

New NMFS Scientific Reports Published

The publications listed below may be obtained from either the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 or from the National Technical Information Service, Springfield, VA 22151. Writing to the agency prior to ordering is advisable to determine availability, order numbers, and price.

NOAA Technical Report NMFS 54. Gooch, Janet A., Malcolm B. Hale, Thomas Brown, Jr., James C. Bonnet, Cheryl G. Brand, and Lloyd W. Regier.

“Proximate and Fatty Acid Composition of 40 Southeastern U.S. Finfish Species.” June 1987, iii + 23 p., 43 tables.

ABSTRACT

This report describes the proximate composition (protein, moisture, fat, and ash) and major fatty acid profiles for raw and cooked samples of 40 southeastern finfish species. All samples (fillets) were cooked by a standard procedure in laminated plastic bags to an internal temperature of 70°C (158°F). Both summarized compositional data, with means and ranges for each species, and individual sample data including harvest dates

and average lengths and weights are presented. When compared with raw samples, cooked samples exhibited an increase in protein content with an accompanying decrease in moisture content. Fat content either remained approximately the same or increased due to moisture loss during cooking. Our results are discussed in reference to compositional data previously published by others on some of the same species. Although additional data are needed to adequately describe the seasonal and geographic variations in the chemical compositions of many of these fish species, the results presented here should be useful to nutritionists, seafood marketers, and consumers.

NOAA Technical Report NMFS 55. Krzynowek, Judith, and Jenny Murphy. **“Proximate Composition, Energy, Fatty Acid, Sodium, and Cholesterol Content of Finfish, Shellfish, and Their Products.”** July 1987, iii + 53 p., 2 tables.

ABSTRACT

This document contains data concerning the proximate composition and energy, fatty acid, sodium, and cholesterol content of finfish, shellfish, and their products, as listed

The Management of Migratory Fishes

“Multi-jurisdictional Management of Marine Fisheries.” edited by Richard H. Stroud, constitutes the “Proceedings of the Eleventh Annual Marine Recreational Fisheries Symposium” held in Tampa, Fla., in May 1986, and is published by the National Coalition for Marine Conservation, Inc., Savannah, Ga. Frank E. Carlton set the tone for the symposium with his introductory address “Fish Know No Boundaries,” which was followed by then-NOAA Administrator Anthony J. Calio who assessed the Federal role in marine fisheries. Carl E. Nettleton then addressed the development of a fisheries resource management plan that would achieve optimum population levels. As with the earlier symposia, this one divided the presentations into several Panels: 1) Putting the challenge of fisheries management into perspective, 2) inter-jurisdictional problems, 3) case studies, 4) new directions for management, 5) to pre-

empt or not, 6) NMFS, Councils, and the Act (MFCMA), ending with summaries of each panel's by the panel chairmen.

In large part, the presentations address the problems and opportunities in managing marine and anadromous fishes under the MFCMA by the various Councils; another important aspect covered was management by the creation of habitat for certain species. In addition, some very controversial issues were aired, including Federal preemption of state authority, Federal saltwater fishing licenses, the Native American role in fisheries management, and various interjurisdictional fisheries problems. In addition, floor discussions and panel debates are published which help air various sides of the issues. Case studies presented included discussions of state-Federal management of red snapper and gag; multi-state-Federal management of king mackerel, and international management of highly migratory tuna and billfishes. Unindexed, the hardbound volume is available from

the International Game Fish Association, 3000 East Las Olas Blvd., Ft. Lauderdale, FL 33316-1616 for \$15.00.

Game Fish Trophies, Articles Published

“World Record Game Fishes 1988” has been published by the International Game Fish Association, 3000 East Las Olas Blvd., Ft. Lauderdale, FL 33316-1616, under the direction of Elwood K. Harry. This year the “articles” section is devoted to presentations by four noted outdoor writers on some of the world's finest angling areas: Alaskan angling by Chris Batin, Hawaiian offshore fishing by Jim Rizzuto, Australia's Great Barrier Reef trophies by Peter Goadby, and America's blue-ribbon trout streams by A. J. McClane.

