

# *The Saltonstall-Kennedy Grant Program:* **Fisheries Research and Development**

**REPORT 2005**

August 1, 2005



**DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
National Marine Fisheries Service



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Vice Admiral Conrad C. Lautenbacher, Jr., U.S. Navy (Ret.)  
Under Secretary of Commerce for Oceans and Atmosphere  
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**National Marine Fisheries Service**

William T. Hogarth, Ph.D., Assistant Administrator

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## TABLE OF CONTENTS

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<b>I. INTRODUCTION .....</b>	<b>1</b>
<b>II. BACKGROUND .....</b>	<b>2</b>
<b>III. PENDING GRANT PROGRAM PROJECTS .....</b>	<b>5</b>
Fisheries Utilization.....	5
Management Alternatives and Fisheries User Conflicts.....	7
Fisheries Bycatch.....	11
Product Quality and Safety .....	15
Aquaculture.....	17
<b>IV. PENDING NATIONAL PROGRAM PROJECTS .....</b>	<b>25</b>
Product Quality and Safety .....	25
Aquaculture.....	26
<b>V. COMPLETED GRANT PROGRAM PROJECTS .....</b>	<b>27</b>
Fisheries Utilization.....	27
Management Alternatives and Fisheries User Conflicts.....	29
Fisheries Bycatch.....	31
Product Quality and Safety .....	32
Aquaculture.....	33
<b>VI. COMPLETED NATIONAL PROGRAM PROJECTS .....</b>	<b>38</b>
Product Quality and Safety .....	38
<b>APPENDIX: National Marine Fisheries Service Offices .....</b>	<b>39</b>

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## **I. INTRODUCTION**

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This report to Congress on the Saltonstall-Kennedy (S-K) Grant Program, administered by the National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, covers fiscal year (FY) 2005. The report contains information on the S-K Program regarding its legislative authority, the application solicitation and grant selection process, recipients, and funding.

Due to an insufficient funding allocation for FY 2005, the competitive program was not conducted.

This report is submitted pursuant to the S-K Act, as amended, which requires that the following information be submitted annually to Congress:

1. The fisheries development goals and funding priorities for a national program of research and development for the next fiscal year (page 2).
2. A description of all pending fisheries research and development projects (page 5).
3. A list of those applications approved and disapproved and the total amount of grants made (Not provided, as the FY 2005 Grant Program was not conducted due to lack of funds).
4. A statement of the extent to which available funds were not obligated or expended by the Secretary for grants (page 3).
5. An assessment of each project completed in the preceding fiscal year regarding the extent to which objectives of the project were attained and the project contributed to fishery development (page 24).

The Appendix provides addresses of NMFS Headquarters and Regional Offices from which information regarding the S-K Program may be obtained.

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## II. BACKGROUND

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The S-K Act, as amended (15 U.S.C. 713c-3), established a fund (known as the S-K fund) that the Secretary of Commerce uses to provide grants or cooperative agreements for fisheries research and development projects. Under this authority, grants and cooperative agreements are made annually on a competitive basis (subject to funding) to assist in carrying out projects related to U.S. commercial and recreational fisheries.

The S-K Grant Program funding priorities are consistent with the goals and objectives of the NOAA and NMFS Strategic Plans and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The objective of the S-K Grant Program is to address the needs of fishing communities (as defined in the Magnuson-Stevens Act) in optimizing economic benefits within the context of rebuilding and maintaining sustainable fisheries, and in dealing with the impacts of conservation and management measures.

Proposals received in response to a solicitation are evaluated for merit by appropriate private- and public-sector experts and for usefulness by representatives of various fisheries constituencies. Proposals are ranked by their average scores. After proposals have been evaluated and ranked, recommendations for funding are developed and submitted to the Assistant Administrator for Fisheries, who determines the projects to be funded.

In addition, 15 U.S.C. 713c-3(d) authorizes the Secretary of Commerce to carry out a national program of research and development (National Program) to address aspects of U.S. fisheries not adequately addressed by projects assisted under the Grant Program.

In FY 2005, NMFS is using the National Program authority to amend an existing grant to the Gulf and South Atlantic Fisheries Foundation, Inc., to provide an additional \$1 million to continue work to educate high-risk consumers about *Vibrio vulnificus* in raw molluscan shellfish as directed by Congress. NMFS is also funding the Wild American Shrimp marketing program for \$1 million under this authority as directed by Congress. In addition, NMFS will provide \$300,000 under the National Program for contracts to support the establishment of a comprehensive, environmentally sound permitting system for marine aquaculture. Summaries of these projects are included in Section IV of this document. NMFS also intends to provide \$100,000 to the City of New Bedford, Massachusetts, for workshops on vessel safety training for commercial fishermen, and \$100,000 to the Herring Gut Learning Center for an education project under the National Program. These two projects are pending application; descriptive summaries will be included in the next report to Congress.

