Republics. Cambridge University Press, New York.

In what circumstances will those who face a potential 'tragedy of the commons' be able to organize a system of rules by which the tragedy is averted? This book is about villages in south India. Some villages in this area have organized the public aspects of resource use to a more sophisticated degree than has been reported previously in the literature on Indian villages, while others have not organized at all. An explanation of the variation and an account of how the collective action problems are overcome in those villages with a large amount of organization is offered.

Wahyuhadi, Joe (198?). "Factors Influencing Used Fishing Vessel's Prices." REN 591 Special Project, Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island.

This paper determined that vessel age, hull type, and length affect the minimum price set by the owner using regression analysis of data collected from boats-for-sale advertisements.

Walker, Henry A. and Saul B. Saila (1986). "Incorporating Climatic and Hydrographic Information into Shrimp Yield Forecasts Using Seasonal Climatic Component Models." In Landry, Andre M., Jr. and Edward F. Klima (eds.) Proceedings of the Shrimp Yield Prediction Workshop, TAMU-SG-86-110, April, Texas A&M University at Galveston, Mitchell Campus, Galveston, Texas.

Conditions were favorable for offshore brown shrimp production in the vicinity of the Texas and Louisiana boundary when there were strong northward winds and eastward Ekman transport during the winter, followed by a dry spring. These conditions may have resulted in higher survival rates for postlarvae and juvenile stages in the estuaries. High springtime river discharges and resulting low salinity in nursery areas reduced offshore brown shrimp yields regardless of wind direction.

White shrimp landings were positively correlated with summer river discharges in the region. Strong winds toward the northwest and northeast Ekman transport in the spring and summer during periods of spawning and larval transport into nursery areas correlated with decreased offshore yields of white shrimp. In the fall, strong easterly winds, low river discharge and relatively cold water temperatures correlated with increased offshore white shrimp landings.

Walker, James M., Roy Gardner, and Elinor Ostrom (1990). "Rent Dissipation in a Limited-Access Common-Pool Resource: Experimental Evidence." Journal of Environmental Economics and Management, 19:203-211.

This paper examines group behavior in an experimental environment designed to parallel the conditions specified in noncooperative models of limited access common pool resources. Using experimental methods, we investigate the strength of theoretical models that predict that users of such resources will appropriate units at a rate at which the marginal returns from appropriation are greater than the marginal appropriation costs. Our results confirm the prediction of suboptimal accrual of rents and offer evidence on the effects of increasing investment capital available to appropriators.

Wallace, Richard K. and C. Lance Robinson (1994). "Bycatch and Bycatch Reduction in Recreational Shrimping." Northeast Gulf Science, 13(2):139-144.

Bycatch from recreational shrimping is estimated by quantifying the catch from fishery independent trawling and through a survey of licensed recreational shrimpers in Alabama during 1990. Paired trawls are used to test tow net modifications (fish shooter and Florida fisheye) for bycatch reduction. The mean fish bycatch was 5.4 kilograms per 20 minutes tow and contained 426 fish primarily from three families (Sciaenidae, Engraulidae, and Clupeidae). The total recreational shrimping effort for Alabama was an estimated 37,244 hours resulting in a potential fish bycatch of 603,000 kg or 47.6 million fish. The fish shooter did not significantly reduce the bycatch in either weight or numbers while the Florida fisheye significantly reduced bycatch in both weight (26 percent) and number (46 percent). Further testing of the Florida fisheye with the position of the nets reversed revealed no significant reduction in weight but a significant reduction in bycatch number (36 percent).

Wallace, Richard K., William Hosking, and Stephen T. Szedlmayer (1994).  
Fisheries Management for Fishermen: A manual for helping fishermen  
understand the federal management process. MASGP-94-012, Auburn  
University Marine Extension and Research Center, 4170 Commanders Drive,  
Mobile, Alabama, 56 pp.

The purpose of the manual is to unlock the mysteries of fisheries jargon  
and to explain how regulations are made in the hope that fishermen will get  
more involved.

Wallace, Stein W. and Karl Brekke (1986). "Optimal Fleet Size When  
National Quotas Can Be Traded." Marine Resource Economics,  
2(4):315-329.

Assuming stochastic quotas for a fish stock that is shared between two  
nations, we find the optimal fleet size for one of them by maximizing expected  
profit under the assumption that national quotas can be traded and that stable  
national quotas is a political goal. As an example we use the Norwegian purse  
seiner fleet and the summer capelin fishery in the Barents Sea.

Walters, A.A. (1963). "Production and Cost Functions: An Econometric  
Survey." Econometrica, 31(1-2):1-66.

A survey article of econometric studies of cost and production  
functions.

Walters, Carl J. (1981). "Optimum Escapements in the Face of  
Alternative Recruitment Hypotheses." Can. J. fish. Aquat. Sci.,  
38:678-689.

Available data are often inadequate to discriminate among alternative  
models that make different predictions about the consequences of allowing  
escapement outside the range of recent historical experience. Dynamic  
programming is used to show that the optimum policy in such situations can  
involve active probing or experimentation with escapements. The optimum  
adaptive policy is usually difficult to compute, but generally may be closely  
approximated by a "Bayes equivalent" policy that is simpler to estimate but  
does not account explicitly for the value of information associated with  
allowing more extreme escapements. While there are various practical  
difficulties in estimating and implementing an optimum policy, it is concluded  
that regular probing experiments should be included in every fishery  
management plan.

Walters, Carl J. and Ray Hilborn (1976). "Adaptive Control of Fishing  
Systems." J. Fish. Res. Board Can., 33:145-159.

This paper discusses some formal techniques for deciding how harvesting  
policies should be modified in the face of uncertainty. Parameter estimation  
and dynamic optimization methods are combined for the Ricker stock-recruitment  
model to show how exploitation rates should be manipulated to give more  
information about the model parameters; in general, harvesting rates should be  
lower than would be predicted by the best fitting recruitment curve unless  
this curve predicts that the stock is very productive. A decision procedure  
is developed for comparing alternative stock-recruitment models; when applied  
to the Fraser River sockeye salmon (Oncorhynchus nerka), the procedure  
indicates that an experimental increase in escapements would be quite  
worthwhile. It appears that there is considerable promise for extending these  
methods and procedures to cases where the stock size is unknown and where  
fishing effort is poorly controlled.

Wang, Der Hsiung, Louis J. Goodreau, and Joseph J. Mueller (1986).  
"Economics of Atlantic Sea Scallop Management." Marine Resource Economics, 3(2):111-135.

We present a brief discussion of the Atlantic sea scallop fisheries, a 12 equation model, and an evaluation using the model of management strategies proposed by the New England Fishery Management Council. The demand for sea scallops at all market levels is price inflexible. Income price flexibility is positive but less than 1 for demand at all market levels. Cross price flexibility is positive but also less than 1 and is approximately the same for demand at all market levels (between 0.36 and .037). In general fishing effort elasticities for each fishing area with respect to scallop abundance for that area are larger than 1. Effort elasticities with respect to ex-vessel price are 0.42 and 0.32 for the New England fleet's effort to the South Channel and eastern Georges Bank fishing areas, respectively. The partial elasticity of production with respect to inputs is higher for scallop abundance than for fishing effort in all Georges Bank resource areas. Reduction in fishing effort or in meat count would accrue positive benefits to the sea scallop industries and consumers, and the greater the reduction in effort and/or in meat count, the larger the benefits under long term equilibrium conditions. However, the short term economic impacts of the various management strategy scenarios are generally the reverse of the long term benefits.

Wang, Stanley (1988). "Chart and Statistical Book of the U.S. Northeast Fisheries." National Marine Fisheries Service, Northeast Regional Office, Services Division, Analytical Services Branch, Gloucester, MA, February, 52 pp.

Trends in investment, landings, biological abundance, productivity, and costs and earnings are emphasized for northeastern region fisheries of the U.S.

Wang, Stanley D. and Christopher B. Kellogg (1988). "An Econometric Model for American Lobster." Marine Resource Economics, 5(1):61-70.

An econometric model for the wholesale and ex-vessel markets of American lobster, Homarus americanus, was developed to determine the market impact of proposed increases in the minimum size for American lobster. Prices were found to be inflexible with respect to landing, imports, and income (i.e., the price flexibilities were less than one) in both wholesale and ex-vessel markets. The size of lobster has a statistically significant effect on wholesale and ex-vessel prices and revenues. On average, wholesalers pass along 52% of any price changes to lobstermen. The ex-vessel price impact of a given change in supply is about the same as for changes in either landings or imports. Any changes in public policies leading to increases in total landings of American lobster and/or decreases in the proportion of small lobsters in the landings would result in increases in gross revenues to fishermen and wholesalers. While the long term impact would be favorable, the short term market impact of increases in the minimum size for lobster would be uncertain.

Wang, Stanley D. and Vuong H. Tang (1993). "The Performance of US Atlantic Surf Clam and Ocean Quahog Fisheries under Limited Entry and Individual Transferable Quota Systems." Fishery Analysis Division, Northeast Regional Office, National Marine Fisheries Service, Gloucester, MA, May, 26 pp.

U.S. Atlantic surf clam and quahog fisheries are the first fisheries managed under a limited entry program and an individual transferable quota (ITQ) system under the Magnuson Fishery Conservation and Management Act. Relative to the limited entry program, the ITQ system shrank the offshore surf clam fleet by about 40% in 1991. Savings in fishing capital and labor under the ITQ system have occurred at no expense to the fleet's expansion of ocean quahog harvesting. The ITQ system has created some economic and social dislocation. Vessel capacity utilization increased by roughly 90%, and vessel productivity increased by 46% to a record level in 1991 as the fleet reduced its excess capital and capacity. Under the ITQ system, in 1992, the off-shore surf clam and quahog resources were worth \$84 million and generated resource rents to the original ITQ owners of \$14 million. Seasonal supply patterns showed market distortion under the limited entry system. The surf clam ex-vessel price in constant dollars has moved downward and the 1991 price under the ITQ system was the lowest since 1980. The clam ex-vessel markets have become highly concentrated with a small number of buyers. Under the ITQ system, the largest buyers continued to gain market shares in the surf clam-quahog market in 1991. Other behaviors of these highly concentrated markets include; vertical integration, unbalanced entry-exit conditions and price stability. From the inception of the ITQ system through March 1992, the number of ITQ owners declined by a third and the ITQ ownership concentration increased slightly.

Wang, Stanley D. and Vuong H. Tang (1995). "The Surf Clam ITQ Management: An Evaluation." Marine Resource Economics, 10(1):93-98.

U.S. Atlantic surf clam and quahog fisheries are the first fisheries managed under a limited entry program and an individual transferable quota (ITQ) system under the Magnuson Fishery Conservation and Management Act. Relative to the limited entry program, the ITQ system shrank the offshore surf clam fleet by about 40% in 1991. Savings in fishing capital and labor under the ITQ system have occurred at no expense to the fleet's expansion of ocean quahog harvesting. The ITQ system has created some economic and social dislocation. Vessel capacity utilization increased by roughly 90%, and vessel productivity increased by 46% to a record level in 1991 as the fleet reduced its excess capital and capacity. Under the ITQ system, in 1992, the off-shore surf clam and quahog resources were worth \$84 million and generated resource rents to the original ITQ owners of \$14 million. Seasonal supply patterns showed market distortion under the limited entry system. The surf clam ex-vessel price in constant dollars has moved downward and the 1991 price under the ITQ system was the lowest since 1980. The clam ex-vessel markets have become highly concentrated with a small number of buyers. Under the ITQ system, the largest buyers continued to gain market shares in the surf clam-quahog market in 1991. Other behaviors of these highly concentrated markets include; vertical integration, unbalanced entry-exit conditions and price stability. From the inception of the ITQ system through March 1992, the number of ITQ owners declined by a third and the ITQ ownership concentration increased slightly.

Ward, Frank A. (1983). "On the Necessity of Simultaneous Recreation Demand Equation Estimation: Comment." Land Economics, 59(4):455-458.

Hof and King (1982) develop an improved and simplified method for estimating the recreational benefits of a single new site given the existence of a system of substitute and complement sites. The authors essentially conclude that when only one new site is involved, its benefits can be evaluated without bias by merely estimating the demand function for that

single site, while accounting for the presence of substitutes (other site prices). This is as opposed to estimating the entire system of demand equations, such as was done by Burt and Brewer (1971) and Cicchetti, Fisher, and Smith (1976). The conclusion of Hof and King (1982) is important for empirical work, for by use of their procedure, unbiasedness in benefit estimates can be maintained while data requirements and associated costs are greatly reduced since use data are required for only the site in question rather than the system of sites. The author agrees with the approach and adds additional theoretical evidence to support it. See Hof and King (1983) for a reply.

Ward, John (1982). "Bureau of Commercial Fisheries Economic Working Papers Series: Annotated Bibliography." National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SEFC-86, National Marine Fisheries Service, Southeast Fisheries Center, Miami, FL, February, 37 pp.

The economic staff of the Bureau of Commercial Fisheries and later the National Marine Fisheries Service compiled a series of approximately 177 economic working papers between 1969 and 1973. The papers deal with various subjects in the area of fisheries economics. Abstracts from 122 of these papers have been collected here for the purpose of indicating those studies that may be utilized for further research or as reference by the Southeast Fisheries Center economic staff. This list will be expanded as more of the working papers become available.

Ward, John M. (1984). "A Synthesis of Cost and Revenue Surveys for Vessels Operating in the Gulf of Mexico Shrimp Fishery." Draft Report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, FL, May, 22 pp.

Hedonic cost and revenue functions are estimated for the Gulf of Mexico shrimp fishery using data published in annual surveys of the fleet from 1971 to 1980. Comparable costs, revenues, and profits are estimated for three vessel size classes for the Texas, Louisiana, and Florida inshore and offshore fleets. The cost and revenue estimates indicate that fishing firms have generally been profitable over the time period of the analysis, exclusive of opportunity costs.

Ward, John M. (1988). "A Synthesis of Cost and Revenue Surveys for Gulf of Mexico Shrimp Vessels." Marine Fisheries Review, 50(1):47-52.

Since detailed cost data are not routinely collected and the published survey data from various sources are not easily compared, trends in costs and revenues for the Gulf of Mexico shrimp fishing fleet cannot be readily determined. A consistent data set for comparing vessel operating costs and revenues between states, vessel sizes, and years was estimated using weighted least squares regression analysis. Differences in the sample variance between the published cost and revenue data caused by time, type of survey, region surveyed, vessel size, sample size, or area of operation are accounted for in the econometric model. The coefficient of determination adjusted for the degrees of freedom and the F statistic indicate that the model specification provides a good statistical fit to the survey data.

Ward, J.M. (1988). "Vessel Operating Behavior in the Gulf of Mexico Shrimp Fishery: Annotated Bibliography." National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SEFC-212,

National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL.

An annotated bibliography of literature pertaining to an analysis of fleet size change over time that is divided into sections on economic theory, fisheries biology, statistical methodologies, and examples of their application.

Ward, J.M. (1989). "Modeling Fleet Size in the Gulf of Mexico Shrimp Fishery, 1966 - 1979." National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SEFC-229, National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL.

The Gulf of Mexico shrimp fishing fleet is modeled extending the approach developed by Prochaska and Cato (1981) by including economic and biological variables. Changes in fleet size are found to be responsive to economic and biological conditions in the fishery. The model indicates that the fleet size is approximately three times that necessary to efficiently harvest the resource. While the model is handicapped by insufficient degrees of freedom, results suggest that alternative modeling approaches could be used to develop a model that successfully predicts changes in fleet size.

Ward, J.M. (1990). "Reduction in Shrimp Bycatch: Effort/Stock Responses Based on the Elasticity of Demand," NOAA Technical Memorandum NMFS-SEFC-274, October, 1990.

The economic implications of adopting a bycatch reduction device in a fishery that discards a fish species that is the focus of a directed commercial fishery when demand is relative elastic and inelastic are discussed. The stock of the bycatch species collapses when the bycatch reduction device increases the supply of fish in the directed fishery when demand is relatively elastic. This outcome is dependent on the assumptions of the model that link fishing effort levels in the two directed commercial fisheries.

Ward, John M. (1992). "Bycatch." Draft reports, NMFS, SERO, 9450 Koger Blvd., St. Petersburg, Fl.

Contains mathematical notes and draft reports concerning the bycatch problem in the Gulf of Mexico.

Ward, John M. (1992). "Conservation and Economic Benefits of Limiting Access in Marine Fisheries." Presented at the Center for Marine Conservation and World Wildlife Fund Workshop Managing Marine Fisheries By Limiting Access at Annapolis, Maryland, September 20-22, 1992.

Often when economics is discussed, it is in terms of gross national product, personal disposable income, number of jobs, and unemployment rates. While these are important outcomes of an economic analysis, they are not in and of themselves economics. Economics is the study of how scarce resources are allocated amongst unlimited wants. The scarce resources are the capital stocks, the stocks of fish, and labor. The unlimited wants include those of commercial and recreational fishermen as well as final consumers of fish products. Allocation concerns the best use of all resources (capital, labor, and fish) in the production of fishery products so that the return to society is maximized. Economics provides the methodology by which the optimal levels of the various inputs in the production process, such as labor, can be determined. For example, increasing the level of employment in a fishery



eventually leads to a decline in the productivity of labor and in the size of the fish stock. More importantly, the excessive use of labor in the fishery deprives the marketplace of not only fish but the productive use of that labor in another industry; leading to a reduced total level of production. Therefore, more jobs in a fishery are not necessarily better for the nation since diverting labor to other industries could result in more products being produced at lower cost. Markets are considered to be economically efficient when they produce the highest level of output at the lowest possible cost. Efficient markets are defined by clearly defined, transferable, and enforceable property rights. Markets tend to be inefficient where these property rights are not clearly defined such as in open access fisheries. By applying the economic modeling framework to the fishery problem in cases where property rights are nonexistent, management regulations can be evaluated to determine if they improve or exacerbate market efficiency.