Also rewritten this year and considerably updated is the game fish species section, about 6 pages of data on popular fishes and which includes many new and improved illustrations, a number by NMFS biologist-artist Susan Smith.

in 228 articles published between the years 1976 and 1984. Also included is a systematic index of the species as referenced in this document listed alphabetically by scientific names.

NOAA Technical Report NMFS 56. Hirth, Harold F., and Larry H. Ogren. "Some Aspects of the Ecology of the Leatherback Turtle *Dermochelys coriacea* at Laguna Jalova, Costa Rica." July 1987, iii + 14 p., 13 figs., 12 tables.

ABSTRACT

The ecology and reproductive biology of the leatherback turtle (*Dermochelys coriacea*) was studied on a high-energy nesting beach near Laguna Jalova, Costa Rica, between 28 March and 8 June 1985. The peak of nesting was between 15 April and 21 May. Leatherbacks here measured an average 146.6 cm straightline standard carapace length and laid an average 81.57 eggs. The eggs averaged 52.12 mm diameter and 85.01 g weight. Significant positive relationships were found between the carapace lengths of nesters and their clutch sizes and average diameter and weight of eggs. The total clutch weighed between 4.02 and 13.39 kg, and yolkless eggs accounted for an average 12.4

percent of this weight. The majority of nesters dug shallow (<24 cm) body pits and spent an average 81 minutes at the nest site. A significant number of clutches were laid below the berm crest. In a hatchery 42.2 percent of the eggs hatched, while in natural nests 70.2 percent hatched. The average hatchling carapace length was 59.8 mm and weight was 44.6 g. The longevity of leatherback tracks and nests on the beach was affected by weather. One nester was recaptured about 1 year later off the coast of Mississippi. Egg poaching was intense on some sections of the Costa Rican coast. Four aerial surveys in four different months provided the basis for comparing density of nesting on seven sectors of the Caribbean coast of Costa Rica. The beach at Jalova is heavily used by green turtles (*Chelonia mydas*) after the leatherback nesting season. The role of the Parque Nacional Tortuguero in conserving the leatherback and green turtle is discussed.

NOAA Technical Report NMFS 57. Brodeur, Richard D., Harriet V. Lorz, William G. Percy. "Food Habits and Dietary Variability of Pelagic Nekton off Oregon and Washington, 1979-1984." July 1987, iii + 32 p., 1 fig., 32 tables.

ABSTRACT

The food habits of 20 species of pelagic nekton were investigated from collections made with small-mesh purse seines from 1979-84 off Washington and Oregon. Four species (spiny dogfish, *Squalus acanthias*; soupfin shark, *Galeorhinus zyopterus*; blue shark, *Prionace glauca*; and cutthroat trout, *Salmo clarki*) were mainly piscivorous. Six species (coho salmon, *Oncorhynchus kisutch*; chinook salmon, *O. tshawytscha*; black rockfish, *Sebastes melanops*; yellowtail rockfish, *S. flavidus*; sablefish, *Anoplopoma fimbria*; and jack mackerel, *Trachurus symmetricus*; consumed both nektonic and planktonic organisms. The remaining species (market squid, *Loligo opalescens*; American shad, *Alosa sapidissima*; Pacific herring, *Clupea harengus pallasi*; northern anchovy, *Engraulis mordax*; pink salmon, *O. gorbuscha*; surf smelt, *Hypomesus pretiosus*; Pacific hake, *Merluccius productus*; Pacific saury, *Cololabis saira*; Pacific mackerel, *Scomber japonicus*; and medusafish, *Icichthys lockingtoni*) were primarily planktonic feeders. There were substantial interannual, seasonal, and geographic variations in the diets of several species due primarily to changes in prey availability. Juvenile salmonids were not commonly consumed by this assemblage of fishes.

Revised and updated, too, are the sections on international angling rules and world record requirements—particularly with the new additions to the world record eligible list like the queenfish, Japanese seabass, kahawai, bluefin trevally, and mutton snapper. For avid anglers, the "meat" of the publication is the listings of world angling trophies (freshwater and saltwater), plus fly-rod and all-tackle trophies and membership in the Thousand Pound Club and the 5, 10, and 20-to-1 clubs. Also provided are lists of state game fish record keeping agencies and organizations, worldwide recordkeeping organizations, and tag-and-release programs. The 320-page paperbound volume is available from the publisher for \$9.75 (U.S.) and \$11.95 (foreign).