For FY 2006, NMFS does not propose to conduct a National Program or competitive program. Therefore, NMFS has not developed funding priorities for the National Program.

The Consolidated Appropriations Act, 2005 (Pub. Law 108-199) directed \$10 million of S-K funds noncompetitively to the Alaska Fisheries Marketing Board. NMFS is providing this funding as an unconditional award for no specified purpose. Therefore, these funds will not be monitored under the S-K Program and are not addressed further in this report.

The S-K program is capitalized through annual transfers by the Secretary of Agriculture to the Secretary of Commerce into the Promote and Develop Fishery Products account of amounts equal to 30 percent of the gross receipts collected under the customs laws on imports of fish and fish products. Table 1 indicates the total duties collected on fishery products; the total receipts in the Promote and Develop for FY 2005; the amount transferred to operations, research, and facilities (ORF); and the amount allocated for the S-K Program, including the competitive Grant Program, the National Program, and program administrative costs, including monitoring of ongoing awards.

*Table 1. S-K Funding for FY 2005 (\$ in millions)*

<u>Funding Item</u>	<u>Amount</u>
Total Duties Collected on Fishery Products	\$258.46
Total Transfer to Promote and Develop account	77.54
ORF Transfer	<u>(65.00)</u>
S-K Allocation	12.54
Carryover*	<u>0.48</u>
Total	13.02
Unconditional Awards to Specified Recipients**	<u>(10.00)</u>
Total Available for S-K Program	3.02
S-K Program Obligations/Commitments	
FY 2005 Grant Program	0
National Program***	2.50
Program Administration	0.50
Estimated Unobligated Balance	<u>0.02</u>
Total	3.02

\*Includes unanticipated prior year recoveries as well as unobligated funds.

\*\*Alaska Fisheries Marketing Board; not part of the S-K Program, directed by appropriations language.

\*\*\*For shellfish safety education, Wild American Shrimp program, aquaculture permitting system development, vessel safety training workshops, and educational program.

Table 2 indicates the recent funding history of the S-K Program.

*Table 2. S-K Funding, 1996–2005 (\$ in millions)*

<b>Fiscal Year</b>	<b>Total Duties</b>	<b>Total P&amp;D Transfer</b>	<b>ORF Offset</b>	<b>Funds Directed to Non-S-K Activities in Appropriations Legislation</b>	<b>Available S-K Program Allocation</b>	<b>S-K Program Allocation as % of Transfer to P&amp;D</b>
1996	221.27	72.89	63.00	-	9.89	13.57
1997	221.27	66.38	66.00	-	0.38	0.57
1998	219.11	65.73	62.38	-	3.35	5.10
1999	221.42	66.43	63.38	-	3.05	4.59
2000	233.07	69.92	68.00	-	1.92	2.75
2001	242.76	72.83	68.00	-	4.83	6.73
2002	263.77	79.13	68.00	-	11.13	14.07
2003	250.75	75.22	65.00	10.00	0.22*	0.29
2004	265.75	79.72	62.00	17.00	0.72**	0.90
2005	258.46	77.54	65.00	10.00	2.54***	3.28

\*Another \$10 million was allocated, but directed to the Alaska Fisheries Marketing Board, outside of the S-K Program.

\*\*Another \$17 million was allocated, but directed to the Alaska Fisheries Marketing Board, Gulf and South Atlantic Fisheries Foundation, Inc., South Carolina Seafood Alliance, Oregon Trawl Commission, and Oregon State University Seafood Laboratory, outside of the S-K Program.

\*\*\*Another \$10 million was allocated, but directed to the Alaska Fisheries Marketing Board, outside of the S-K Program.



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### III. PENDING GRANT PROGRAM PROJECTS

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This section contains a description of all pending (ongoing) projects under the S-K Grant Program, along with the name of the grantee, grant number, project title, federal funding level, recipient funding level (i.e., cost share), and the NMFS contact, addresses for whom are in the Appendix. The projects are listed by grantee within each subject area.

#### FISHERIES UTILIZATION

*Grantee:* University of Alaska, Fairbanks, Alaska  
*Grant No.:* NA16FD2387 *NMFS Contact:* F/AKR  
*Project Title:* Utilizing Bycatch: Developing Products from Arrowtooth Flounder and Other Economic Discards  
*Funding:* *Federal:* \$78,636 *Recipient:* \$16,545

*Description:* To develop a mince/washed mince/surimi from arrowtooth flounder that will have textural properties similar to beef sausages for use in food service products. Specific objectives include determining processing protocols that will produce a texture acceptable for food service application; evaluating the need for additives to achieve the appropriate texture, color, and flavor; determining frozen shelf life of finished products; testing the product in a food service operation; and conducting a marketing and economic analysis of the process.