Ward, John M. (1993). "The Bioeconomic Implications of A Bycatch Reduction Device as a Stock Conservation Management Measure." Draft report submitted to the Journal of Marine Resource Economics.

The proposed regulation to reduce bycatch and discarding of finfish in the southeastern region is a gear modification that excludes finfish from shrimp trawls. This regulation is analyzed using a simple theoretical model of a multispecies fishery whose bycatch is harvested in a directed fishery consisting of commercial and recreational fishermen. The costless reduction in bycatch fishing mortality imposed on the multispecies fishery does not result in an increased stock size for the bycatch fish species or a substantial increase in its level of harvest. Instead, the fish stock is reallocated from the multispecies fishery to the fishery directed at the bycatch species causing fishing effort to expand in the bycatch species fishery that drives the stock size down to the previously existing equilibrium level. Recreational harvest and effort levels remain unchanged since the model is linear in effort and the commercial fishery is given access to the fishery first.

Ward, John M. (1993). 1996 Pelagic Logbook Trip Summary Form. Cost and earnings data collection questionnaire and proposed model, U.S. Department of Commerce, National Oceanic Administration, National Marine Fisheries Service, 2 pp.

An indirect cost model is proposed based on a modification to data collected via logbook.

Ward, John M. (1993). 1996 Pelagic Logbook Trip Summary Form. Cost and earnings data collection questionnaire and proposed model, U.S. Department of Commerce, National Oceanic Administration, National Marine Fisheries Service, 2 pp.

An indirect cost model is proposed based on a modification to data collected via logbook.

Ward, John M. (1994). "An Annotated Bibliography of Economic and Biological Research Related to the Fishery Resources of the United States." NOAA Technical Memorandum NMFS-SEFSC-342, 454 pp.

An annotated bibliography of approximately 1500 articles, reports, memorandas, and text books concerning renewable and nonrenewable resources.

Ward, John M. (1994). "The Bioeconomic Implications of A Bycatch Reduction Device as a Stock Conservation Management Measure." Marine Resource Economics, 9(3):227-240.

The proposed regulation to reduce bycatch and discarding of finfish in the southeastern region is a gear modification that excludes finfish from shrimp trawls. This regulation is analyzed using a simple theoretical model of a multispecies fishery whose bycatch is harvested in a directed fishery consisting of commercial and recreational fishermen. The costless reduction in bycatch fishing mortality imposed on the multispecies fishery does not result in an increased stock size for the bycatch fish species or a substantial increase in its level of harvest. Instead, the fish stock is reallocated from the multispecies fishery to the fishery directed at the bycatch species causing fishing effort to expand in the bycatch species fishery that drives the stock size down to the previously existing equilibrium level. Recreational harvest and effort levels remain unchanged since the model is linear in effort and the commercial fishery is given access to the fishery first.

Ward, John M. (1994). "Conservation and Economic Benefits of Limiting Access in Marine Fisheries." In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

Often when economics is discussed, it is in terms of gross national product, personal disposable income, number of jobs, and unemployment rates. While these are important outcomes of an economic analysis, they are not in and of themselves economics. Economics is the study of how scarce resources are allocated amongst unlimited wants. The scarce resources are the capital stocks, the stocks of fish, and labor. The unlimited wants include those of commercial and recreational fishermen as well as final consumers of fish products. Allocation concerns the best use of all resources (capital, labor, and fish) in the production of fishery products so that the return to society is maximized. Economics provides the methodology by which the optimal levels of the various inputs in the production process, such as labor, can be determined. For example, increasing the level of employment in a fishery eventually leads to a decline in the productivity of labor and in the size of the fish stock. More importantly, the excessive use of labor in the fishery deprives the marketplace of not only fish but the productive use of that labor in another industry; leading to a reduced total level of production. Therefore, more jobs in a fishery are not necessarily better for the nation since diverting labor to other industries could result in more products being produced at lower cost. Markets are considered to be economically efficient when they produce the highest level of output at the lowest possible cost. Efficient markets are defined by clearly defined, transferable, and enforceable property rights. Markets tend to be inefficient where these property rights are not clearly defined such as in open access fisheries. By applying the economic modeling framework to the fishery problem in cases where property rights are nonexistent, management regulations can be evaluated to determine if they improve or exacerbate market efficiency.

Ward, John M. (1994). "The South Atlantic Shrimp Stock Assessment and Fisheries Evaluation Report; 1994 Update." National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Boulevard, St. Petersburg, FL, February.

An update of the south Atlantic shrimp SAFE report that includes an ex-vessel price analysis to determine if seasonal closures would enhance the

economic return to the fishery and an annotated bibliography of biological, economic, and sociological research related to the shrimp fishery.

Ward, John M. (1994). "Economic Analysis of Finfish Bycatch in the Gulf of Mexico Shrimp Fishery." MARFIN Cooperative Agreement Number 92NMFS11, Division of Economics and Trade Analysis, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL, July.

A primary data collection effort was contracted for using MARFIN funds. A request for proposals was prepared and Resource Economics Consultants were selected to interview and collect costs, returns, and bycatch information from a sample of shrimp fishermen in the Gulf of Mexico. Data was collected for the three most current years of vessel operation in the Gulf of Mexico shrimp fishery and combined with historic data from other sources. Preliminary data was analyzed to ensure that accurate information was collected and data entry errors were minimized. This information was then used to estimate a vessel operating cost model. This approach permits the estimation of costs and returns for individual vessels in the Gulf of Mexico shrimp fishery. Estimates of costs, revenues, and net revenues have been prepared and are presented in the Stock Assessment and Fishery Evaluation Report for the Gulf of Mexico Shrimp Fishery, 1994 Update (SAFE). The SAFE report also provides a discussion of the impacts of proposed fishery management regulations to reduce finfish bycatch in the shrimp fishery. The final contract report by Resource Economics Consultants is attached.

Ward, John M. (1994). "Factor Rents and Windfall Profits." Position Paper presented at the Limited Access Workshop, Seattle, Washington, November 1-3. National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL.

Individual transferable quota programs that have been adopted in the U.S. have allocated the fishing rights at no charge to the historical fishermen. As a result of subsequent trading in an ITQ market, the initially free ITQ market shares and poundage coupons become valuable. It is the contention of this paper, however, that this increase in ITQ value reflects a reallocation of resource rents from the quasi-fixed factor inputs of capital and labor to a relatively more fixed factor input; the ITQ. As a result, the initial sale does not represent a windfall profit to the fisherman who was initially allocated the ITQ, at least in fully developed or over developed common property fisheries.

Ward, John M. (1994). "Trawl Bycatch Presentation." Division of Economics and Trade Analysis, Southeast Regional Office, National Marine Fisheries Service, St. Petersburg, FL.

A presentation of the static and dynamic impacts of a gear modification to reduce finfish bycatch in another directed fishery. The effects of a bycatch reduction device on a fishery that generates a bycatch of finfish in its directed fishery operations on the commercial and recreational sectors of a fishery directed at the bycatch species is determined. The implications are that the costs to society exceed the benefits for this management approach, commercial and recreational fishing effort levels for the bycatch species fishery increase, and alternative management measures such as individual transferable quotas would be more successful in reaching management objectives.

Ward, John M. (1995). "Cost and Revenues in the Gulf of Mexico Shrimp Fishery." Draft report, National Marine Fisheries Service,

Southeast Regional Office, Economics and Trade Analysis Division,  
9721 Executive Center Drive, North, St. Petersburg, FL

While cost and revenue data is not routinely collected in the southeastern region of the United States, many specialized data collection efforts have been funded by Sea Grant, Saltonstall/Kennedy grants, and Marine Fisheries Initiative cooperative agreements to collect data concerning the financial viability of the shrimp fishery in the Gulf of Mexico. This study describes new data collection efforts in the Gulf of Mexico and presents a statistical analysis of a data set that combines the newly collected data with historical data sets provided by the authors of existing studies. The statistical analysis suggests that home port and hull construction material do not directly affect the total costs of operating in the shrimp fishery. The resulting statistical model allows the estimation of total operating costs for vessels operating in the Gulf of Mexico shrimp fishery so that the impacts of proposed fishery management regulations can be determined for cost-benefit analysis.

Ward, John M. (1995). "Present Value of Total Revenue from Predicted Yield for the Gulf of Mexico King Mackerel Fishery." Report to the Gulf of Mexico Fishery Management Council, Tampa, FL. National Marine Fisheries Service, Southeast Regional Office, Economics and Trade Analysis Division, 9721 Executive Center Drive, North, St. Petersburg, FL.

Development of discounted present value of total revenue generated by the king mackerel fishery in the Gulf of Mexico. Analysis is based on a general equilibrium demand model (Easley, et al., 1993) and yield estimates (Powers, 1995).

Ward, John M. (1996). Annotated Bibliography of Biological and Economic Literature Related to the Gulf of Mexico Shrimp Fishery. NOAA Technical Memorandum NMFS-SEFSC-388, U.S. Department of Commerce, National Oceanic Administration, National Marine Fisheries Service, July, 122 pp.

An annotated bibliography of articles concerning the biology, economics, sociology, and anthropology of the shrimp fishery in the Gulf of Mexico. The articles are not strictly related to the Gulf fishery and are primarily economic studies from peer review journals, in-house analyses, gray literature, and from MARFIN, S/K, and Sea Grant funded projects.

Ward, John M. (1996). Bioeconomic Model of the Gulf of Mexico Shrimp Fishery. SAS program, U.S. Department of Commerce, National Oceanic Administration, National Marine Fisheries Service, 6 pp.

A SAS computer model of the Gulf of Mexico shrimp fishery used to determine the costs and benefits of adopting proposed bycatch reduction fishery management regulations in amendment 9 to the Gulf of Mexico shrimp fishery management plan regulatory impact review. This program is set up to investigate the impacts of an embargo of shrimp imported into the U.S. required by Congress to ensure that TED regulations are enforced world wide.

Ward, John M. and Wade L. Griffin (1994). "Transferable Limited License Market Model." Notes, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive, North, St. Petersburg, FL.

Simple model of a market for transferable licenses to determine license

prices and their impact on fishing effort levels. Capital stuffing in a fishery with transferable licenses can be determined.

Ward, John M. and Walter R. Keithly, Jr. (1998). Practical Implications of Property Rights Based Management Using Empirical Models of a Common Property Fishery: The Case of the Gulf of Mexico Shrimp Fishery. Fisheries Management and Development presentation, Ninth IIFET Conference, Norway.

Individual transferable quota (ITQ) prices are theoretically assumed to affect prices and harvesting costs symmetrically. In this analysis, the incidence of two different ITQ programs on the U.S. Gulf of Mexico shrimp fishery are investigated. First, the impact of the ITQ prices are assumed to affect only the ex-vessel price of shrimp. Second, the impact of ITQ prices is assumed to affect only the harvesting cost per pound. This empirically based simulation model demonstrates that if the annual ITQ prices affect the harvesting costs, net benefits to the vessel owners are reduced and crew share increases substantially; suggesting that owners and crews would negotiate to achieve a more equitable distribution of wealth generated by the adoption of ITQ programs. If the incidence of the ITQ regulations impact is on price, on the other hand, then crew receives only a small increase in income and vessel owner captures most of the increase in net benefits. In both cases, fleet size declines causing a reduction in capacity.

Ward, John M. and Walter R. Keithly, Jr. (1999). Determining the Impacts of Adopting Property Rights as a Fisheries Management Tool in Regulated Open Access Fisheries. FAO Fish Rights 99 Conference, 14-17 November, Fremantle, Australia.

In "A Critical Review of the Individual Quota as a Device in Fisheries Management," Parzival Copes(1986)presents many sound arguments against the use of individual quotas as a fishery management instrument citing the results of actual applications. While individual quotas are not useful in the fisheries "rationalization" process without transferability, transferability has unsightly equity and income reallocation effects. The question that remains unanswered is whether ITQ's are preferable to the common property or open access fishery scenario. This question can be addressed by analyzing the effect of adopting ITQ s in a computer simulation of a dynamic bioeconomic model of the Gulf of Mexico shrimp fishery. The computer simulation model is based on empirical research conducted on the shrimp fishery, which developed models of market supply and demand, fleet dynamics, and operating costs. This dynamic simulation model will also address the question of whether fisheries with highly variable recruitment are appropriate subjects for ITQ management. Although a simulation model, the advantages of this approach are that the actual behavior of a group of individual fishermen is the basis for the model, various scenarios can be compared based on the same set of initial assumptions, transition paths can be compared to long-run equilibrium conditions, and an index based on the present value of net benefits can be generated for open access, common property, and rights-based fishery resource management.

Ward, John M. and Seth Macinko (1993). "Using Theory: Rethinking Fisheries Bycatch Problems." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

A dynamic bioeconomic model that incorporates a commercial and recreational fishery for a species of fish that is discarded in another directed commercial fishery is developed and used to determine the economic implications of a bycatch reduction device in a common property fishery.

Ward, John M. and Seth Macinko (1996). "Static and Dynamic Implications of a Gear Modification Designed to Reduce Bycatch in a Stylized Fishery. Submitted to The Southern Business Journal.

The harvesting of finfish in shrimp fishing operations, known as incidental take or bycatch, is a complex multi disciplinary and international fisheries management problem. The discarded bycatch problem in commercial shrimp fisheries has been addressed internationally with annual estimates of finfish bycatch ranging from 64 thousand tons to 1 million tons with potential benefits ranging from \$28 million to \$1.273 billion. Finfish bycatch is also a significant domestic fishery management problem with annual estimates varying from 700 million to 1.7 billion pounds. National concern has been expressed by an amendment to the Magnuson Fishery Conservation and Management Act (MFCMA), the need expressed by National Marine Fisheries Service (NMFS) to determine the economic impacts on the domestic fishery, the recognition of non-target species bycatch in three fishery management plans, and the bycatch policy of the American Fisheries Society. To this end, the bioeconomic implications of bycatch reduction regulations are addressed employing both static and dynamic simulation models of a stylized fishery. The intent is to present an overview of the fishery management problem and the bioeconomic implications of the proposed management scenario.

Ward, John M. and Seth Macinko (1996). "Static and Dynamic Implications of a Gear Modification Designed to Reduce Bycatch in a Stylized Fishery. The Southern Business and Economic Journal, 19(4):273-292.

The harvesting of finfish in shrimp fishing operations, known as incidental take or bycatch, is a complex multidisciplinary and international fisheries management problem. The discarded bycatch problem in commercial shrimp fisheries has been addressed internationally with annual estimates of finfish bycatch ranging from 64 thousand tons to 1 million tons with potential benefits ranging from \$28 million to \$1.273 billion. Finfish bycatch is also a significant domestic fishery management problem with annual estimates varying from 700 million to 1.7 billion pounds. National concern has been expressed by an amendment to the Magnuson Fishery Conservation and Management Act (MFCMA), the need expressed by National Marine Fisheries Service (NMFS) to determine the economic impacts on the domestic fishery, the recognition of non-target species bycatch in three fishery management plans, and the bycatch policy of the American Fisheries Society. To this end, the bioeconomic implications of bycatch reduction regulations are addressed employing both static and dynamic simulation models of a stylized fishery. The intent is to present an overview of the fishery management problem and the bioeconomic implications of the proposed management scenario.

Ward, John M. and James M. Nance (1994). "1994 Update to the Stock Assessment and Fishery Evaluation (SAFE) Report for the Gulf of Mexico Shrimp Fishery." National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Drive, North, St. Petersburg, FL.

A comprehensive review of the available economic and biological data for the Gulf of Mexico shrimp fishery. Trends in vessel level operating costs, total revenue, landings, and net revenue are provided over time. Net revenue per vessel is declining with the increase in operating costs and the decline in ex-vessel prices.

Ward, John M. and John R. Poffenberger (1981). "A Report on the Economic Data Bases for the Coastal Migratory Pelagic Resource

(Mackerel) Management Unit." NOAA Technical Memorandum, NMFS-SEFC-84, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami, FL, March, 42 pp.

This report presents an inventory of existing economic data useful in the analysis of the coastal migratory pelagic resources (mackerel) within the southeast region. The actual list providing an inventory of the existing data describes the available data and provides representative examples. The second section of this report discusses this data inventory and describes near term plans to supplement the existing data bases. A fairly complete list of the bibliographic influences applicable to the economic analysis of the coastal pelagic fishery is also presented.

Ward, John M. and John R. Poffenberger (1982). "Survey of Ice Plants in Louisiana, Mississippi, and Alabama, 1980-81." Marine Fisheries Review, 44(9-10):55-57.

This report presents the findings of the 1980-81 survey of ice plants in the coastal areas of Louisiana, Mississippi, and Alabama. The survey was undertaken by the National Marine Fisheries Service's Southeast Fisheries Center to determine the impact of the Texas Closure regulation on the level of ice sales in this region. The 1980 survey was limited to Louisiana ice plants during the 13 week period of the spring brown shrimp season. The 1981 survey of Louisiana, Mississippi, and Alabama ice plants covered an 18 week period. The two surveys were compared using the 13 week period of the 1980 Louisiana survey. Results of the analysis indicate that weekly ice sales did not exceed productive and storage capacity in either year despite both the increased shrimp landings and the Texas closure regulation in 1981.