Pacific Salmon and Their Management

Publication of "Salmon Production, Management, and Allocation," edited by William J. McNeil, has been an-

nounced by the Oregon State University Press, 101 Waldo Hall, Corvallis, OR 97331-6407. Subtitled "Biological, Economic, and Policy Issues," it is a compilation of 20 papers presented at the World Salmonid Conference which was held in October 1986 in Portland, Oreg., by the Salmonid Foundation. The authors, ranging from scientists and aquaculturists to economists, fishery managers, and lawyers, have presented a wide variety of authoritative papers relating to the integration of aquaculture into the overall production of Pacific salmon, and the topics range from salmon biology and ecology to pertinent social and economic issues.

Lawyer Alfred A. Hampson discusses the laws and property rights relating to salmon ranching by public and private entities, and he suggests several legislative needs. A thorough review of Japanese salmonid programs, salmon supplies, and public policy is given by Yoshio Nasaka, while Frank Gjerset reviews the status and outlook for Norwegian Atlantic salmon farming, com-

paring characteristics of that industry with those of the U.S. catfish farming industry. Other articles include changes in the catch pattern of North American salmonids by Japan's high seas fleet by Colin Harris, while William Percy discusses factors affecting survival of coho salmon off Oregon and Washington, and Ernest Salo looks at the chum salmon as an indicator of ocean carrying capacity. And, Donald Rogers reviews the timing and size composition of Bristol Bay smolt migrations and the effects on distribution and survival at sea.

Additional papers discuss the problems involved in managing mixed-stock salmon fisheries; the culture, allocation, and economic value of Pacific salmon in the Great Lakes; conservation and allocation decisions in fishery management, the impacts on coastal communities of recreational-commercial fishery allocation of salmon; salmon markets, economics of recreational salmon fishing, potential hazards for spreading of infectious disease by transplanted fish, and directed and inadver-

tent genetic selection in salmonid culture.

Salmon harvests, after dropping to less than half their historic levels, began increasing nearly two decades ago, and are again approaching their historic levels. While naturally produced salmon still contribute most to the world's salmon harvest, aquaculture production is growing rapidly. This book examines many important issues, some very controversial, and should be of interest to those involved in salmon research, culture, marketing, and management. Indexed, the 194-page hardbound volume is available from the publisher for \$31.95 postpaid.

The Marine Fisheries of Indonesia and Thailand

The International Center for Living Aquatic Resources Management (ICLARM), Manila, Philippines, has produced excellent new reviews on the fisheries of Thailand and Indonesia. "**Indonesia Marine Capture Fisheries**" by C. Bailey, A. Dwiponggo, and F. Marahudin, ICLARM Contribution 338, is part of the ICLARM Studies and Reviews Series 10. The authors have winnowed existing literature to provide a fine descriptive overview of that nation's fisheries and, in the process, pointed out areas in need of greater study and research. Following reviews of the nation's marine fisheries and fishery resources, the authors address fisheries management and development policies and programs, economics, fish marketing and distribution, socioeconomic factors of small-scale fisheries, and needs for further research. Included in the 196-page paperbound volume is an extensive list of references. The volume is available either from ICLARM at US\$9.50 (surface mail) or US\$18.00 (airmail) or, in the United States, from International Specialized Book Services, P.O. Box 1632, Beaverton, OR 97075 at \$18.00.

ICLARM Technical Reports 17 is "**Growth, Mortality and Recruitment of Commercially Important Fishes and Penaeid Shrimps in Indonesian Waters**" by A. Dwiponggo, T. Hariati, S. Banon, M. L. Palomares, and D.