*Grantee:* Kake Foods, Inc., Kake, Alaska  
*Grant No.:* NA03NMF4270111 *NMFS Contact:* F/AKR  
*Project Title:* Economic and Resource Full Utilization of the Seafood Processing Waste Stream: Discards, Underutilized Species, Byproducts and Carcasses through Conversion into High Value Organic Composts on an Industrial Scale Operation  
*Funding:* *Federal:* \$180,634 *Recipient:* \$180,633

*Description:* To develop usable products from economic discards (defined in the Magnuson-Stevens Act as “fish which are the target of a fishery, but which are not retained because they are of undesirable size, sex, or quality, or for other economic reasons”), underutilized species, and byproducts of processing.

*Grantee:* Cornell University, Ithaca, New York  
*Grant No.:* NA16FD2389 *NMFS Contact:* F/AKR  
*Project Title:* Optimizing the Utilization of Pollock Byproducts Focusing on Skin, Bones, Scales, and Viscera  
*Funding:* *Federal:* \$150,613 *Recipient:* \$49,648

*Description:* To better utilize the pollock harvest in Alaska, using Dutch Harbor as a model, in order to increase the economic return on the fishery and increase the total amount of fish material that is beneficially used. The major expected impact of this project is to provide fish processors in Alaska with a set of alternative value-added products that can use parts of the pollock not

currently used. This should result in a number of benefits, including increased yield from harvest, increased economic return to the fishers and fish processors, less environmental damage, and a favorable impact on our balance of trade.

*Grantee:* University of Maine, Orono, Maine  
*Grant No.:* NA03NMF4270124 *NMFS Contact:* F/NER  
*Project Title:* Recovery of Value from Crustacean Waste: Production and Assessment of an Improved Chitosan-based Heavy Metal Adsorbent  
*Funding:* *Federal:* \$57,772 *Recipient:* \$9,218

*Description:* To create an effective metal adsorbent material from modified chitosan derived from crustacean shell waste. This high-value product will have improved uptake, specificity for toxic heavy metals, and flow characteristics compared to other chitosan-based adsorbents as well as other commonly used, commercially available sorbent materials.

*Grantee:* University of Michigan, Ann Arbor, Michigan  
*Grant No.:* NA03NMF4270149 *NMFS Contact:* F/NER  
*Project Title:* Gear, Product, and Market Development for the Underutilized, Yet Burgeoning Populations of Freshwater Cod (*Lota lota*) in the Great Lakes  
*Funding:* *Federal:* \$120,284 *Recipient:* \$29,791

*Description:* To (1) develop gear that will more efficiently harvest live burbot and reduce bycatch, (2) determine methods to handle and preserve fish for product research and testing, and (3) develop fish products for public consumption and test them using established markets and marketing strategies.

*Grantee:* National Fisheries Institute, Inc., Arlington, Virginia  
*Grant No.:* NA03NMF4270275 *NMFS Contact:* F/NER  
*Project Title:* Development of the “Chub” Mackerel Fishery, an Underutilized Species  
*Funding:* *Federal:* \$117,410 *Recipient:* \$28,840

*Description:* To develop a fishery for chub mackerel (*Scomber japonicus*). This proposal will (1) test a dual-boat towing configuration to achieve the increased towing speeds necessary for efficient capture of the fish; (2) evaluate the availability of this fish during the summer season; and (3) record information on catch and discard of non-target species to identify unwanted impacts on other commercially, recreationally, or environmentally sensitive species.

*Grantee:* University of Washington, Seattle, Washington  
*Grant No.:* NA03NMF4270156 *NMFS Contact:* F/NWR  
*Project Title:* Potential for Sustainable Expansion of the Dogfish (*Squalus acanthias*) Fishery in the Northeast Pacific  
*Funding:* *Federal:* \$157,431 *Recipient:* \$25,958

*Description:* To provide basic data on stock structure, stock assessment, and socioeconomic issues for an expanded, sustainable international fishery on dogfish in the northeast Pacific Ocean. The project will identify self-recruiting stocks of dogfish on the West Coast using genetic markers, compare population parameters along a latitudinal gradient, and determine appropriate socioeconomic indicators of the existing fishery.

*Grantee:* Louisiana State University Agricultural Center, Baton Rouge, Louisiana  
*Grant No.:* NA03NMF4270092 *NMFS Contact:* F/SER  
*Project Title:* Purification of Lysozyme from Shell Liquor of Eastern Oysters (*Crassostrea virginica*) and Potential Commercial Use  
*Funding:* *Federal:* \$117,437 *Recipient:* \$28,613

*Description:* To purify lysozyme from oyster shell liquor obtained from oyster processors in spring, summer, fall, and winter. The lysozyme yield in mg. protein/liter of shell liquor will be determined for each season. The minimum concentration of lysozyme inhibiting the growth of bacteria responsible for food poisoning and food spoilage will be measured using protocols of the National Committee for Clinical Laboratory Standards. The allergenicity of oyster lysozyme will be determined by western blotting, enzyme-linked immunosorbent assay (ELISA), and passive cutaneous anaphylaxis test.