Ward, John M. and Jon G. Sutinen (1992). "Modeling Vessel Mobility: The Gulf of Mexico Shrimp Fleet." NOAA Technical Report, National Marine Laboratory, F/AKC3, National Marine Fisheries Service, NOAA, 7600 Sand Point Way, N.E., Seattle, WA 98115-0070.

Given the heterogeneous nature of the fishing fleet and the complex behavior of vessels, the traditional marginalist supply models are not well suited for modeling vessel mobility. A discrete choice model is utilized in this analysis to predict the probability that a vessel will enter, exit, or remain in the Gulf of Mexico shrimp fishery based on a myopic profit maximization criteria. The multinomial logit model indicates that stock variability does not influence fisherman behavior in the Gulf of Mexico shrimp fishery. The crowding externality, represented by the size of the fishing fleet, exhibits a strong negative impact on the probability of entry by fishing vessels independent of changes in abundance, ex-vessel prices, or harvesting costs. Lastly, the Gulf of Mexico shrimp fishery is not the autonomous system of fishing vessels as was initially believed.

Ward, John M. and Jon G. Sutinen (1992). "Modeling Vessel Entry-Exit Behavior in the Gulf of Mexico Shrimp Fishery." Draft report submitted to the American Journal of Agricultural Economics.

Given the heterogeneous nature of the fishing fleet and the complex behavior of vessels, the traditional marginalist supply models are not well suited for modeling vessel mobility. A discrete choice model is utilized in this analysis to predict the probability that a vessel will enter, exit, or remain in the Gulf of Mexico shrimp fishery based on a myopic profit maximization criteria. The multinomial logit model indicates that stock variability does not influence fisherman behavior in the Gulf of Mexico shrimp

fishery. The crowding externality, represented by the size of the fishing fleet, exhibits a strong negative impact on the probability of entry by fishing vessels independent of changes in abundance, ex-vessel prices, or harvesting costs. Lastly, the Gulf of Mexico shrimp fishery is not the autonomous system of fishing vessels as was initially believed.

Ward, John M. and Jon G. Sutinen (1994). "Vessel Entry-Exit Behavior in the Gulf of Mexico Shrimp Fishery." American Journal of Agricultural Economics, 76(4):916-923.

Given the heterogeneous nature of the fishing fleet and the complex behavior of vessels, the traditional marginalist supply models are not well suited for modeling vessel mobility. A discrete choice model is utilized in this analysis to predict the probability that a vessel will enter, exit, or remain in the Gulf of Mexico shrimp fishery based on a myopic profit maximization criteria. The multinomial logit model indicates that stock variability does not influence fisherman behavior in the Gulf of Mexico shrimp fishery. The crowding externality, represented by the size of the fishing fleet, exhibits a strong negative impact on the probability of entry by fishing vessels independent of changes in abundance, ex-vessel prices, or harvesting costs. The Gulf of Mexico shrimp fishery is not the autonomous system of fishing vessels as was initially believed.

Ward, John M., Theophilus R. Brainerd, and John R. Gauvin (1994). "A Description and Evaluation of the Individual Transferable Quota (ITQ) Fishery Management Program for the south Atlantic Wreckfish (Polyprion Americanus) Fishery." C.M. 1994/T:22, Theme Session on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September.

The individual transferable quota (ITQ) program for wreckfish in the south Atlantic was first implemented during the 1992-1993 season. The program has now entered its third year and so far no changes have been made to the initial actions that established the ITQ program. A monitoring program has been tracking landings, shares and coupons transactions, among others and has provided information to the stock assessment group that meets annually to evaluate the status of the fishery. This paper presents a brief background of the fishery, the conception, development, and implementation of the ITQ program. Monitoring the progress of the program is vital to evaluating whether it is fulfilling its objectives. The use of socioeconomic data is important not only for this process, but also in developing the ITQ program. A close look is given to the role socioeconomic data has played in this process. Some thoughts are provided on the lessons learned from this process and to what types of socioeconomic data could improve future implementation of ITQ programs.

Ward, John, Wade Griffin, and James Nance (1996). A Bioeconomic Analysis of Existing and Proposed Fishery Management Alternatives to Control Sea Turtle Mortality In the Gulf of Mexico Shrimp Fishery. Draft report prepared for Congress, Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL, July, 58 pp.

The General Bioeconomic Fishery Simulation Model was used to determine the effects on net benefits and real days fished of four proposed fishery management alternatives to reduce marine turtle bycatch and strandings in the Gulf of Mexico shrimp fishery. The analysis greatly exceeded the capabilities



of the model and the results should not be considered to accurately reflect the conditions in the shrimp fishery.

Ward, John, Wade Griffin, and James Nance (1996). A Bioeconomic Analysis of Existing and Proposed Fishery Management Alternatives to Control Sea Turtle Mortality In the Gulf of Mexico Shrimp Fishery. Final report prepared for Congress, Southeast Regional Office, National Marine Fisheries Service, 9721 Executive Center Drive, North, St. Petersburg, FL, July, 44 pp.

The General Bioeconomic Fishery Simulation Model was used to determine the effects on net benefits and real days fished of four proposed fishery management alternatives to reduce marine turtle bycatch and strandings in the Gulf of Mexico shrimp fishery. The analysis greatly exceeded the capabilities of the model and the results should not be considered to accurately reflect the conditions in the shrimp fishery.

Ward, John M., Wade L. Griffin, and Teofilo Ozuna (1995). "Cost and Revenues in the Gulf of Mexico Shrimp Fishery." Draft report, National Marine Fisheries Service, Southeast Regional Office, Economics and Trade Analysis Division, 9721 Executive Center Drive, North, St. Petersburg, FL

While cost and revenue data is not routinely collected in the southeastern region of the United States, many specialized data collection efforts have been funded by Sea Grant, Salstonstall/Kennedy grants, and Marine Fisheries Initiative cooperative agreements to collect data concerning the financial viability of the shrimp fishery in the Gulf of Mexico. This study describes new data collection efforts in the Gulf of Mexico and presents a statistical analysis of a data set that combines the newly collected data with historical data sets provided by the authors of existing studies. The statistical analysis suggests that home port and hull construction material do not directly affect the total costs of operating in the shrimp fishery. The resulting statistical model allows the estimation of total operating costs for vessels operating in the Gulf of Mexico shrimp fishery so that the impacts of proposed fishery management regulations can be determined for cost-benefit analysis.

Ward, John M., Teofilo Ozuna, and Wade L. Griffin (1995). "Cost and Revenues in the Gulf of Mexico Shrimp Fishery." NOAA Technical Memorandum NMFS-SEFSC-371, National Marine Fisheries Service, Southeast Regional Office, Economics and Trade Analysis Division, 9721 Executive Center Drive, North, St. Petersburg, FL, May, 76 pp.

While cost and revenue data is not routinely collected in the southeastern region of the United States, many specialized data collection efforts have been funded by Sea Grant, Salstonstall/Kennedy grants, and Marine Fisheries Initiative cooperative agreements to collect data concerning the financial viability of the shrimp fishery in the Gulf of Mexico. This study describes new data collection efforts in the Gulf of Mexico and presents a statistical analysis of a data set that combines the newly collected data with historical data sets provided by the authors of existing studies. The statistical analysis suggests that home port and hull construction material do not directly affect the total costs of operating in the shrimp fishery. The resulting statistical model allows the estimation of total operating costs for vessels operating in the Gulf of Mexico shrimp fishery so that the impacts of proposed fishery management regulations can be determined by cost-benefit analysis.

Ward , John M., Theo Brainerd, Steve Freese, Pamela Mace, Matteo Milazzo, Dale Squires, Joe Terry, Eric Thunberg, Mike Travis, and John Walden (1999).  
Report of the National Task Force for Defining and Measuring Fishing Capacity. National Marine Fisheries Service, Office of Science and Technology, Silver Spring, Maryland, June.

Report on the definition of capacity, its measurement using DEA, Peak to Peak, and SPF techniques, and potential management regulations to control and reduce excess capacity in domestic fisheries.

Wardlaw, N.J. and Wade L. Griffin (1974). "Economic Analysis of Costs and Returns for Gulf of Mexico Shrimp Vessels: 1973." Departmental Technical Report No. 74-3, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, December, 43 pp.

A budget generating computer program was established to assimilate and report the data according to the desired vessel classifications, interest rate, percent financed, number of years financed, number of loan payments per year, depreciation method, crew share agreement, rate of packing charges, payroll tax rate, discount rate, planning horizon, and object year under consideration. The program reported results in the form of total costs and returns budgets, unit costs and returns budgets, and projected cash flow budgets.

Warren, Brad (1994). The Bycatch Zone, Alaska Longliners Hope for a Way Out. In Brad Warren, Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

A brief discussion of the halibut, blackcod, and sablefish fisheries in Alaska and the effect the individual fishermen s quota will have on bycatch of these species in each fishery.

Warren, Brad (ed.) (1994). Win-Win Bycatch Solutions. National Fisheries Conservation Center, Seattle WA.

The unintentional capture of nontarget organisms has become a critical issue in world fisheries. Our aim is to provide models, strategies, and information to help stakeholders in the fisheries join forces to fashion their own bycatch solutions. The problems faced are complex enough to require a broadly inclusive approach.

Warren, John P. and Wade L. Griffin (1978). "Costs and Returns Trends for Gulf of Mexico Shrimp Vessels." DIR 78-1, SP-4, Department of Agricultural Economics, Texas A&M University, College Station, Texas, September, 20 pp.

The profitability of Gulf shrimp vessels in recent years has been highly variable, due largely to changes in input costs, shrimp prices, landings, and the cost, financing terms, and configuration of vessels. Ownership of a Gulf shrimp vessel can be a satisfactory investment given the variation in landings over an extended period of time.

Warren, John P. and Wade L. Griffin (1980). "Costs and Returns Trends in the Gulf of Mexico Shrimp Industry, 1971-78." Marine Fisheries Review, (February): 1-7.

This report describes the magnitude and past performance of the Gulf of Mexico shrimp industry, the recent performance of an "average" Gulf shrimp vessel in terms of costs, returns, and basic investment analysis, summarizes

data and analyses and, finally, discusses implications.

Warren, John P., Wade L. Griffin, and William E. Grant (1982).

"Regional Fish Stock Management: A Model for Northwest Africa."  
Marine Policy, 6:121-130.

Development of a bioeconomic model for applications in managing an important north African fishery is reported in this article. The model is applied through identification of baseline conditions and analysis of two alternative fishery management plans; limiting the number of vessels and instituting a closed season. Several key assumptions relative to biological and fleet variables are necessarily made, since in some areas historical data are limited. However, results strongly suggest that rents to resource owners (African coastal countries) can be substantially increased by either method of limiting access to the fishery and by licensing vessels and fishermen.

Warren, John P., Wade L. Griffin, and Ronald D. Lacewell (1974).

"Applying An Index of Fishing Effort to Estimate 1971 Costs and Returns for Gulf of Mexico Shrimp Vessels." TAMU-SG-74-217,  
Department of Agricultural Economics, Texas Agricultural Experiment Station, Texas A&M University, February, 11 pp.

Shrimp vessels operating in the Gulf of Mexico are heterogeneous with respect to physical characteristics. In this study, the investigators developed a more effective and useful method of classifying vessels for costs and returns analysis by the introduction of an index of fishing effort. This effort index is defined as the fishing power of any given vessel relative to the fishing power of a base or standard vessel. The results indicate that the use of an effort index to establish relatively homogeneous groups of vessels for costs and returns studies, that are needed by the industry and by agencies responsible for management of the resource, constitutes an improvement over use of a classification based on a single criterion such as length only.

Washington, Percy M. and Ann M. Koziol (1993). Overview of the Interactions and Environmental Impacts of Hatchery Practices on Natural and Artificial Stocks of Salmonids. Fisheries Research, 18:105-122.

Artificial propagation of Pacific salmon has been carried out for over a century. Salmonid stocks used in hatcheries were made homogeneous to be more easily manipulated. The stocks that form the basis for most coastal net and troll fisheries are currently of hatchery origin, and a 3-5% escapement of hatchery stocks is considered adequate for reproduction. During the period 1960-1980, although numbers and average sizes of coho released from Columbia River hatcheries increased, returning adults declined between 1970 and 1980. Massive efforts were made to improve the efficiency of production in salmon hatcheries. Adult biomass potential decreased where there was a proportional increase in precociousness, resulting in decrease in older mature individuals. Fisheries based upon enhancement have consistently fostered the over-fishing of naturally reproduced stock. For reasons never satisfactorily explained, salmonids have been released for decades in upstream areas without a basic understanding of instream ecological requirements of the salmonids, a knowledge of what resources these released salmonids are being superimposed upon, or a concern for the ecological devastation caused by these practices. A policy based on artificial propagation served as an accomplice in reducing wild salmonid stock genetic diversity among wild salmonid stocks and average size and age of returning adults. Fishery policy makers were provided a convenient excuse for the worst possible resource use practices, and used hatcheries to affect wild salmonid stocks profoundly.

Waters, James (1982). "Review of the 1982 Shrimp Fishery Along the South Atlantic Coast." Draft report, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Miami, FL 33149, March, 21 pp.

This report summarizes available information about the 1982 shrimp fishery along the south Atlantic coast. Four aspects of the fishery are discussed in relation to historical trends: (1) ex-vessel value received by commercial shrimpers, (2) landings, (3) productivity of commercial vessels and (4) profitability. Overall, 1982 was a good year for commercial shrimpers in the south Atlantic, and the relatively mild winter of 1982-83 suggests that 1983 will be a good year as well.

Waters, James (1983). "Dynamics of Establishing Minimum Size Limits in the South Atlantic Snapper-Grouper Fishery." A Summary of Work Performed for the South Atlantic Fishery Management Council, National Marine Fisheries Service, Southeast Fisheries Center, Beaufort Laboratory, Beaufort, NC, January, 25 pp.

An objective of minimum size limits is to increase biomass landed by harvesting fewer but heavier fish. Biological yield per recruit models adequately predict equilibrium yield per recruit with and without the size limit, but they do not quantify the trade offs between short run losses and long run gains in yield per recruit during the transition between equilibria. This study quantifies the transition between equilibria and suggests the internal rate of return as a suitable criterion for evaluating the effectiveness of a proposed minimum size limit. In addition, two new variables are introduced into the yield per recruit framework, one representing the probability that undersized fish are caught and released and the other defining the probability that a released fish will survive. Minimum size limits for ten species in the south Atlantic snapper-grouper fishery are evaluated.

Waters, James (1983). "Review of the Snapper-Grouper Fisheries in the Gulf of Mexico, 1982." National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Miami, FL, August.

In 1982, commercial landings of snappers and groupers exceeded 21 million pounds worth approximately \$25.8 million. Grouper landings increased from less than 5 million pounds in 1978 to a record 12.4 million pounds worth a record \$12.3 million in 1982, primarily due to the increased use of bottom longlines. In 1982, groupers represented nearly 59 percent of the commercial snapper-grouper catch. Red snapper landings increased from 4.5 to nearly 6 million pounds from 1978 to 1982, which reverses a long run decline that began in 1966. Red snapper landings were worth a record \$10.2 million in 1982. Recreational fishermen harvest significant numbers of snappers, groupers, and sea basses, but recreational catch data have not been available since 1979 when approximately 9 million fish were caught.

Waters, James (1984). "Review of the Reef Fish Fisheries in the South Atlantic, 1982." National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Miami, FL, April.

A review of the commercial and recreational landings and value of reef fish species in the southeastern Atlantic region of the United States from 1977 to 1982.

Waters, James (1984). "Review of the Commercial Reef Fish Fisheries along the Gulf of Mexico and South Atlantic Coasts, 1983."

National Marine Fisheries Service, Southeast Fisheries Center,  
Miami Laboratory, Miami, FL, August.

A review of the commercial landings and value of reef fish species in  
the southeastern region of the United States.

Waters, James (1986). "Aggregate Models of Limited Entry." Draft  
report, National Marine Fisheries Service, Southeast Fisheries  
Center, Miami Laboratory, Miami, FL 33149, April, pp. 9.

Models for analysis of limited entry regulations.

Waters, James (1986). "Estimation of Production Functions for Shrimping  
Trips in Inshore Waters." Draft report, National Marine Fisheries  
Service, Southeast Regional Office, Beaufort Laboratory, Beaufort,  
North Carolina.

A production function describes the relationship between inputs and  
outputs. The concept of a production function could be used to describe the  
technology of the fishing firm or the technology of the entire industry.  
Empirical applications of fishery production functions usually have estimated  
either an industry wide production function or an annual production function  
for a representative vessel. For example, Griffin et al. (1976) estimated an  
annual industry production function for the shrimp fishery in the Gulf of  
Mexico. This study uses data from the inshore shrimp fisheries in Galveston  
Bay and Calcasieu Lake to estimate catch per trip as a function of fishing  
effort and some measure of population abundance or biomass as inputs. Doll  
(1988) discusses the fishery production function and its underlying  
assumptions.

Waters, James R. (1991). "Restricted Access vs. Open Access Methods of  
Management: Toward More Effective Regulation of Fishing Effort."  
Marine Fisheries Review, 53(3):1-10.