Pauly. Data is presented in 61 plates and tables covering fishes ranging in size from 10 cm (*Secutor ruconius*) to 80 cm (*Katsuwonus pelamis*) and for areas from Jakarta Bay to the Arafura Sea. Altogether, 52 stocks of fish are covered, including 36 species, 21 genera, and 15 families of bony fishes as well as 9 annual cohorts from the Arafura Sea stock of the shrimp *Penaeus merguensis*. Presented are estimates of von Bertalanffy growth parameters which were derived through application of the ELEFAN I program to length-frequency data from the various fishes. Derived quantities such as total, natural, and fishing mortality estimates, as well as selection and recruitment patterns were then obtained by application of the ELEFAN II program to the same length-frequency data. Some generalizations on the status of the stocks are presented, particularly for the demersal fishes off the north coast of Java and on *P. merguensis* in the Arafura Sea. Paperbound, the 91 page volume is priced at US\$4.50 (surface mail) and US\$8.50 (airmail and the U.S. price from ISBS).

ICLARM Studies and Reviews 14 is "**The Economics and Management of Thai Marine Fisheries**" by Theodore Panayotou and Songpol Jetanavanich. Like number 10, this is a fine review of the relevant literature and presentation of data on Thai fisheries—one of the world's ten largest, having a fleet of more than 20,000 modern vessels and a harvest of around 2 million metric tons. Thailand fishermen supply 20 kg/capita of fish for a population of 50 million and earn the nation about \$500,000,000 in foreign exchange annually. The authors document the profitability of the trawl fishery, small-scale fishermen's economic problems, overfishing in the Gulf of Thailand, and the problems and potential in the nation's management and enforcement capabilities. It also suggests a number of solutions to Thai fisheries problems. Price of the 82-page paperbound volume is US\$5.00 (surface mail) and US\$9.00 (airmail—and the ISBS price). ICLARM recommends orders to them be for airmail delivery owing to surface mail delays of several months and potential losses in transit.

ICLARM has also published ICLARM Bibliographies 7, "A Bibliography of Trochus (*Trochus niloticus* L.) (Gastropoda: Trochidae), by Warwick J. Nash, updating the annotated bibliography of Gail and Devambeze of 1958. It includes over 130 citations, many hard to locate in conventional databases, along with subject and geographic indexes (price not listed).

What Is Ecology?

When Danish marine ecologist and professor Tom Fenchel received the first annual "Excellence in Ecology" award from the Ecology Institute, Oldendorf/Luhe, FRG, he found a string attached: He was expected to serve science and society by authoring a book along the aims of the Institute. Thus, the first book in the new series "Excellence in Ecology" is Fenchel's "**Ecology—Potentials and Limitations**," edited by O. Kinne, Institute Director. Fenchel's book is aimed primarily at other ecologists, hoping to engage them in a debate on the definition of ecology, as well as to present central problems and results of ecology to biologists at large and to other scientists.

The author complains that ecology, per se, seems to be a "diffuse" or an "immature" science that many people would define differently, often in light of their own specialization. He notes that ecology differs from most other natural sciences in seemingly lacking a central core of ideas, concepts, methods, and goals upon which everyone can agree. Fenchel then strives to present what he sees as the "core" of that discipline, and to provide a synthesis of the field.

In so doing, the author begins with a brief historical background of contemporary ecology and presents his view of how ecology should be defined: "As the study of the principles which govern temporal and spatial patterns for assemblages of organisms." He discusses different types of theoretical models used in ecology and attempts to delimit ecology relative to other biological disciplines, such as natural history, evolutionary biology, physiology, behavioral biology, and biogeochemistry.

Section III, entitled "Concepts, ideas, and problems in ecology," presents a more detailed look at the "gist" of ecology—scales of size and time among living things, flow of energy and materials, resource competition, interactions between species populations, structure of biotic communities, evolution of life cycles, and more. The following section (IV) then presents selected examples to illustrate several of the general ecological principles given in the previous section.

Section V, "Ecology and society," is concerned with applied ecology, and here Fenchel warns his peers that, while applied research is necessary and desirable, some aspects of ecology may be especially vulnerable to intellectual corruption. This is an especially thoughtful and interesting book, made all the more so because of the author's marine science background and the examples woven through it. The 186-page hard-bound volume is available from the publisher, Ecology Institute, D-2124 Oldendorf/Luhe, Federal Republic of Germany; price is DM7, or about US\$40 (depending on the exchange rate).

A Trolling Handbook for South Pacific Fishermen

"**Trolling Techniques for the Pacific Islands**," by G. L. Preston, L. B. Chapman, P. D. Mead, and P. Taumaia and illustrated by S. E. Belew is Handbook No. 28 of the South Pacific Commission, Noumea, New Caledonia. The handbook was developed as a training aid for the Pacific Island region to document some of the specialized and often unwritten knowledge and practical experience gleaned by SPC staff over the years, and the latter may be its greatest strength. The volume is thoroughly and well illustrated and clearly documents many of the techniques learned or proven in that region over the years.

Following a basic introduction to Pacific trolling, the authors illustrate, chapter by chapter, all aspects of that fishery for the individual small-scale fisherman: Vessel considerations and preparation (fish containers, trolling booms, handreels, gaffs, etc.); prepara-

tion of trolling lines and gear; types of baits and lures and their rigging; trolling conditions and techniques; fishing action—working the lines, the strike, handling fish on fixed lines and handreels, and boating and care of the catch; care of the boat and fishing gear and recordkeeping; coping with problems—injuries, accidents, breakdowns, signaling, and sea survival techniques. Another chapter describes the habits and characteristics of commonly caught species; appendices illustrate pole trolling in the Pacific Island tradition and give suggestions for additional sources of information. All in all, the book is an excellent guide for the region's fishermen. Paperbound, the 162-page volume is available from the SPC (price not listed).

Drying of Fish With Solar Energy

Drying fish is an ancient preservation method that is still of considerable importance, especially in tropical regions. Aspects of this, and appropriate techniques and research, are addressed in "**Solar Drying in Africa**," subtitled *Proceedings of a Workshop held in Dakar, Senegal, 21-24 July 1986*, edited by Michael W. Basseby and O. G. Schmidt and published by the International Development Research Center, P.O. Box 8500, Ottawa, Canada K1G 3H9. Contributions address a range of studies including papers reviewing solar energy available in typical tropical locations and applications of solar energy in food production, and construction and performance of solar crop dryers. Studies are presented on the evaluation of various types of solar dryers—solar concentrator/dryer, flat-plate collector/dryer, and flat-plate collector/dryer-storage unit.

Another paper specifically addresses appropriate technology for solar drying of salt fish and fermented fish. Others discuss the application of natural- and forced-convection style solar dryers to various fishes and fish products, along with other agricultural commodities. Additional reports address the outlook for solar drying of fish in The Gambia, how solar drying can reduce post-har-

vest fish losses, and a variety of problems and developments in solar drying in African nations. The 286-page paper-bound volume, IDRC-255e, is available from the IDRC (price not listed).

MACROALGAE AND ENERGY PRODUCTION

The energy crisis of the early 1970's spawned many efforts to gain new sources of energy; some went for deeper deposits of oil and gas, some turned to coal, and some, as the following volume attests, went to the sea, in this case to cultivate seaweeds for energy conversion. "**Seaweed Cultivation for Renewable Resources**," edited by K. T. Bird and P. H. Benson, and published as volume 16 in the series "Developments in Aquaculture and Fisheries Science" by Elsevier Science Publishing Company Inc., 52 Vanderbilt Avenue, New York, NY 10017, goes well beyond simply reviewing seaweed as an energy source. Many of the advancements reported initially in various (and sometimes hard to locate) symposia, conference proceedings, technical reports, and journal articles are here condensed, synthesized, and collected into one volume.

The first four chapters deal with the giant kelp, *Macrocystis pyrifera*, the species which was the primary candidate in most marine biomass studies. Indeed, chapter 1 provides both a history of the giant kelp biomass program but reviews the early and current industrial development and utilization of kelp. Chapter 2 then describes successes and failures of the early efforts to cultivate kelp on offshore structures, while chapter 3 reviews the work on growing kelp in nearshore farm environments. Chapter 4 discusses the optimization of kelp growth in marine farms.

Chapter 5 then describes *Laminaria* culture in the far east and in North America, along with the idea of multi-cropping with a summer-adapted seaweed species for improved year-round productivity. C. K. Tseng then reviews the Chinese kelp cultivation industry and its implications for biomass energy systems.