This paper gives an overview of the economic rationale for limited entry  
as a method of fishery management and discusses general advantages and  
disadvantages of license limitation and catch rights as the two primary  
methods of restricting access to marine fisheries. Traditional open access  
methods of regulation can be temporarily effective in protecting fish  
populations, but they generally fail to provide lasting biological or economic  
benefits to fishermen because they do not restrict access to the fishery. The  
general result of regulation with unrestricted access to a fishery is  
additional, ore costly and complex regulations as competition increases for  
dwindling fishery resources. Regulation that restricts access to a fishery in  
conjunction with selected traditional methods of regulation would encourage  
efficient resource usage and minimize the need for future regulatory  
adjustments, provided that enforcement and monitoring costs are not too great.  
In theory, catch rights are superior to license limitation as a means of  
restricting access to a fishery.

Waters, James R. (1991). "Restricted Access vs. Open Access Methods of  
Management: Toward More Effective Regulation of Fishing Effort."  
Draft report, Southeast Regional Office, National Marine Fisheries  
Service, NOAA, 9450 Koger Boulevard, St. Petersburg, FL 33702.

This paper gives an overview of the economic rationale for limited entry  
as a method of fishery management and discusses general advantages and  
disadvantages of license limitation and catch rights as the two primary  
methods of restricting access to marine fisheries. Traditional open access

methods of regulation can be temporarily effective in protecting fish populations, but they generally fail to provide lasting biological or economic benefits to fishermen because they do not restrict access to the fishery. The general result of regulation with unrestricted access to a fishery is additional, ore costly and complex regulations as competition increases for dwindling fishery resources. Regulation that restricts access to a fishery in conjunction with selected traditional methods of regulation would encourage efficient resource usage and minimize the need for future regulatory adjustments, provided that enforcement and monitoring costs are not too great. In theory, catch rights are superior to license limitation as a means of restricting access to a fishery. Includes a limited entry presentation outline.

Waters, James R. (1993). "Economic Analyses of Minimum Size Limits for Selected Reef Fishes Along the U.S. South Atlantic Coast." Report for the South Atlantic Fisheries Management Council, June, 22 pp.

This paper investigates the economic effects of alternative minimum size limits for white grunt, gray triggerfish, mutton snapper, and greater amberjack. A bioeconomic simulation model was used to predict changes in commercial and recreational landings over time. The economic concept of net present value was used as the criterion for evaluation of the tradeoffs between short-term losses and long term gains in commercial revenues. The utility that fishermen receive from recreational fishing could not be evaluated due to a lack of data.

Waters, James R. (1993). "Ideas for Analysis of ITQs in the Gulf Red Snapper Fishery." Memorandum to John Ward, National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, May.

An outline of ideas for analyzing ITQs in the Gulf red snapper fishery.

Waters, James R. (1994). "Economic Implications of Potential Changes in Management for the Reef Fisheries in the U.S. Gulf of Mexico." National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, August.

This report describes the economic implications of potential changes in management that were recommended by the Reef Fish Stock Assessment Panel for the reef fisheries in the Gulf of Mexico.

Waters, James R. (1994). "Recent Trends in the Commercial Reef Fisheries in the U.S. Gulf of Mexico." National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, August.

Trends in landings and value for the northern, western, and eastern Gulf of Mexico reef fish fishery are presented along with a management history. A descriptive analysis of the impacts of management regulations is presented for each managed area.

Waters, James R. (1995). Reef Fish Cost and Earnings Data. National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, August.

A copy of a data set for the cost and returns per trip made by Gulf of Mexico (Florida West Coast) and south Atlantic reef fish fishermen with a set of memorandums that indicate corrections to the data that have been made over

time, documentation of the file contents, and a copy of the questionnaires.

Waters, James R. (1995). "Management with Individual Transferable Quotas in a Multispecies Fishery." Draft, National Marine Fisheries Service, 101 Piver's Island Road, Beaufort, North Carolina, January.

This paper examines the conditions under which management with individual transferable quotas might be successfully implemented in a multispecies fishery. The first section briefly describes the concept of individual transferable quotas, while the second and third sections identify its advantages and disadvantages as a method of fishery management. More detailed discussions are available in the papers by Waters (1991) and Copes (1986). The fourth section examines the complications of applying individual transferable quotas in a multispecies fishery and identifies conditions under which the method might be successfully implemented. The fifth section discusses several characteristics of the snowy grouper and tilefish fisheries along the U.S. south Atlantic coast to see if individual transferable quotas are likely to be successful if implemented there.

Waters, James R. (1995). A Model of Commercial Fishing Behavior. National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, August.

A discreet trip level model of commercial fishing firm behavior in a multi-species fishery using individual transferable quotas.

Waters, James R. (1996). "Economic Aspects of a 14 vs. 15 Inch Minimum Size Limit for Red Snapper in the Gulf of Mexico." National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, August.

An economic analysis of a recent proposal to reduce the minimum size limit for red snapper from 15 to 14 inches determines a net benefit of \$23,650 change in revenue for one year in the fishery.

Waters, James R. (1996). "An Economic Survey of Commercial Reef Fish Vessels in the U.S. Gulf of Mexico." National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, July.

This report summarizes the results of a survey of reef fish fishermen in the southeastern U.S. waters. The primary objective of the survey was to collect information needed to describe the financial performance of commercial reef fish vessels in the Gulf of Mexico. Results are presented in terms of group averages, frequency distributions, and other methods of summarization as needed to maintain the confidentiality of individual respondents. The ultimate aim of the study is to determine the economic effects of regulation in the commercial reef fish fishery. Regulation affects fishermen through constraints on how and when they may fish and what they may catch and keep. The economic effects of a particular rule would be calculated as the difference between net revenues with and without that rule.

Waters, James R. (1997). "Graphical Summary of Economic Trends in the Commercial Red Snapper Fishery of the U.S. Gulf of Mexico." National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, October.

Landings, value, ex-vessel prices, linear and log-linear demand equations, imports, reef fish boats household income, number of boats, and net return per day for owners, captain, and crew for red snapper and related reef fish species presented in graphical form.

Waters, James R. (1997). "Tabular Summary: Commercial Landings and Ex-Vessel Value of Reef Fishes in the U.S. Gulf of Mexico (Texas to Monroe County, FL)." National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, October.

A set of tables listing landings and value from 1962 to 1996 for reef fish species in the Gulf of Mexico.

Waters, James R. (1998). "Economic Review of the Commercial Fisheries for Vermilion Snapper and Gag in U.S. Waters of the Gulf of Mexico." National Marine Fisheries Service, Southeast Regional Office, Beaufort Laboratory, 101 Piver's Island Road, Beaufort, NC, August, 52 pp.

This report reviews available data pertaining to the economic status of the commercial reef fish fisheries for vermilion snapper (*Rhomboplites aurorubens*) and gag (*Mycteroperca microlepis*) in the Gulf of Mexico. Aggregated data about landings and ex-vessel value received by fishermen provided information about general trends in the fisheries between 1986 (the first year for which reasonably accurate species identifications were available) and 1997. Information about the activities of individual participants were obtained from trip reports submitted to the reef fish logbook program.

Waters, James R. and Bill Antozzi (1997). "Likely Economic Effects of Mini-Derbies." Report, NOAA, NMFS, SERO, Beaufort Laboratory, Beaufort, NC 28516, April, 4 pp.

A discussion of the likely economic effects of a proposed regulation to limit the fishing season for red snapper to the first 15 days of each month using the change in total revenue as a measure of net benefits. The authors conclude that the total revenue received by fishermen will be reduced because of the impact the proposed regulations will have on exvessel prices.

Waters, James R. and James M. Nance (1989). "Production Functions for Shrimping Trips in Inshore Waters." Draft report, NOAA, NMFS, SEFC Beaufort Laboratory, Beaufort, NC 28516 and Galveston Laboratory, Galveston TX 77551, May, 34 pp.

Personnel at the NMFS Laboratory at Galveston, Texas, interviewed fishermen at dockside to collect economic information about fishing activities in two major estuaries of the Gulf of Mexico: Galveston Bay, Texas, and Calcasieu Lake, Louisiana. Interviews were conducted between May 20 and October 30, 1987. This study estimated production functions for trips with bay licenses in Galveston Bay and for trips with shrimp trawls in Calcasieu Lake. In one specification, catch per trip was estimated as a function of hours fished, trawl width, vessel length and time as a proxy for the unknown shrimp biomass. Another specification estimated catch per trip as a function of the number of tows per trip, average duration of each tow, trawl width, vessel length and time. These functions could be used in future analyses of the proposal to require fishermen to limit their tow times to 90 minutes or less. Data collection techniques (data collected exclusively between the hours of 8:00 am and 5:00 pm) allegedly biased the data set and may have led



to erroneous results.

Waters, James R. and James M. Nance (1990). "A Description of Trip Data Collected from the 1987 Inshore Shrimp Fishery of Galveston Bay, Texas." NOAA, Technical Memorandum NMFS-SEFC-257, 63 pp.

Economic information about inshore shrimping trips in Galveston Bay, Texas was collected from fishermen at dockside between May 20 and October 30, 1987. This study presents information about fishing effort, operating costs, landings and revenues per trip for trips with bay and bait licenses in Galveston Bay.

Waters, Jim and Jon Platt (1990). "Economic Analyses of Alternative Management Options for the Red Snapper Fishery in the Gulf of Mexico." Report prepared for the Gulf of Mexico Fishery Management Council by National Marine Fisheries Service, Southeast Regional Office, 9450 Koger Boulevard, St. Petersburg, FL 33702.

Biological investigations have determined that the red snapper (Lutianus campechanus) resource in the Gulf of Mexico has been significantly overfished and that regulations implemented in 1990 and earlier years will not restore the red snapper population to desired levels (Goodyear and Phares, 1990). This report describes economic implications of management alternatives to govern the directed commercial and recreational reef fish fisheries and to reduce the incidental catch and discard of juvenile red snappers and other species by the shrimp trawl fishery. Economic effects of various management alternatives on the commercial and recreational red snapper fisheries were based on projections of future landings made with a simulation model developed by Goodyear (1989). Economic effects of management alternatives on the commercial shrimp fishery were based on the results of a simulation model described by Griffin et al. (1990). This report was reviewed by a panel of economists that met at council headquarters on June 5-6, 1990, whose recommendations were subsequently ignored by the authors.

Waters, James R., Leon E. Danielson, and J.E. Easley, Jr. (1978). "Economic Evaluation of the Shrimp Discard Problem in Pamlico Sound, North Carolina." Contribution Paper, AAEA Annual Meeting, VPI and SU, August, 12 pp.

In North Carolina, commercially undersized pink shrimp are incidentally landed, killed, and discarded during harvest of brown shrimp. This study analyzed the incidental catch (discard) problem and management policies to protect pink shrimp. Results showed incidental catch does not generally reduce fishermen's income sufficiently to adopt a discard abatement policy.

Waters, James R., Leon E. Danielson, and J.E. Easley, Jr. (1979). "An Economic Analysis of the Shrimp Discard Problem in Pamlico Sound." Economics Research Report No. 40, Department of Economics and Business, North Carolina State University, Raleigh, North Carolina, February, 47 pp.

The North Carolina shrimp catch is composed of three different species, brown (Penaeus aztecus), pink (P. duorarum), and white (P. setiferus). Brown shrimp mature and are harvested in the fall. During this same period the pink shrimp are primarily in juvenile stages and are below commercial size. However, because they utilize the same areas, pink shrimp are caught incidentally while harvesting brown shrimp and are killed. Hence they are lost to the fishery and represent foregone future earnings to the fishery since they would otherwise have reached commercial size in late fall and

spring. This incidental (or discard) catch problem is analyzed to ascertain whether alternative shrimp management policies should be instituted that would reduce the extent of the discard problem. The basis for evaluating the policies was whether or not net income to the fishery increased. Because of the lack of required data, the analysis was primarily a sensitivity analysis on the parameters involved. Results showed that the potential for increasing income to the fishery through reduced discard exists only at high discard rates. This is primarily due to high natural mortality and the low probability of catching those pink shrimp that are save from being discarded.

Waters, James R., J.E. Easley, Jr., and Leon E. Danielson (1980).  
"Economic Trade-Offs and the North Carolina Shrimp Fishery."  
American Journal of Agricultural Economics, 62(1):124-129.

The purpose of this study is to analyze the incidental catch (or discard) problem to ascertain whether discard abatement policies should be instituted during August and September to protect juvenile pink shrimp. Interest is focused on whether or not the range of observed discard rates is sufficiently large to warrant protection. Because of the lack of required data, the study is primarily a simulation analysis.

Waters, James R., Raymond J. Rhodes, and Robert Wiggers (1997). Description of Economic Data Collected With a Random Sample of Commercial Reef Fish Boats in the Florida Keys. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 101 Piver's Island Road, Beaufort, NC 28516 and South Carolina Department of Natural Resources, Marine Resources Division, Office of Fisheries Management, P.O. Box 12559, Charleston, SC, October, 117 pp.

This survey provides basic economic information about the financial performance of boats in the commercial reef fish fishery in the Florida Keys. Respondents were characterized with regard to their dependence on the commercial reef fish fishery as a source of household income. Boats were described in terms of their physical and financial characteristics. Some boats fished in one kind of activity year-round whereas others rotated among several kinds of fishing trips according to seasonal availability of fish, seasonal variation in prices, fishery regulations and so forth. An important objective of the survey was to estimate average net operating revenues per boat per trip and per boat per year that were earned on the most important kinds of fishing trips taken by reef fish boats. Yellowtail snapper was the most commonly sought species by commercial reef fish boats in the Florida Keys. Spiny lobster was the second most frequently cited species as being most important in terms of annual revenues, and generated the highest net returns among the activities examined in this study. Black grouper and mutton snapper were commonly mentioned as the second, third, fourth or lower ranked species in terms of the generation of annual revenues, principally in the Upper and Lower Keys. Fishing for greater amberjack was the highest volume activity examined in this study. Overall financial performance was measured as the boat's gross revenues and net income before taxes for all fishing activities combined. Net incomes per boat averaged \$11,129 based on revenues of \$49,581 in the Upper Keys, \$3,301 based on revenues of \$13,714 in the Middle Keys, and \$6,653 based on revenues of \$28,027 in the Lower Keys. The estimated total revenues for the sampled population of reef fish boats in the Keys were \$18.4 million, with aggregate net incomes of \$4.3 million.

Waters, James R., Raymond J. Rhodes, Wayne Waltz, and Robert Wiggers (1997).  
An Economic Survey of Commercial Reef Fish Boats Along the U.S. South Atlantic Coast. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 101

Piver's Island Road, Beaufort, NC 28516 and South Carolina Department of Natural Resources, Marine Resources Division, Office of Fisheries Management, P.O. Box 12559, Charleston, SC, November, 117 pp.

This study summarizes the results of a survey designed to provide economic information about the financial status of commercial snapper-grouper boats with home ports between Dare County, North Carolina and Dade County, Florida. A survey questionnaire was administered in the summer and fall of 1994 by interviewers in face-to-face meetings with owners or operators of randomly selected boats. Fishermen were asked for background information about themselves and their boats, their capital investments in boat and equipment, and about their average catches, revenues and costs per trip for their two most important kinds of fishing trips for species in the snapper-grouper complex during 1993. Respondents were characterized with regard to their dependence on the commercial snapper-grouper fishery as a source of household income. Boats were described in terms of their physical and financial characteristics. The different kinds of fishing trips were identified by the species that generated the greatest revenue and grouped into six general categories: trips for temperate, mid-shelf species; trips for tropical snappers; trips for deep water groupers and tilefish; trips with pots for black sea bass; trips for greater amberjack; and trips for king mackerel. Average catches, revenues, routine trip costs and net operating revenues per boat per trip and per boat per year were estimated for each category of fishing trips.

This survey constitutes the first, comprehensive source of baseline information about the financial status of snapper-grouper boats along the Atlantic seaboard. In addition to its descriptive value, data collected during this study will aid in future examinations of the economic effects of various regulations on commercial snapper-grouper fishermen.

Watson, John W. (1983). "FY 1982 Project Report, Sea Turtle Excluder Trawl." Draft report, Division of Harvesting Systems and Surveys, Mississippi Laboratories, Southeast Fisheries Center, National Marine Fisheries Service.

The turtle excluder trawl project goal for FY 1982 was to encourage and accelerate voluntary use of the TED technology in the southeastern shrimp fishery by documenting and demonstrating potential benefits to the shrimping industry. Potential benefits of TED technology include reduction of unwanted and troublesome bycatch organisms including finfish, decreases in trawl drag due to improved water flow resulting in fuel savings, and increases in shrimp catch rates and quality of shrimp catch.

Watson, John W. (1983). "FY 1983 Project Report, Sea Turtle Excluder Trawl." Draft report, Division of Harvesting Systems and Surveys, Mississippi Laboratories, Southeast Fisheries Center, National Marine Fisheries Service.

Research was completed on the energy aspects of the TED and a model study and field testing aboard a chartered shrimp vessel completed in November, 1982. Lighter designs for TEDs were researched. Modifications to the TED resulted in finfish separation rates of as much as 53% during the day but only 10% or less at night.

Watson, John W. (1981). "Sea Turtle Excluder Trawl Project." Milestone Report, Division of Harvesting Systems and Surveys, Mississippi Laboratories, Southeast Fisheries Center, National Marine Fisheries Service.

This report presents the progress and status of the sea turtle excluder trawl development projects and describes the research objectives planned for FY81. Data are presented on comparative catch rates between two turtle excluder designs and standard shrimp trawls. Data are also presented on the effect of reduced tow time and resuscitation of comatose turtles on sea turtle mortality in shrimp trawls.

Watson, John W. (1984). "Sea Turtle Excluder Trawl, FY 1984 Project Report." Draft report, Division of Harvesting Systems and Surveys, Mississippi Laboratories, Southeast Fisheries Center, National Marine Fisheries Service.