Many other less well known seaweeds, of course, are adapted to warm water

habitats and the biology of such important tropical and subtropical species are reviewed by Clinton Dawes in chapter 7, along with physiological considerations in relating to their cultivation. Biomass production of *Gracilaria* in outdoor cultivation systems in Florida is discussed in chapter 8, along with factors influencing *Gracilaria* yield, research on other species of macroalgae (i.e., *Sargassum* and *Ulva*), and a discussion of other uses for biomass of macroalgae (i.e., hydrocolloid production, wastewater treatment, fish feed, fodder, and fertilizer). Additional chapters discuss tissue culture of seaweeds, nitrogen fixation in marine communities and its potential role in seaweed cultivation, biological gasification of marine algae, microbial degradation of marine biomass, cost analyses of energy from marine biomass, and a commercialization strategy for nori culture in Puget Sound, Washington. Each chapter carries a literature cited section, and a separate section at the end of the book presents a list of 78 technical reports on marine biomass for energy, along with suggested sources of additional data or reports (i.e., symposia proceedings, etc.).

The key to the future of marine biomass programs, the editors note, must be crop yield improvements, perhaps through breeding and genetic analysis to produce new crop candidates. While western biomass to energy programs are now idle, they have generated much important and useful information which this volume handily reviews. Indexed the 381-page hardbound volume is available from the publisher.

Toward a Sociology of Natural Science

Publication of "**Social Science in Natural Resource Management Systems**," edited by Marc L. Miller, Richard P. Gale, and Perry J. Brown, as part

of the "Social Behavior and Natural Resources Series, has been announced by Westview Press, 5500 Central Avenue, Boulder, CO 80301. Some natural resource agencies seem to have integrated social scientists and their studies into research and management programs and policies more than others and this volume examines a variety of such situations—including marine fisheries.

Presentations are divided into several parts: Following an overview of natural resource management systems, the section "Roles of Science" presents a discussion of natural resource sociology, utilizing forests and marine fisheries as the examples, and the authors suggest a need to strengthen natural resource sociology to be better able to respond to shifting social, political, and economic situations. Other contributions in this section examine the partnership between social scientists and park and resource managers, the practice and promise of social science in the U.S. Forest Service, the integration of social science into wildlife management, and the sociology of the forestry and marine fisheries sciences in the Pacific Northwest.

A third section, "Applications of Social Science," has chapters on park planning in Canada, planning and managing visitor activity in Canadian National Parks, social carrying capacity research in a wilderness area, and an interesting discussion of emotions in environmental decision making—rational planning vs. the passionate public. A final section presents reports on social science research and recommendations on three public land issues.

Early on, the editors present their concept of a natural resource management system (NRMS), a four-part system with the following elements: 1) natural resources, 2) management bureaucracies, 3) profit-seeking industries, 4) and diverse publics (organized and unorganized), in which they establish all four components as fair objects of social

science research. In addition, they portray "management bureaucracies" as "embedded within" the NRMS, rather than as a "detached steward." They then utilize this NRMS as a basis for comparing resource management experiences in later chapters. The book is aimed primarily at social scientists who, the editors say, "must establish their own niche in natural resource management systems." But it would also be of interest to resource biologists and managers who must also deal with social as well as resource issues on a daily basis. Paperbound, the 265-page book is available from the publisher for \$22.50.

Marine Ecology Text Updated

The second edition of "**An Introduction to Marine Ecology**" by R. S. K. Barnes and R. N. Hughes has been considerably revised and updated by authors and republished by Blackwell Scientific Publications, Inc., 667 Lytton Avenue, Palo Alto, CA 94301. The volume is intended for students with a knowledge of basic ecology, but who are venturing into marine ecology for the first time. Thus, each chapter treats a distinct process or subsystem of the ocean.

Following a general introductory chapter on the nature and global distribution of marine organisms and their habitats, the authors succinctly review the planktonic system of surface waters, the benthos of continental shelf and littoral sediments; salt marshes, mangrove swamps and seagrass meadows; rocky shores and kelp forests; coral reefs, pelagic and benthic systems of the deep sea; fish and other nekton, ecology of life histories, speciation and biogeography, the marine ecosystem as a functional whole, and human exploitation and interference. Indexed, the 351-page volume is available in paperbound (\$29.50) and hardbound (\$67.50) versions from the publisher, and it provides a good concise introduction to the field.