The TED project goal for FY 1984 was to encourage and accelerate voluntary use of the TED technology in the southeastern shrimp fishery by improving the handling and operational characteristics of the TED and improve and demonstrate the finfish reduction potential of the TED during both nocturnal and diurnal periods.

Watson, John W., John F. Mitchell, and Arvind K. Shah (1985). "Trawling Efficiency Device: A New Concept for Selective Shrimp Trawling Gear." Draft report, National Marine Fisheries Service, Southeast Fisheries Center, Mississippi Laboratories, Pascagoula, MS.

The Trawl Efficiency Device (TED) is inserted between the body and cod end of a shrimp trawl. A steel grid and trap door ejects unwanted shrimp bycatch such as turtles, sharks, rays, jellyfish, crabs, sponge, etc. The TED also can be used to reduce finfish bycatch by employing a finfish deflector grid, leading panels, and exit openings. The device eliminates finfish by taking advantage of the difference in swimming ability and behavior between finfish and shrimp. Shrimp are carried into the cod end by accelerating water flow through the device with a webbing funnel. Finfish are stimulated into an escape reaction by a finfish deflector grid and are guided to exit openings by leading panels. Finfish separation rates averaging 78 percent and 53 percent were achieved during day trawling and night trawling, respectively, with no significant difference in shrimp catch rates. Finfish separation rates varied by species and total separation varied as a function of catch composition. The TED is being introduced into the shrimp fishery in the southeastern United States to reduce incidental turtle captures, conserve finfish resources discarded by the shrimp fleet, and increase trawling efficiency.

Watson, John W., John F. Mitchell, and Arvind K. Shah (1986). "Trawling Efficiency Device: A New Concept for Selective Shrimp Trawling Gear." Marine Fisheries Review, 48(1):1-9.

The Trawling Efficiency Device (TED) is inserted between the body and cod end of a shrimp trawl. A steel grid and trap door ejects unwanted shrimp bycatch such as turtles, sharks, rays, jellyfish, crabs, sponge, etc. The TED also can be used to reduce finfish bycatch by employing a finfish deflector grid, leading panels, and exit openings. The device eliminates finfish by taking advantage of the difference in swimming ability and behavior between finfish and shrimp. Shrimp are carried into the cod end by accelerating water flow through the device with a webbing funnel. Finfish are stimulated into an escape reaction by a finfish deflector grid and are guided to exit openings by leading panels. Finfish separation rates averaging 78 percent and 53 percent were achieved during day trawling and night trawling, respectively, with no significant difference in shrimp catch rates. Finfish separation rates varied by species and total separation varied as a function of catch composition. The TED is being introduced into the shrimp fishery in the southeastern United States to reduce incidental turtle captures, conserve finfish resources

discarded by the shrimp fleet, and increase trawling efficiency.

Watson, John W., Ian Workman, Dan Foster, Charles Taylor, Arvind K. Shah, James Barbour, and Dominy Hataway (1993). "Status Report on the Potential of Gear Modifications to Reduce Finfish Bycatch in Shrimp Trawls in the Southeastern United States, 1990-1992." NOAA Technical Memorandum NMFS-SEFSC-327, March, 131 pp.

This status report presents data from scuba diver evaluations and bycatch reduction/shrimp retention test results for prototype bycatch reduction device (BRD) designs. Fish bycatch and shrimp retention data are presented for 30 prototype BRD designs. Of these, 12 have demonstrated overall fish bycatch reduction rates between 43% and 67% and 7 had shrimp retention rates between 90% and 100%. Prototype designs that show the best potential for achieving a 50% reduction in total fish bycatch with better than 90% shrimp retention are the large mesh funnel design, the extended funnel design, the HSB design, and the fisheye design.

Watts, Noel H. and Gilmore J. Pellegrin, Jr. (1982). "Comparison of Shrimp and Finfish Catch Rates and Ratios for Texas and Louisiana." Marine Fisheries Review, 44(9-10):44-49.

A comparison was made between 1980 and 1981 commercial fishing to judge effects of the Texas closure on shrimp and finfish catches off Texas and Louisiana. Historical data (1973-78) for the two areas was used as baseline, and comparisons were made of finfish/shrimp catch ratios and species composition. Mean shrimp catch rates (heads-on) standardized to 100-foot trawls for Texas and Louisiana in 1980 were 42.56 pounds/hour and 42.53 pounds/hour, respectively, and in 1981 were 89.03 pounds/hour and 62.20 pounds/hour. Mean finfish catch rates for Texas and Louisiana in 1980 were 333.90 pounds/hour and 242.84 pounds/hour, respectively, and in 1981 were 156.19 pounds/hour and 408.88 pounds/hour. Average finfish/shrimp ratios for Texas were 12.94 in 1980 and 2.55 in 1981. For Louisiana, the average finfish/shrimp ratios were 22.15 in 1980 and 37.23 in 1981.

Differences between 1980 and 1981 shrimp catch rates off Texas and Louisiana, and between Texas and Louisiana in 1981, were significant at the 95 percent confidence level. Finfish catch rates off both states were significantly influenced by depth, with no significant differences found between years for either state when the effect of depth was removed. Species composition of the bycatch was removed. Species composition of the bycatch in waters 10 fathoms or less was relatively consistent regardless of state or year. The composition of bycatch from deeper waters was much more variable and significantly different from catches made in the shallower waters. Overall, the analyses supported a hypothesis of increased shrimp catch rates due to the Texas closure. Finfish catch rates and compositions, however, were not shown to change as a result of the closure. This latter conclusion assumes the distribution of fishing effort by depth zone was unaffected by the closure.

Webb, Michael G. and Martin J. Ricketts (1980). The Economics of Energy. John Wiley & Sons, New York.

The objective of this book is to provide an integrated and reasonably comprehensive introduction to the economics of energy. The analytical framework of the book is that of Paretian welfare economics. An extensive reference section is included in the book.

Weber, Karen L. (1994). "Analysis of Decisionmaking Processes in the Ivoirian Maritime Fisheries Sector." C.M. 1994/T:24, Theme Session

on Improving the Link Between Fisheries Science and Management: Biological, Social, and Economic Considerations, International Council for the Exploration of the Sea, 82<sup>nd</sup> Statutory Meeting, St. John's, Newfoundland, Canada, September, 4 pp.

This paper addresses the interface of the artisanal fishing community, the industrial fishermen, and the government in the decision making processes that so intricately operate in the Ivorian maritime fisheries sector.

Weber, Michael (1989). "Presentation to the National Academy of Sciences' Committee on Sea Turtle Conservation." Center for Marine Conservation, Jekyll Island, Georgia, June 28, 14 pp.

A presentation to the National Academy of Science concerning sea turtle conservation efforts by the Center for Marine Conservation and the National Academy of Science's study of marine turtle mortality in shrimp otter trawls.

Weber, Michael (1997). "Effects of Japanese Government Subsidies of Distant Water Tuna Fleets: A Case Study." World Wildlife Fund, 1250 Twenty-Fourth Street, NW, Washington, D.C., January, 18 pp.

This paper describes subsidy programs of Japan that have built and maintained the distant water tuna fleet. The paper then outlines the principal features of access agreements in the South Pacific region, focusing upon access agreements between Japan and the Solomon Islands. A general description of Japanese development assistance to Pacific Island countries leads to a specific description of some aid projects with the Solomon Islands specifically. Economic returns on the subsidies provided by the government of Japan are analyzed, and the role of Japanese trading companies in the expansion of tuna fishing in the South Pacific is described. The paper ends with a discussion of likely future developments in tuna fishing in the South Pacific region.

Weber, Michael (1997). "Effects of Japanese Government Subsidies of Distant Water Tuna Fleets." In World Wildlife Fund's Subsidies and Depletion of World Fisheries, WWF's Endangered Seas Campaign, 1250 Twenty-Fourth St., NW, Washington, D.C., 136 pp.

This paper describes subsidy programs of Japan that have built and maintained the distant water tuna fleet. The paper then outlines the principal features of access agreements in the South Pacific region, focusing upon access agreements between Japan and the Solomon Islands. A general description of Japanese development assistance to Pacific Island countries leads to a specific description of some aid projects with the Solomon Islands specifically. Economic returns on the subsidies provided by the government of Japan are analyzed, and the role of Japanese trading companies in the expansion of tuna fishing in the South Pacific is described. The paper ends with a discussion of likely future developments in tuna fishing in the South Pacific region.

Weber, Michael, Deborah Crouse, Robert Irvin, and Suzanne Ludicello (1995). "Delay and Denial: A Political History of Sea Turtles and Shrimp Fishing." Center for Marine Conservation.

A management history of the turtle excluder device (TED) fishery management regulation. While accurately portraying events, causation is often confused and misguided. For example, the authors attempt to argue that fishery managers used short run economic criteria to justify not protecting

sea turtle stocks which is in fact a ludicrous argument.

Weil, Ernesto M. and Roger G. Laughlin (1984). Biology, Population Dynamics, and Reproduction of the Queen Conch Strombus Gigas Linne in the Archipelago De Los Roques National Park. Journal of Shellfish Research, 4(1):45-62.

Data relating to the distribution, population dynamics, and reproduction of the queen conch Strombus gigas Linne at the Archipelago Los Roques National Park, Venezuela are presented.

Weisbrod, Burton A. (1968). "Income Redistribution Effects and Benefit-Cost Analysis." In S.C. (ed.) Problems in Public Expenditure Analysis, The Brookings Institution, Washington, D.C.

This paper considers the conceptual case for integrating income distributional effects and allocative efficiency effects in the evaluation of public expenditure projects.

Weintraub, E. Roy (1982). Mathematics for Economists. Cambridge University Press, New York.

This book is written out of the belief that a student's intuition should be involved in the study of mathematical techniques in economics. The book is designed to develop an understanding of the optimization problem and concludes with chapters on classical programming and linear and nonlinear programming.

Weisberg, Herbert F. (1978). "Evaluating Theories of Congressional Roll-Call Voting." American Journal of Political Science, 22(3):554-577.

Criteria are developed to evaluate recent theories of roll-call voting in the House of Representatives. Since tests of these very different theories find high levels of predictive success, we must decide how to choose among them. Baseline models are developed to show the extent to which the votes could be predicted with minimal information. The 80-90 percent of the individual votes correctly predicted by the theories is found to be little improvement over the baseline models predicting voting along with the House or party majority. Since the statistical criterion is found to be indeterminate, the importance of verisimilitude to the process being studied is stressed. Simulation studies have done a good job of portraying the process aspects, and they could be usefully combined with statistical studies of long term forces and interviewing studies of short term forces affecting the voting. Theory development in the field should move to a more longitudinal perspective, as well as combining the long term and short term elements into a single overarching theory.

Weiskel, T.C. (1991). "Muddles in the Models: Ecosystemic Process, Cultural Understandings and the Limits of Human Metaphor in Devising Public Policy for Global Environmental Change." Presented at the GSA Meetings, San Diego, California, October.

Scientific understanding of the earth's ecosystem has developed through a series of successive metaphors or models, each of which has proved to be more inclusive than its predecessors in explaining natural phenomena. While these metaphors or models help to extend our ecological understanding, it is important to realize that a substantially different set of metaphors inform the cultural beliefs and guide the collective behavior of human communities. In short, the gap between what people know and how they act can be quite

pronounced, and it can vary considerably from culture to culture depending upon the institutional matrix and the vision of public leadership in any given society.

The time-lag involved in the cultural appropriation of new scientific knowledge becomes a critical issue in trying to devise appropriate public policy for the global environment. Human communities perceive problems and devise public policies largely on the basis of metaphors derived from their historical experience. When confronted with new circumstances, the culturally dominant metaphors available to guide and motivate action may prove to be inappropriate or dysfunctional, engendering collective behavior that hastens ecosystemic collapse rather than that which might preserve system-wide integrity and continuity. This paper examines some of the disparities between emerging scientific models and the dominant cultural metaphors which continue to condition the development of public policy on environmental issues.

Weitzman, Martin L. (1974). "Free Access vs. Private Ownership as Alternative Systems for Managing Common Property." Journal of Economic Theory, 8:225-234.

This paper develops a formal model to characterize and compare the alternative static allocations of resources that occur under conditions of free access and of private property ownership. There turns out to be a definite limitation on the amount of inefficiency that can be introduced into a competitive situation when property is freely accessible. That bound has an interesting welfare interpretation. The variable factor will always be better off with (inefficient) free access rights to the fixed factor than under (efficient) private ownership of property.

Weitzman, Martin L. (1974). "Prices vs. Quantities." Review of Economic Studies, 41(128):477-491.

For one particular economic variable that needs to be regulated, what is the best way to implement control for the benefit of the organization as a whole? Is it better to directly administer the activity under scrutiny (quantities) or to fix transfer prices and rely on self-interested profit or utility maximization to achieve the same ends in decentralized fashion.

Wellman, Katharine F. (1990). "Chicken of the Sea?: The U.S. Consumer Retail Demand for Fish Products." Ph.D. Dissertation, Department of Economics, University of Washington.

The principle objectives of this study are (1) to address the limitations of past U.S. fish demand research at the retail level through the development of a variation of the almost ideal demand system model of disaggregate fish products; (2) to address relevant model specification and estimation issues including the choice of an appropriate functional form, the incorporation of non-economic variables and household quality choice, and the determination of an estimation procedure for a system of demand equations given a sample with censored dependent variables; and (3) to address the importance of this economic analysis in the context of fisheries management and market development and promotion.

Weninger, Quinn R. (1998). Assessing Efficiency Gains from Individual Transferable Quotas: An Application to the Mid-Atlantic Surf Clam and Ocean Quahog Fishery. American Journal of Agricultural Economics, 80(4):750-764.

Delayed fishing fleet restructuring complicates the assessment of efficiency gains from individual transferable quota (ITQ) fisheries management



programs. This article presents a methodology to estimate harvest sector efficiency gains in lieu of incomplete fleet restructuring. The methodology is applied to assess the efficiency gains in the Mid-Atlantic surf clam and ocean quahog fishery ITQ program. While roughly 128 vessels harvested clams under the previous management regime, the analysis suggests that 21-25 vessels will remain under ITQs. The efficiency gains are estimated to be between \$11.1 million and \$12.8 million annually (1990 dollars).

Weninger, Quinn R. and Richard E. Just (1997). An Analysis of Transition From Limited Entry to Transferable Quota: Non-Marshallian Principles for Fisheries Management. Natural Resource Modeling, 10(1):53-83.

Static analysis shows that individual transferable quotas (ITQs) can dramatically increase economic efficiency comparable to a limited entry (LE) management by releasing excess capital. However, the transition from LE to ITQ management presents further efficiency questions. This paper shows that the rate of retirement of excess capital is determined by the opportunity cost of holding ITQ harvest rights on cost inefficient vessels. While restructuring is immediate with perfect foresight delayed exit occurs with uncertainty and low opportunity costs of holding ITQ. Nearly cost-efficient fishers anticipate increasing their payoff by waiting for higher ITQ prices, e.g., game theoretic principles rather than static Marshallian principles apply. The results raise policy questions about allocating ITQ to incumbent fishers at no charge. The Mid-Atlantic surf clam and ocean quahog fishery which switch from LE to ITQ management in 1990 is analyzed as a case study. Results show that a large surplus was possible but unattained under LE management but also that adjustment has been slow and costly, consistent with the results of this paper.

Wesney, David (1989). "Applied Fisheries Management Plans: Individual Transferable Quotas and Input Controls." In Neher, Philip A., Ragnar Arnason, and Nina Mollett (eds.). Rights Based Fishing, Kluwer Academic Publishers, Boston.

This paper examines two different management systems which have been applied in recent years to two of Australia's major fisheries, the southern bluefin tuna (SBT) fishery and the northern prawn fishery (NPF). These Australian fisheries have been closely managed from the onset of commercial exploitation and have produced good results from both biological and economic perspectives.

Wespestad, Vidar G. and Joseph M. Terry (1984). "Biological and Economic Yields for Eastern Bering Sea Walleye Pollock under Differing Fishing Regimes." North American Journal of Fisheries Management, 4:204-215.

A bioeconomic simulation was conducted to evaluate the alternative management strategies. The simulation model was an age structured population model to which economic functions were added. Four alternative fishing regimes were evaluated in the analysis: the current fishery, a fishery directed toward small fillet pollock, a fishery directed toward large fillet pollock, and a fishery directed primarily toward small pollock for fish paste (surimi). Each fishing regime was simulated over a 20 year period. To account for stochastic variation in the recruitment function, each fishing regime was repeated five times.

Wessells, Cathy R (1998). Barriers to International Trade in Fisheries. Discussion paper prepared for the FAO E-Mail Conference on Fisheries Trade and Food Security, Department of Environmental and Natural

Resource Economics, University of Rhode Island, Kingston, RI 02881, May, 10 pp.

This paper presents a brief background on the Hazard Analysis of Critical Control Points (HACCP) Programmes, which have been adopted by many developed nations to ensure a safe seafood supply, and on the recent trend toward use of eco-labels to indicate which fisheries products have environmentally desirable properties. The final section focuses on the potential of each of these programmes to create either inadvertent or blatant seafood trade barriers, and compare and contrast the effects of the programmes of developed versus developing nations.

Wessells, Cathy Roheim and James L. Anderson (1991). "Innovations and Progress in Seafood Demand and Market Analysis." Draft report, Department of Resource Economics, University of Rhode Island, Kingston, RI 02881, May, pp. 21.

This paper reviews several economic studies that present a spectrum of interesting and creative approaches to analyzing the demand for and markets of fish and seafood. We do so in an effort to illustrate the potential of this area of research in the decisions that promote efficient use of the worlds' fisheries resources. Each approach has its merits and limitations, depending on the issue at hand, quality of the data and skills of the researcher. The approaches are delineated by categorizing them either as demand analysis studies following more traditional commodity analysis methods, or as market research studies, following approaches used by the business marketing profession.

Wessells, Cathy R., Holger Donath, and Robert J. Johnston (1999). U.S. Consumer Preferences for Ecolabeled Seafood, Results of a Consumer Study. Sea Grant No. NA86RG0076, University of Rhode Island, Department of Environmental and Natural Resource Economics, Kingston, RI, September, 68 pp.

The potential acceptance of consumers for a seafood products ecolabeling program was evaluated. A telephone survey of 1,640 seafood consumers across the contiguous U.S. was administered between September and October 1998. A contingent choice survey was used to elicit choice of ecolabeled versus non-ecolabeled seafood products. The results of the survey indicate that with sufficient market research and consumer education, certifying and ecolabeling some seafood products may be a feasible long run approach to promoting sustainable fisheries.

Wessells, Cathy Roheim, Christopher J. Miller, and Priscilla M. Brooks (1995). Toxic Algae Contamination and Demand for Shellfish: A Case Study of Demand for Mussels in Montreal. Marine Resource Economics, 10(2):143-159.

Toxic algae blooms are a worldwide phenomena, which appear to be increasing in frequency and severity. These natural events cause product contaminations that often have significant economic consequences, including supply interruptions due to closed fishing grounds, losses from human illness, and losses due to a decline in demand for the affected products. This paper evaluates the impacts of a toxic algae bloom contamination event on demand for unaffected shellfish. As an empirical example of the economic losses the shellfish industry experiences for these events, demand for mussels in Montreal is estimated using firm level data and proxies for consumer information, during and after domoic acid contamination of Prince Edward Island mussels. Sales losses due to decreased demand are calculated.

Implications of this issue for seafood safety and management policies are discussed.

Western Pacific Regional Fishery Management Council (1998). Amendment 5, Northwestern Hawaiian Islands Mau Zone Limited Access System, Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. Western Pacific Regional Fishery Management Council, 1164 Bishop Street, Suite 1400, Honolulu, Hawaii, August, 75 pp.

This amendment will establish limited access system for the Mau Zone.

Weymark, John A. (1980). "Duality Results in Demand Theory." European Economic Review, 14:377-395.

Four results in demand theory are considered: the Ville-Roy Identity, the Hotelling-Wold Identity, the Shephard Lemma, and the Shephard-Hanoch Lemma. It is shown how all four theorems can be stated using the same functional form and can be illustrated using the same graphical technique. Consideration is also given to the nature of the compensations employed in movements along compensated and inverse compensated demand functions.

White, David R.M. (1990). "Sea Turtles and Resistance to TEDs Among Shrimp Fishermen of the U.S. Gulf Coast." Report, Environmental Affairs Division, Southern California Edison Company.

The National Marine Fisheries Service has issued regulations requiring southeast Atlantic and Gulf Coast shrimp fishermen to use Turtle Excluder Devices (TEDs) on their nets. Significant opposition has developed among Gulf Coast shrimpers. Ethnographic data, including observations of turtle capture and mortality, suggest reasons for resistance to the regulations.

Whitehead, John C. (1992). Ex Ante Willingness to Pay with Supply and Demand Uncertainty: Implications for Valuing a Sea Turtle Protection Programme. Applied Economics, 24:981-988.

It is argued that ex ante willingness to pay is appropriately measured as a function of subjective supply and demand probabilities. An exploratory case study of a loggerhead sea turtle protection programme is used to show how estimates of these probabilities can be obtained from a sample survey and how a change in probabilities determines contingent choice. Empirical results confirm that subjective probabilities are important when explaining ex ante willingness to pay. Attempts to estimate the determinants of ex ante willingness to pay without controlling for subjective probabilities will result in specification bias. It is important that subjective probability information is gleaned from contingent valuation survey respondents and included in empirical models of contingent choice.

Whitmarsh, David J. and James A. Young (1985). "Management of the UK Mackerel Fisheries, An Economic Perspective." Marine Policy, July:220-236.

The mackerel fisheries in the Northeast Atlantic have undergone radical development in recent years. The largest EEC participant, the UK, has introduced a number of control measures designed to regulate these fisheries. The article highlights the practical difficulties of fisheries management, drawing attention particularly to the objectives pursued, how closely they have been attained and the adverse effects of regulation. In the final section the proposition is made that economically oriented techniques offer a

new direction that management can take in the future.

Whittle, Peter (1982). Optimization Over Time, Volumes I and II. John Wiley and Sons, New York.

An introduction to optimization over time (dynamic programming or stochastic control) that gives a unified account of the method of dynamic programming as an analytic tool for the solution of temporal optimization problems, considers applications of this and related methods to major areas such as control and inference, and investigates a number of interesting cases in detail.

Whittlesey, Norman K. and Philip R. Wandschneider (1992). "Salmon Recovery: As Viewed by Two Economists." Choices, Second Quarter:3-5.

The value society places on salmon has changed over time. Values of salmon were quite low relative to other uses during the period of irrigation, hydropower, and navigation development. This short sighted view of resource values leaves a dwindling number of salmon and a legacy of property rights which are difficult to change even though they may be viewed as inappropriate for the future. Recently, the Endangered Species Act (ESA) has been involved to halt the population decline. However, the ESA is a narrow and inflexible tool to apply to complicated biological and environmental problems.

Wieland, Robert (1992). "Why People Catch Too Many Fish: A Discussion of Fishing and Economic Incentives." Draft report for The Center for Marine Conservation, January.

The report explains the causes of overfishing and lays out some management alternatives for commercial and recreational fishermen, policy makers, and environmentalists; needs work.

Wieland, Robert (1992). Why People Catch Too Many Fish: A Discussion of Fishing and Economic Incentives. The Center for Marine Conservation, Washington, D.C.

The book explains the causes of overfishing and lays out some management alternatives for commercial and recreational fishermen, policy makers, and environmentalists. The text contains an error in its discussion of sole owner fishery models and does not seem to understand individual transferable quota management measures very well or the implications for effort limitation programs, total quotas, or seasonal closures when the common property externality exists in the fishery.

Weise, Craig (1990). Borrowing, A Guide for Alaska Commercial Fishermen. Marine Advisory Bulletin No. 30, Alaska Sea Grant College Program, University of Alaska Fairbanks, 138 Irving II, Fairbanks, Alaska.

A guide for borrowing money for use in financing a commercial fishing venture in Alaska. A list of lenders and guidance in filing out loan application forms is provided along with loan payment tables. Information on how to conduct a break even analysis and an example of how to conduct one is presented.

Wigley, Roland L. (1973). "Fishery for Northern Shrimp, Pandalus borealis, in the Gulf of Maine." Marine Fisheries Review, 35(3-4):9-15.

A fishery for northern shrimp in the Gulf of Maine has grown rapidly during the last decade to become one of the most valuable fisheries in New England. American landings of this shrimp in the period 1962 to 1972 increased from 388,000 pounds to 24,295,000 pounds; correspondingly, value increased from \$57,000 to \$4,577,000. Trends in the total catch of northern shrimp in the past few years, plus decreased catch per unit effort during the past year, indicate the maximum utilization of this stock was attained in 1969. This paper briefly reviews the history and development of the fishery, landings, vessel types and gear, processing, and recent development in the fishery.

Wigley, Susan E. and Wendy L. Gabriel (1991). Distribution of Sexually Immature Components of 10 Northwest Atlantic Groundfish Species Based on Northeast Fisheries Center Bottom Trawl Surveys, 1968-86. NOAA Technical Memorandum, NMFS-F/NEC-80, National Marine Fisheries Service, Northeast Fisheries Center, Woods Hole, Massachusetts, January, 17 pp.

Analysis of data obtained from research vessel survey cruises over a 19 year period reveal distinctive patterns in the geographic occurrence of immature fish. These occurrences provide qualitative evidence for potentially significant fishing mortality of the sexually immature components of 10 species in the Gulf of Maine-Georges Bank-Southern New England region, where substantial overlap exists between unregulated mesh/exempted fishing areas and the distributions of these immature fish.

Wigner, Martha F. (1973). "Disaggregated Mode Choice Models of Downtown Trips in the Chicago Region." Chicago Area Transportation Study, 230 North Michigan Avenue, Chicago, Illinois 60601, January, 38 pp.

Mode choice models that combine both regional and behavioral aspects were successfully developed and calibrated for the Chicago area. The regional aspects include the coverage of trip origins over the entire Chicago area and the zonal nature of the data. The form of the dependent variable, a dummy indicating the mode chosen, and the analytic functions (logit and probit), both yielding "S" shaped curves are the aspects of the models typical of disaggregated and behavioral mode choice models. Using a dummy for the dependent variable solves the problem of errors in the dependent variable and of aggregation over values of the independent variables. Probit and logit analysis restrict the value of the dependent variable suitably, and are consistent with expected behavioral patterns. The independent variables chosen reflect characteristics of travelers, and of the modal options available for a particular trip.

Wilens, J.E. (1979). "Fisherman Behavior and the Design of Efficient Fisheries Regulation Programs." J. Fish. Res. Board Can., 36:855-858.

This paper examines the importance of hypotheses about fisherman behavior for predicting, understanding, and designing efficient fisheries regulation programs. Particular attention is paid to flexible technology fisheries where individuals are free to alter several dimensions of effort. It is suggested that the appropriate hypothesis of share-focused behavior ensures that there will always be an incentive to combine inputs inefficiently although technical conditions may limit or block the actual ability to do so. Some observations on the success of existing programs are also offered.

Wilens, J.E. (1985). "Towards a Theory of the Regulated Fishery." Marine Resource Economics, 1(4):369-388.

This paper develops a model of a modern regulated fishery in which direct biological controls such as gear restrictions and shortened seasons are used to control allowable harvest. Individual fishermen are assumed to make decisions regarding potential fishing and capacity in light of how they anticipate fellow fishermen and regulators to act. An equilibrium occurs in which there is excess capacity that is controlled at the fishery level to ensure aggregate harvest targets are not exceeded. Some discussion of alternative mechanisms such as direct limitations or taxes on potential effort and on individual fishermen is also presented.

Wilens, J.E. (1988). "Limited Entry Licensing: A Retrospective Assessment." Marine Resource Economics, 5(4):313-324.

This article takes a retrospective look at experience with limited entry licensing with particular attention to events of the past decade since the Powell River Conference of 1978. The perspective is set by reviewing some of the issues raised early on in these programs' histories. This is followed with a synthesis of some of the important trends and characteristics of limited entry license programs. Finally, some speculative thought is offered regarding future directions for limited entry license programs and their roles in fisheries management. Limited area license programs are proposed as a means to reduce the fisherman pool to a size where cooperative agreements to harvest can be reached.

Wilens, J.E. (1993). "Enhancing Economic Analysis for Fishery Management: Discussion." American Journal of Agricultural Economics, 75(5):1198-1199.

The papers by Milon "U.S. Fisheries Management and Economic Analysis: Implications of the Alaskan Groundfish Controversy," Hanemann and Strand "Natural Resource Damage Assessment: Economic Implications for Fisheries Management," and Sutinen "Recreational and Commercial Fisheries Allocation with Costly Enforcement" are discussed.

Wilens, James E., Tgy-Ning Chen, and Frances Homans (1991). "Fishermen and Labor Markets: Participation, Earnings, and Alternatives in Pacific Coast Fisheries." Final Report, Contract No. 50-ABNF-6-0016, Southwest Fisheries Center, National Marine Fisheries Service, August, 55 pp.

This report summarizes an investigation of labor participation and choices by fishermen involved in commercial fishing in California. The project arose out of both practical and basic questions about fishermen, their labor markets, and their opportunities outside of fishing. Little concrete knowledge exists about fishing as an occupation and as an alternative or complement to other nonfishing jobs. Thus a primary objective of the study has been to describe the fundamental nature of fishing as an employment alternative on the Pacific coast. A secondary objective has been to attempt to measure alternative wages of fishermen who participate in Pacific coast commercial fisheries.

Williams, Joel Sylvan (1976). "An Economic Analysis of Alternative Management Strategies for the Spiny Lobster Industry." Ph.D. Dissertation, Food and Resource Economics Department, University of Florida, Gainesville, FL, 164 pp.

This dissertation was designed to evaluate the current level of resource use, determine the maximum sustainable and economic yield levels, and analyze alternative lobster management programs. Bioeconomic and firm harvest

analytical models were developed and estimated. Maximum sustainable yield was estimated to be approximately seven million pounds while maximum economic yield was estimated to be 5.8 million pounds annually, slightly above current levels. Optimum levels of input use are 215 lobster firms each fishing 795 traps. These levels require a 47 percent reduction in the number of firms in the industry with no reduction in number of traps fished. Specific management programs considered in the analysis include licensing, quotas, and a harvest rebate program. For each program, maximum yield levels, costs, revenues and profits were determined. For the harvest rebate program alternative levels of administrative costs and related sources of revenue were analyzed.

Williams, Joel Sylvan and Fred J. Prochaska (1976). "The Florida Spiny Lobster Fishery: Landings, Prices, and Resource Productivity." Florida Sea Grant Program, Report Number 12, Department of Food and Resource Economics, University of Florida, February, 50 pp.

The report analyses the trends in the quality and value of spiny lobster landings in Florida, trends in resource inputs (fishermen, fishing craft, and gear) employed, and presents productivity trends.

Williams, Joel Sylvan and Fred J. Prochaska (1977). "Maximum Economic Yield and Resource Allocation in the Spiny Lobster Industry." Southern Journal of Agricultural Economics, July:145-149.

A maximum economic yield model is developed for the spiny lobster industry and is used to determine the level of economic resources required for the most efficient level of fishing effort with a discussion of management implications.

Williams, Mark L., Harold A. Brusher, Barbara J. Palko, and Lee Trent (1984). "Catch and Effort Data from a Sample Survey of Charterboat Captains in the Southeastern United States, 1983." NOAA Technical Memorandum, NMFS-SEFC-139, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, May.

A sample survey of recreational fishing catch and effort by charterboats in the southeastern United States was conducted by personnel of the National Marine Fisheries Service (NMFS), Southeast Fisheries Center, Panama City Laboratory during 1983. The 1983 survey followed a pilot study in 1982 in which nine captains, who conducted chartered fishing trips off the southeastern United States coast, were contracted to provide daily records of their catch and effort (Williams, Brusher, and Trent, 1984. NOAA TECH. Mem. NMFS-SEFC-129). Since the pilot study was successful, coverage was expanded in 1983. The purpose of this report is to make the detailed 1983 data available.

Williams, Ted (1996). Attack on the Sharks. Audubon, July-August, pp: 30-40.

Shark populations in U.S. waters are perilously low.

Williams, Ted (1997). Murder in the Nursery. Fly Rod & Reel, Nov.-Dec., 4 pp.

The slaughter of juvenile fish by commercial trawl fishermen in inshore North Carolina waters must be stopped to protect fishery resources on the entire eastern coast of the United States.

Willig, Robert D. (1976). "Consumer's Surplus Without Apology." The American Economic Review, 66(4):589-597.

Precise upper and lower bounds on the percentage errors of approximating the compensating and equivalent variations with consumer surplus are derived. These bounds can be explicitly calculated from observable demand data and it is clear that in most applications the error of approximation will often be less than the errors involved in estimating the demand curve. The results in no way depend upon arguments about the constancy of the marginal utility of income.

Willig, Robert D. (1979). "Consumer's Surplus Without Apology: Reply." The American Economic Review, 69(3):469-474.

A reply to McKenzie (1979) criticism of Willig's (1976) article on calculating consumer surplus measures.

Willmann, R. and S. Garcia (1985). "Bioeconomic Model for the Analysis of Net Economic Benefits of Artisanal and Industrial Sequential Fisheries for Tropical Shrimp (Example of the Fisheries of Suriname). Draft report, 31 pp.

The paper presents the design and parameterization of a bioeconomic model for the analysis of net economic benefits of artisanal and industrial sequential fisheries for tropical shrimp. The model has been applied to the analysis of the artisanal and industrial shrimp fishery of Suriname. The main conclusions to be drawn from the simulation results are that an expansion of the artisanal dragnet fishery for juvenile penaeid shrimp in coastal swamps can have a strong negative impact on the industrial shrimp fishery and that Suriname's shrimp industry is overcapitalized.

Willmann, R. and S. Garcia (1985). "Bioeconomic Model for the Analysis of Net Economic Benefits of Artisanal and Industrial Sequential Fisheries for Tropical Shrimp (With a Case Study of the Suriname Shrimp Fisheries). FIPP/FIRM/T270, FAO Fisheries Technical Paper 270, Food and Agriculture Organization of the United Nations, Rome, 49 pp.

The paper presents the design and parameters of a bioeconomic model for the analysis of net economic benefits of artisanal and industrial sequential fisheries for tropical shrimp. The model has been applied to the analysis of the artisanal and industrial shrimp fishery of Suriname. The main conclusions to be drawn from the simulation results are that an expansion of the artisanal dragnet fishery for juvenile penaeid shrimp in coastal swamps can have a strong negative impact on the industrial shrimp fishery and that Suriname's shrimp industry is overcapitalized.

Wilmot, David (1996). Statement of the Ocean Wildlife Campaign Prepared for the Atlantic Shark operations Team Meeting, August 27-28, 1996. Ocean Wildlife Campaign, 666 Pennsylvania Avenue, SE Washington, DC, August, 2 pp.

Comments call for a 50% reduction in the commercial large coastal shark quota to be taken immediately, reduced bag limit for recreational fishermen, protected species status for basking and whale sharks, multinational management, data collection, and scheduling of a new assessment workshop for small coastal and pelagic shark species.

Wilson, Charles A. (19??). "Surface Longlining for Yellowfin Tuna in



the Gulf of Mexico." Draft report.

This report briefly summarizes available yellowfin tuna landings data from the Gulf of Mexico and then describes the basic components of a longlining operation.

Wilson, Charles A. and Virginia Van Sickle (19??). "The Louisiana Artificial Reef Plan." Draft report prepared for the Louisiana Artificial Reef Council.

The emplacement of oil and gas platforms off the Louisiana coast has resulted in the creation of this country's most extensive artificial reef system. By the year 2000, it has been estimated that over 40% of the remaining oil and gas structures in the Gulf of Mexico will have been removed at a major loss to Louisiana fishermen. It was, therefore, imperative that the state of Louisiana recognize this potential loss of habitat and plan to offset it either by creating new artificial reefs or by preserving those that already existed. In this report, sites were selected, permitting procedures established, and a list of acceptable materials generated.

Wilson, C.D. and M.A. Guttormsen (1997). Echo Integration-Trawl Survey of Pacific Whiting, Merluccius productus, off the West Coasts of the United States and Canada During July-September 1995. NOAA Technical Memorandum NMFS-AFSC-74, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, June, 70 pp.

Results of the seventh triennial echo integration-trawl survey of Pacific whiting along the west coasts of the United States and Canada are presented. The coast wide biomass for Pacific whiting was estimated at 1.39 million ton using a new model of target strength to length. Justification for the use of the new model is discussed and estimates based on both models are compared.

Wilson, James A. (1982). "The Economical Management of Multispecies Fisheries." Land Economics, 58(4):417-434.

This paper develops an economic analysis appropriate to the biological and social characteristics of highly variable, multiple species systems with biological and social dynamics that are imperfectly understood and parameters that are difficult to measure. The argument (alien to traditional treatment of fisheries economics) is that (1) the imperfections of our knowledge and the uncontrollable variations in fisheries systems severely constrain the range of economically feasible management options; (2) the social cost of rule making and enforcement are high when a complex, uncertain, and highly variable environment is the target of management; and (3) efficiency in this kind of environment is much more closely related to the adaptive, learning behavior of individual economic actors than to the traditional notion of input cost minimization.

Wilson, James A. (1992). "Self-Governance in the Maine Lobster Fishery." Draft report, Department of Agricultural Economics, University of Maine, Orono, Maine.

The Maine lobster fishery has long been described as a classic case of over fishing; both biologically and economically. To the discomfort of standard management theory the fishery continues to produce high sustained yields; in terms of biological performance it may be one of the best managed fisheries in the world. This result occurs without resort to limited entry

or individual transferable quotas (ITQs). This paper argues there are strong biological, social, and economic reasons to be skeptical that limited entry will ever solve the fisheries conservation problem. It suggests that the reasons for the lobster fishery's continued success can be found in the institutions of virtual user self-governance that have evolved over the years. Self-governance forces a consensus with regard to the kinds of rules used in the fishery, assures wide-spread perception of their fairness and efficacy, and leads to a situation where social sanctions are widely used for their enforcement. Self-governance in this fishery has led to mutual coercion, mutually agreed upon and mutually enforced.

Wilson, James (1994). Self-Governance in the Maine Lobster Fishery. In Karyn L. Gimbel (ed.) Limiting Access to Marine Fisheries: Keeping the Focus on Conservation, Center for Marine Conservation and the World Wildlife Fund, Washington, D.C.

The Maine lobster fishery has long been described as a classic case of over fishing - both biologically and economically. To the discomfort of standard management theory the fishery continues to produce high sustained yields; as for biological performance it may be one of the best managed fisheries in the world. This paper suggests that the reasons for the fishery's continued success can be found in the institutions of virtual user self-governance that have evolved over the years. Self-governance forces a consensus about the kinds of rules used in the fishery, assures widespread perception of their fairness and efficacy, and leads to a situation where social sanctions are widely used for their enforcement. Self-governance in this fishery has led to mutual coercion, mutually agreed upon and mutually enforced.

Wilson, James A. and Ralph Townsend (19??). "Simulation Model of a Stochastic Multiple Species Fishery System with High Search Costs." Proposal, Departments of Economics and Physics, University of Maine, Orono, Maine.

The proposed research uses simulation modeling of multispecies fisheries systems to reevaluate the desirability of certain management regimes.

Wilson, James A., James M. Acheson, Mark Metcalfe, and Peter Kleban (1994). "Chaos, Complexity and Community Management of Fisheries." Marine Policy, 18(4):291-305.

For several decades, fisheries management has been based on stock recruitment models, leading to policies designed to control the amount of effort and the quantity of fish caught. This approach has not been notably successful. In this paper we take the view that this problem arises from the complex and likely chaotic nature of fisheries. This attribute of fisheries creates a very difficult and costly information problem, which renders attempts to control the long term numerical abundance of individual species virtually impossible. We argue that feasible management must address the relatively stable parameters of fisheries systems - habitat and basic biological processes, and that this demands management attention to the fine as well as the broad scale attributes of the system. Attention to detail at these differing scales implies the need for a layered or hierarchical management structure. The need to minimize information costs also suggests an emphasis on decentralized, community based approaches to management. A review of the anthropological literature shows that such approaches are common in many societies.

Wilson, James A., R. Townsend, P. Kelban, S. McKay, and J. French

(1990). "Managing unpredictable resources: traditional policies applied to chaotic populations." Ocean and Shoreline Management, 13, pp. 179-197.

Conventional theory for the management of living ocean resources assumes a predictable link between current management actions and the future state of managed populations. As a practical matter, however, it is very hard to establish this kind of predictable relationship. It is possible that the dynamics of these populations exhibit chaotic variation. This paper addresses the question of appropriate management policies in a regime characterized by chaotic population dynamics. The problem is approached through a bioeconomic simulator that has chaotic properties. With light fishing, policies that alter the conditions of fishing perform better than policies dependent upon population predictions. A lightweight paper that discusses the project in general terms. It does not present the model or any explanation of how the results were derived. The dissertation by Susan McKay (?) may be a better source for the actual model used in this paper.

Wilson, James R. (1997). Peer Review of the Economics of Management Strategies for Red Snapper in the Gulf of Mexico. Draft report for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 63 du Sommet est, Rimouski, Quebec G5L 7B5, Canada, September, 62 pp.

A review of the social science analyses relating to red snapper management of the directed fishery, the recreational fishery, and the incidental catch issue associated with the shrimp fishery.

Wilson, James R. and Rebecca Lent (1993). "Economic Perspective and the Evolution of Fisheries Management Methods: Towards Subjectivist Methodology." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

This paper attempts to explain, using neo-institutional economics, why some of the most vaulted and comprehensive management programs have been failures while others have been qualified successes. It is argued that the failures often occur with programs that take a more constructivist approach to public management, proposing integrated solutions to common pool problems that surpass the ability of managers and managed to foresee and predict outcomes.

Wilson, James R. and Rebecca Lent (1994). "Economic Perspective and the Evolution of Fisheries Management Methods: Towards Subjectivist Methodology." Marine Resource Economics, 9(4):353-373.

Some perspectives of neo-institutional economics are used to reexamine the common pool fishery. Applications of property rights theory in models simulating the evolution of fisheries management suggest that even in the presence of positive information and transactions costs (ITCs), resource users may have incentives to sequentially negotiate rules of common pool use. Such a result might imply that fisheries managers should be more concerned with ITCs than inefficiencies due to overcapitalization. This impression is further reinforced in collective choice examples taken from U.S. fisheries management. These comparative cases of public decision making in New England and Alaska suggest that variations in the style of public management as well as other aspects such as fleet heterogeneity might cause variations in management effectiveness. These variations in effectiveness may be related to the ITC environment internal to the public agencies, as well as to the external ITC environment they face.

Wilson, Robert R., Russell G. Thompson, and Richard W. Callen (1970).  
"Optimal Investment and Financial Strategies in Shrimp Fishing."  
TAMU-SG-71-701, Institute of Statistics, Texas A&M University, Dec.

In this study a deterministic optimal control model of a shrimp fishing firm (Thompson, Callen, and Wolken) is extended by requiring the purchase of integer (positive) numbers of vessels and is used in developing optimal investment strategies for shrimp fishermen.

Wise, John P. (1991). Federal Conservation & Management of Marine Fisheries in the United States, Center for Marine Conservation, 1725 DeSales St., NW, Washington, DC 20036.

The elimination of gross foreign overfishing, and increased production and consumption of marine fisheries products in the U.S. mask serious institutional failures. Application the Magnuson Fishery Conservation and Management Act has in fact exacerbated U.S. fisheries problems with the result of replacement of foreign overfishing by domestic overfishing.

Witzig, John F. (1988). "Estimation of Recreational Fishing Trips, Catch, and Participation." Report, National Marine Fisheries Service, Washington, D.C. 20235, May, 13 pp.

This report describes the methods and calculations used in the current MRFSS programs to estimate the total number of fishing trips and catch from the telephone and intercept surveys. The variable names used throughout this report are keyed to similarly named variables in the SAS program. Explanations of the variables are given where they are first encountered.

Witzell, Wayne N. (1994). The Origin, Evolution, and Demise of the U.S. Sea Turtle Fisheries. Marine Fisheries Review, 56(4):8-23.

Fishing methods, landings and value by area fished, and reasons for the demise of the U.S. Sea Turtle fishery are reviewed in this insightful article.

Wohlgenant, Michael K. and Richard C. Haidacher (1991). "Retail to Farm Linkage of System of Food Commodities." Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture, Technical Bulletin No. 1775.

A new conceptual model is needed to estimate the impact of demand, supply, and marketing margins on retail food prices and farm prices. This model should be theoretically consistent with group behavior. The present study critiques past approaches to modeling farm to retail price spread behavior, to emphasize the need for a larger framework for the analysis of retail to farm linkages. This enlarged model consists of reduced form retail and farm price equations derived from the behavior relationships that characterize aggregate output supply and input demand responses of the marketing sector. The model is then applied empirically to a set of eight food commodities. The results are generally consistent with theory that indicates compatibility with competitive behavior and an aggregate constant returns to scale technology of food processing. The results also show the need to allow for variable factor proportions between farm and marketing inputs. Farm level derived demand elasticities are more than 40 percent larger than those obtained by assuming fixed proportions.

Wohlgenant, Michael K. and Richard C. Haidacher (1991). "Approaches to Modeling Retail-Farm Price Spreads and Derived Demand Relationships for Food Commodities: A Selected, Annotated Bibliography."

Commodity Economics Division, Economic Research Service, U.S.  
Department of Agriculture, Staff Report No. AGES 9136.

Eighty-eight theoretical and empirical studies that focus on various aspects related to modeling the economic linkage between retail demand and farm level demand for food commodities and related inputs are reviewed. The focus of each study and its more salient features and conclusions related to the retail to farm demand linkage are summarized.

Wolfe, Philip (1959). "The Simplex Method for Quadratic Programming."  
Econometrica, 27(3):381-398.

A computational procedure is given for finding the minimum of a quadratic function of variables subject to linear inequality constraints. The procedure is analogous to the Simplex Method for linear programming being based on the Barankin-Dorfman procedure for this problem.

Wolff, Maury (1972). "A Study of North Carolina Scrap Fishery."  
Special Scientific Report No. 20, Division of Commercial and Sports Fisheries, North Carolina Department of Natural and Economic Resources, March, 29 pp.

A total of 18,955 fish were tagged in an effort to obtain movement, growth, and mortality characteristics of young Atlantic croaker (Micropogon undulatus), Spot (Leiostomus xanthurus), and Weakfish (Cynoscion regalis). Samples were taken from trawler landed scrapfish. Sixty-three species of fish were identified. Spot, croaker, and weakfish comprised 48.2% by weight of the total scrap. Seventeen edible species totaled 71.0% of the trawler discard. Comparison of landings and discard samples indicated that nearly 100%, 65%, and 43% of landed spot, croaker, and weakfish, respectively, are discarded as scrap. Samples were collected to determine the ratio of discarded fish to shrimp and the species composition of the fish discard. Fifty-one species of fish were identified in the samples. Spot, croaker, and weakfish totaled 66.8% by weight of the discard. Fifteen edible species accounted for 84.2% of the discard. The overall fish/shrimp discard ratio expressed in pounds was determined to be 5.4:1. The ratio for night samples was 46:1, while that for day samples was 6.3:1. Samples of spot, croaker, and weakfish were retained during tagging operations for age analyses. Forty-one percent of all spot, 49% of all croaker, and 81% of all weakfish discarded as scrap were 0 age.

Woodland, A.D. (1979). "Stochastic Specification and the Estimation of Share Equations." Journal of Econometrics, 10:361-383.

The standard stochastic specification for a system of share equations is obtained by assuming that the shares have a joint normal distribution with means depending upon exogenous variables and a constant covariance matrix. This specification ignores the requirement that shares be between zero and unity by giving positive probability to shares outside this range. An alternative stochastic specification involving the Dirichlet distribution, that automatically limits shares to the unit simplex, is suggested. A comparison of results obtained from the two specifications is made using sampling experiments and data from three different empirical studies. The sampling experiments and empirical applications show that the results are generally quite close, thus providing some justification for the continued use of the normal distribution specification in the estimation of share equations.

The World Bank (1991). "Staff Appraisal Report, Republic of Maldives, Third Fisheries Project." Report No. 9880-MAL, Agricultural Operations Division, Country Department V, Asia Regional Office.

The six year project will assist the government of the Maldives (GOM) to: increase fish production, government revenues, and foreign exchange earnings, at a lower processing cost; increase incomes of fishing households to alleviate relative poverty; reduce migration to the capital, Male, through balanced regional growth; and create the environment for increased private sector participation in the fisheries sector. The project is intended to reinforce the existing system of artisanal fisheries and small scale fish collection.

Working, Holbrook A. (1948). "Theory of the Inverse Carrying Charge in Futures Markets." Journal of Farm Economics, 30:1-28.

The paper presents four alternative explanations for inverse carrying charges in futures markets and the other market conditions that accompany them.

Workman, Ian and J. Watson (1991). "Shrimp Trawl Bycatch Reduction Annual Report." In 1991 Marfin Annual Report: Small Pelagics (Butterfish, Coastal Herrings and Associated Species), Shrimp Trawl Bycatch Reduction, Ted Technology Transfer, USDOC, NOAA, NMFS, SEFC, Mississippi Laboratories.

Report on the effectiveness of bycatch reduction devices in the Gulf of Mexico shrimp fishery.

Workman, Ian, John Watson, Dan Foster, Arvind Shah, Charles Taylor, and James Barbour (1994). "Status of Gear Modifications to Reduce Shrimp Trawl Finfish Bycatch in the Southeastern United States." 1993 Annual Report, National Marine Fisheries Service, Southeast Fisheries Science Center, Mississippi Laboratories, Pascagoula Facility, P.O. Drawer 1207, Pascagoula, MS, March.

A report on the fourth year of research into methods of reducing bycatch in the southeastern shrimp trawl fishery. Proof of concept bycatch reduction devices were found to reduce finfish bycatch rates between 43% and 67% with shrimp retention rates between 90% and 100%.

World Wildlife Fund (1997). Subsidies and Depletion of World Fisheries, WWF's Endangered Seas Campaign, 1250 Twenty-Fourth St., NW, Washington, D.C., 136 pp.

Because a careful accounting of the costs and benefits of fisheries subsidy programs is a prerequisite for an informed discussion of future policy options, World Wide fund for Nature commissioned four case studies on Euro-African fishing agreements, the Newfoundland fishery, vessel buyback programs, and Japanese subsidies of distant water tuna fleets. They examine the connection between government aid to the fisheries and the array of problems confronting world fisheries, in the context of selected subsidy programs. They demonstrate both the disconnect between the rhetoric of fisheries reform and the reality of government economic policy, as well as the complexity inherent in reshaping these programs in a way that will promote a transition to more sustainable fishing.

World Wildlife Fund and the Center for Marine Conservation (1992). Managing Marine Fisheries by Limiting Access, Workshop, Annapolis, Maryland, September 20-22, 1992.

Briefing book for the conference that contains abstracts of the presentations and a list of reprinted references.

World Wildlife Fund and the Center for Marine Conservation (1993).  
Limited Access Management: A Guidebook To Conservation, Draft  
Report for the Workshop held in Annapolis, Maryland, September 20-  
22, 1992.

A draft report of the workshop on limiting access to the fisheries.

Wright, Gavin (1990). "The Origins of American Industrial Success,  
1879-1940." American Economic Review, 80(4):651-668.

The United States became the world's preeminent manufacturing nation at the turn of the twentieth century. This study considers the bases for this success by examining the factor content of trade in manufactured goods. Surprisingly, the most distinctive characteristic of U.S. manufacturing exports was intensity in nonreproducible natural resource; furthermore, this relative intensity was increasing between 1880 and 1920. The study then asks whether resource abundance reflected geological endowment or greater exploitation of geological potential. It was mainly the latter.

Wright, Sam (1981). "Contemporary Pacific Salmon Fisheries Management."  
North American Journal of Fisheries Management, 1:29-40.

Successful salmon fisheries management requires effective data systems, advance planning, well-supported spawning escapement objectives, dependable population-size determinations and recognition of practical differences between recreational and commercial fisheries. Ocean fisheries must be managed to ensure an escapement from the ocean that will support viable "inside" fisheries as well as meet spawning requirements, while the key to commercial net fisheries management inside is the ability to make accurate, in-season assessments of the runs. A manager's primary client must be the resource, not user groups. In this context, an adequate surplus of fish is required before a fishery is permitted rather than proof of overfishing before a fishery is closed. Management should normally attempt to maximize sustained yields, but this can be legitimately modified by economic considerations in both recreational and commercial fisheries management. Management of mixed stocks of hatchery and wild fish is a major challenge for today's manager who needs to be directly involved in salmon-enhancement planning.

Yahaya, Jahara (1988). "Fishery Management and Regulation in Peninsular Malaysia: Issues and Constraints." Marine Resource Economics, 5(2):83-98.

In Malaysia, the official view held by fishery managers is that fishery resources in the inshore waters (0-12 miles) have been biologically overfished. This has prompted the introduction of new management policies such as license limitation, allocation of fishing grounds, and mesh size regulation. The paper examines a number of issues and constraints confronting the implementation of these policies. In most tropical fisheries countries like Malaysia, these issues and constraints are more complicated than mere operational difficulties (enforcement problems, bureaucratic inefficiencies, etc.) commonly associated with fishery management in the developed countries. This stems from not only the dualistic nature of the Malaysian fisheries sector - that is, large scale commercialized fisheries on the one hand, and traditional small scale artisaal fisheries on the other - but also the glaring socioeconomic inequalities between the two. Worse still, while the majority of the commercialized fishermen are Chinese, the artisaal fishermen are predominantly malays - and the New Economic Policy (NEP) seeks to reduce the economic imbalance between races in the country. The paper also examines the potential effects of the license limitation, allocation of fishing grounds and

mesh size regulation policies on productivity of the individual fishermen, employment, cost of fishing, and pressure on fish stock.

Yamamoto, Tadashi (1993). "A Fishing Right to Coop as a Basis for Community Based Fisheries Management." Presented at the International Conference on Fisheries Economics, Os, Norway, May 26-28.

In Japan, a fishing right is granted to a group of coastal fishermen who are organized at the community level. Such a fishing right system has been developed over the past 250 years. During this period there were three fishery laws in effect. Under the first two fishery laws (Ura and the old fishery law), the fishing right was granted in an attitude that the government was the resource manager. Conversely, under the current fishery law, fishermen are allowed to participate in the formulation of a coastal fisheries management plan within a legal framework set out by the law. This has given a great motive to fishermen to create their own community based coastal fisheries management systems.

Yamamoto, Tadashi (1995). "Development of a Community-Based Fishery Management System in Japan." Marine Resource Economics, 10(1):21-34.

The development of Japan's community-based fishery management system is described. Over the past 250 years, three fishery laws were in effect. These fishery laws commonly adopted a fishing rights system as a tool for coastal fisheries management. During the feudal era until 1867, the fishing right system was used mainly to collect a fishery tax. The fishing right system established by the Old Fishery Law (1901-1947) helped to reduce conflicts between fishermen exploiting the same resources with different gears. The Current Fishery Law, enacted in 1949, has led to Territorial Use Rights in Fisheries by limiting its coverage to sedentary resources and non-mobile gear. At the same time, the Current Fishery Law created a system to establish coastal fishery management plans through fishing rights and licenses. These innovations have motivated fishermen to create the community-based coastal fisheries management system. Since the inception of the Current Fishery Law in 1949, the number of fishery management organizations created increased annually to a total of 1524 in 1993.

Ye, Yimin and John R. Beddington (1996). "Bioeconomic Interactions Between the Capture Fishery and Aquaculture." Marine Resource Economics, 11(2):105-123.

This paper builds on the work of Anderson (1985a). Interactions between the capture fishery and aquaculture are modeled in two different cases: (1) cultured fish has the same market value as wild fish, and (2) cultured fish has only a substitute value for wild fish. In agreement with Anderson's conclusions, it is found that the entry of aquaculture lowers market price, increases total supply, reduces fishing effort, and raises natural fish stocks. When culture cost is reduced in some way, the fish price will decrease and fishing effort will decline. This may represent another way to reduce pressure on capture fisheries, with the advantage that the market equilibrium has a higher supply and lower price than other effort control measures. The interactions in both cases are similar, but impacts of aquaculture on price, supply, and effort in the second case are weaker than the first. Dynamic simulations are carried out and show more clearly the process of dynamic iterations between the capture fishery and aquaculture.

Yeto, Susan Cabrera, Rosario Gomez Garcia, and Gumersindo Ruiz Bravo (1997).



Potential Gains from Cooperation for Vessels and Countries. Marine Resource Economics, 12(2):145-158.

In this paper, we consider a model in which fishing boats or firms share the stock of fish in a fishing ground. The catches made by each firm reduce the stock available for the rest of the firms, which directly affects their profits. We aim to quantify in a static framework the gain in welfare obtained by the firms if they decide to cooperate to attain an individually rational efficient outcome. One of the main results is that both the incentives for the firms to cooperate and the minimum level of catches which permits any gain in welfare decrease as real wage increases. On the other hand, the greater the asymmetry among boats or firms, the more difficult it will be to reach any cooperative agreement.

Yew, Tai Shzee and Terry Heaps (1996). "Effort Dynamics and Alternative Management Policies for the Small Pelagic Fisheries of Northwest Peninsular Malaysia." Marine Resource Economics, 11(2):85-103.

The dynamics of fish stocks are an important consideration in determining appropriate fishery management policy. Equally crucial are the dynamics of fishing effort. Both these dynamics have been incorporated in a simulation model to analyze the bio-socioeconomic impacts of four alternative limited entry management policies for the multispecies, multigear small pelagic fishery of northwest Peninsular Malaysia. Fishing effort dynamics are determined by the difference in profits and opportunity costs. Several management alternatives are evaluated at equilibrium. Performance variables such as equilibrium catch, social profits, consumer surplus, social benefits, direct fishery employment and income of individual crew are used in the evaluation. The implications for policy makers are discussed.

Yohe, Gary W. (1984). "Regulation Under Uncertainty: An Intuitive Survey and Application to Fisheries." Marine Resource Economics, 1(2):171-192.

This paper surveys the issues involved in setting or improving regulatory activity in the presence of uncertainty. It is conducted in a way that will bring forth the underlying intuitions of the existing literature so that the various policy options can easily be distinguished on grounds of efficiency, as well as distributional and international considerations. This approach not only fits well into a section outlining the need for regulatory review, but also provides a basis for suggesting the issues involved in regulation fisheries. Intuition more than modeling aids in initially applying general analysis to specific areas, and the fisheries example illustrates how that application can be scientifically accomplished.

Yohe, Gary W. (1991). "The Cost of Not Holding Back the Sea-Economic Vulnerability." Ocean & Shoreline Management, 15:233-255.

A method for quantifying the economic vulnerability of developed shoreline to the threat of greenhouse induced sea level rise is described and applied to Long Beach Island, New Jersey, USA. While the method carefully accounts for structure, land and beach vulnerability along arbitrary sea level rise scenarios from tax maps and careful geographical accounting, it does not produce opportunity cost estimates for abandonment. The data generated here are, nonetheless, the foundation from which such cost estimates can be constructed given market and individual reactions to subjective perceptions of the threat and its timing.

Young, Richard H. (1982). "Strategy for Shrimp By-Catch Utilization."

FAO Fisheries Circular No. 745, Food and Agricultural Organization of the United Nations, Rome, March, 19 pp.

This paper summarizes conclusions based on field experience gained in various regions of the world on problems of bycatch utilization and on the recommendations emanating from the Technical Consultation on Shrimp Bycatch Utilization held in Georgetown, Guyana, 27-30 October 1981. In view of the considerable experience already gained, the paper proposes a strategy to promote a fuller use of shrimp bycatch and outlines the objectives and the structure of an initial two year coordinating project to achieve it.

Young, Robert A. and Robert H. Haveman (1985). "Economics of Water Resources: A Survey." Chapter 11 in Kneese, Allen V. and James L. Sweeney (ed.). Handbook of Natural Resource and Energy Economics, Vol. II, Elsevier Science Publishers B.V.

This chapter reviews the application of economic concepts to the study of the consumption, supply, and allocation water resources. The authors aim is to direct attention to the more significant of the economic aspects of water resource management.

Young, Ron (1984). "The Rising Tide." Chapter 7 in Richard H. Stroud (ed.) Marine Recreational Fisheries, 9, Proceedings of the Ninth Annual Marine Recreational Fisheries Symposium, Virginia Beach, Virginia, April 24 and 25, National Coalition for Marine Conservation, Inc., Savannah, Georgia.

A recreational fisherman imparts what he perceives to be the principal impediments to gaining his objectives.

Yucel, Mine Kuban (1989). "Severance Taxes and Market Structure in an Exhaustible Resource Industry." Journal of Environmental Economics and Management, 16:134-148.

This paper compares the effects of a severance tax on profit maximizing competitive and monopolistic firms that explore and produce an exhaustible resource. The producers' response to the tax are studied and the deadweight losses from the tax are calculated. Time paths of exploratory effort, extraction, and price are computed. Severance taxes lead both producers to reduce production and exploration and cause a shift in the time path for prices. The deadweight losses from the tax are low, especially in competition. The losses in the monopoly case are relatively higher, with the tax burden falling mainly on the monopolistic producer.

Zarembka, Paul (ed.) (1974). Frontiers in Econometrics. Academic Press, New York.

The contributions in this volume define a number of frontiers in econometric theory. Most of them illustrate with empirical applications. It is often through econometrics that theoretical hypotheses are confronted with data, and it is often through econometrics that economists attempt to use theory for purposes of quantitative policy. While applied research cannot be better than the underlying economic theory and available data, it also cannot be better than statistical procedures utilized.

Zeckhauser, Richard (1981). "Preferred Policies When There is a Concern for Probability of Adoption." Journal of Environmental Economics and Management, 8:215-237.

A theory of effective policy choice is developed that recognizes that the probability that a policy is adopted depends on who gains from it, who loses, and by how much. Ten pieces of recent environmental legislation are assessed to see how mechanisms such as coupling with other legislation, phased implementation, and the manipulation of uncertainty can spread benefits and costs. Several optimizing models are presented that explicitly incorporate the probability of adoption.

Zeeman, E.C. (1974). "Levels of Structure in Catastrophe Theory Illustrated by Applications in the Social and Biological Sciences." Proceedings of the International Congress of Mathematicians, 2:533-546.

Catastrophe theory offers two attractions: on the one hand it sometimes provides the deepest level of insight and lends a simplicity of understanding. On the other hand, in very complex systems such as occur in biology and the social sciences, it can sometimes provide a model where none was previously thought possible. This paper discusses various levels of structure that can be superimposed upon an underlying catastrophe and illustrate them with an assortment of examples.

Zein-Eldin, Zoula P. and Maurice L. Renaud (1986). "Inshore Environmental Effects on Brown Shrimp, Penaeus aztecus, and White Shrimp, P. setiferus, Populations in Coastal Waters, Particularly of Texas." Marine Fisheries Review, 48(3):9-19.

Our discussion compares and contrasts responses of the two species to single factors and their interactions, giving only limited literature citations. Implications for the two species are then explored. The purposes of this paper are to 1) provide, in an easily accessed tabular format, representative information and literature sources relating environmental factors to several inshore life stages of brown and white shrimp and 2) bring attention to those factors, their interactions, and life stages for which information is lacking.

Zellner, Arnold and Tong Hun Lee (1965). "Joint Estimation of Relationships Involving Discrete Random Variables." Econometrica, 33(2):382-394.

In this paper we present several models that have been utilized to explain the variation of proportions. For these models, we review single equation estimation techniques that yield asymptotically efficient estimators. We then go on to consider the analysis of a set of correlated sample proportions and develop a joint estimation procedure that yields asymptotically efficient estimators. The joint estimation procedure, by taking account of heteroscedasticity as well as the correlations existing between proportions, produces estimators with smaller asymptotic variances than do single equation techniques that take account only of heteroscedasticity. Data on consumer decisions with respect to durable purchases and use of instalment credit are analyzed to illustrate one use of these techniques in economics.

Zhang, Zhengkun and Richard S. Johnston (199?). An Analysis of Pricing Strategies for a Multiproduct Monopolist in a Discrete Choice Model. Draft Report, Oregon State University.

Supermarkets are multi-product sellers. Under combined influences of shopping complementarity, consumption complementarity and consumption substitution, their pricing strategy could generate perfectly price-inelastic

input demands and cause a product's output and input prices to move in opposite directions. This may explain some observed behavior of seafood processors.

Zhou, Ying Qi (1998). Some Consideration on Fisheries management and Fishing Capacity Control. Draft Report, Technical Working Group on the Management of Fishing Capacity, FAO, La Jolla CA, April 15-18, 2 pp.

A set of observations on market conditions, fisheries management, and the control of fishing capacity from an international perspective. Lack of property rights are recognized as the underlying cause of excess capacity. Correcting this market failure is cited as the only approach that will reduce capacity.

Ziemer, Rod F., Wesley N. Musser, and R. Carter Hill (1980). Recreation Demand Equations: Functional Form and Consumer Surplus. American Journal of Agricultural Economics, 62(1):136-141.

A set of decision criteria for the choice between three popular functional forms that have been employed previously in recreation demand equations is presented. The choice between linear and quadratic forms can be made via conventional hypothesis testing procedures. The Box and Cox transformation procedure often allows choice between linear, semilog, and other power transformations of the dependent variable. The consequences of the choice of a particular functional form on consumer surplus also are investigated.

Zimmerman, Roger (1993). "A Forecast for the 1993 Brown Shrimping Season in the Western Gulf of Mexico, from the Mississippi River to the U.S.-Mexico Border." Southeast Fisheries Science Center, Galveston Laboratory, 4700 Avenue U, Galveston, Texas, June, 2 pp., 7 tables.

The 1993 indices of postlarval and juvenile shrimp abundance indicate a below average brown shrimp harvest off both Texas and Louisiana for the July 1993-June 1994 season.

Zimmerman, Steven and Mariamna D. Melovidov (1987). "The 1986 Subsistence Harvest of Northern Fur Seals, Callorhinus ursinus, on St. Paul Island, Alaska." Marine Fisheries Review, 49(3):70-72.

There has been no commercial harvesting of northern fur seals on the Pribilof Islands, Alaska since the Interim Convention on Conservation of North Pacific Fur Seals expired in 1948. During 1985 and 1986, northern fur seals were harvested on St. Paul and St. George Islands to meet only the dietary (subsistence) needs of Aleut residents. A summary of the 1985 subsistence harvest on St. Paul Island is found in Zimmerman and Leacher (1986). This paper summarizes the 1986 harvest on St. Paul Island and contrasts the two years.

Zuboy, J. R., A.C. Jones, and T.J. Costello (1980). "Lobster Fishery Management Under the Fishery Conservation and Management Act." Fisheries, 5(4):50-52.

The Fishery Conservation and Management Act of 1976 (PL 94-265) created a new era in fishery management, featuring development of comprehensive fishery management plans by regional fishery management councils and management for "optimum yield." In this paper we discuss the main features of the Act, consider the development of fishery management plans in general, and

briefly describe management plans for lobsters.

Zuboy, J.R. and A.C. Jones (1980). "Everything You Always Wanted to Know About MSY and OY (But Were Afraid to Ask)." NOAA Technical Memorandum NMFS-SEFC-17, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, June, 19 pp.

The eight fishery management councils established by the Fishery Conservation and Management Act of 1976 are mandated to manage U.S. marine fisheries resources occurring in the fishery conservation zone based on the concepts of maximum sustainable yield and optimum yield. Fulfilling the mandate requires a thorough understanding of these concepts. It is the purpose of this paper to present a nontechnical discussion of maximum sustainable yield and optimum yield to facilitate understanding by the councils, that are composed largely of laypersons, so that they may carry out their duties under the Act.

Zweifel, James R. (1984). "Description of Procedures for Collecting Effort, CPUE and Biological Data in the Creel Survey and Biological Sampling Plan (CSBSP)." Memorandum, National Marine Fisheries Service, Southeast Fisheries Center, Miami, Florida, May, 90 pp.

This manual describes the CSBSP data base.

Zweifel, James R. and Beany Slater (19??). "Some Comments on the Estimation of Swordfish Growth and Mortality Rates and a Proposed Sample Design for the Collection of Catch Data from the Commercial Fishery." SEFC/SAW/BSS/8, U.S. Department of Commerce, NOAA, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida.

There is no obvious method for relating sample size in terms of numbers of fishing trips to be sampled to any quantitative measure or index of efficiency which encompasses the totality of information on size, age, sex composition, and distribution by time and area or to the estimate of yield per recruit (YPR). Estimation of the growth parameters and variances as well as the YPR require nonlinear iterative solutions. Further, given the greater precision in estimation of the Gompertz growth parameters, considerable improvement in estimating natural mortality would also be expected using the same model. The same is true of natural mortality. Pauly (1980) used the parameters of the von Bertalanffy equation to determine his empirical relationship. Similar methods using the Gompertz equation would likely result in both improved accuracy and precision. More importantly, variability in the parameter estimates is a function of the unknown size (and age) distribution in the population and the sample. When so little is known, it is too early to ask and impossible to answer how much better a 20% sample would be than a 10%, etc. The primary goal of the sampling design proposed here is to obtain a representative sample of size, sex and age over the study area.