## **MANAGEMENT ALTERNATIVES AND FISHERIES USER CONFLICTS**

*Grantee:* University of Massachusetts, Dartmouth, North Dartmouth, Massachusetts  
*Grant No.:* NA03NMF4270265 *NMFS Contact:* F/NER  
*Project Title:* Full-time Employment and Income in New Bedford Before and After Days at Sea  
*Funding:* *Federal:* \$79,128 *Recipient:* \$20,201

*Description:* To estimate full-time employment and income for 1994 and 2002 and annual and hourly income for 2002, using available data (e.g., settlement sheets), and to survey boat owners, captains, and crew members for these data. The project will also suggest methods to collect these data in other ports and to use these data in models for estimating social and economic effects.

*Grantee:* University of Rhode Island, Kingston, Rhode Island  
*Grant No.:* NA03NMF4270181 *NMFS Contact:* F/NER  
*Project Title:* An Economic Analysis of an Alternative Atlantic Sea Scallop Management: Harvesters Cooperatives and Scallop Enhancement  
*Funding:* *Federal:* \$109,894 *Recipient:* \$29,690  
*Description:* To estimate the demand function, harvesting cost, and growth functions for wild scallop and enhanced scallop stocks. Using these estimations, the researchers will develop a bioeconomic simulation model for status quo management and cooperative management to calculate and compare their net benefits (costs).

*Grantee:* University of Rhode Island, Kingston, Rhode Island  
*Grant No.:* NA03NMF4270146 *NMFS Contact:* F/NER  
*Project Title:* A Compliance Diagnostic for the Northeast Groundfish Fishery  
*Funding:* *Federal:* \$50,052 *Recipient:* \$15,258

*Description:* To survey groundfish fishermen and analyze the data to reveal salient linkages between the procedures used for establishing and implementing policy and fishermen's compliance decisions.

*Grantee:* Massachusetts Fishermen's Partnership, Inc., Gloucester, Massachusetts  
*Grant No.:* NA16FD2302 *NMFS Contact:* F/NER  
*Project Title:* Institutionalizing Social Science Data Collection: A Pilot Project  
*Funding:* *Federal:* \$136,250 *Recipient:* \$17,900

*Description:* To bring fishermen, researchers, community members, educators, and coastal managers together on panels that will work together to develop a process for the ongoing collection of social science information pertinent to both fisheries management and coping with change. Such a process, if successful, will provide NMFS with a model to meet Sustainable Fisheries Act requirements of National Standard 8.

*Grantee:* University of Maryland, Cambridge, Maryland  
*Grant No.:* NA96FD0071 *NMFS Contact:* F/NER  
*Project Title:* Test of Two Stock Hypotheses for Atlantic Bluefin Tuna Using Otolith Elemental Fingerprints  
*Funding:* *Federal:* \$88,374 *Recipient:* \$22,207

*Description:* To determine the spatial and temporal stability of elemental fingerprints classified for Mediterranean and western Atlantic bluefin tuna nurseries, using results from a previous S-K project on otolith microconstituent analysis. Juvenile otoliths collected over 2 years and among several sites within each nursery will be analyzed. Inductively coupled plasma mass spectrometry will also be evaluated to determine the elemental fingerprints associated with the first year of life.

*Grantee:* University of Maryland, Cambridge, Maryland  
*Grant No.:* NA96FD0073 *NMFS Contact:* F/NER  
*Project Title:* Recruitment Dynamics of Northern Shrimp (*Pandalus borealis*)  
*Funding:* *Federal:* \$92,789 *Recipient:* \$21,871

*Description:* To investigate the influence of physical factors, excluding temperature, on northern shrimp recruitment. The match-mismatch hypothesis in relation to shrimp recruitment will also be investigated. A stock-recruitment model, incorporating the effects of significant environmental and ecological variables, will be developed. In addition, potential overfishing definitions of northern shrimp, with explicit consideration of the impact of environmental and ecological variation, will be explored.

*Grantee:* University of Maryland, Cambridge, Maryland  
*Grant No.:* NA96FD0076 *NMFS Contact:* F/NER  
*Project Title:* Density-Dependent Growth and Reproduction of Chesapeake Bay Striped Bass  
*Funding:* *Federal:* \$88,702 *Recipient:* \$23,404

*Description:* To estimate the age and year class-specific growth rates of Chesapeake Bay striped bass juveniles, pre-migrant sub-adults, and migratory females. Evidence for density dependence in growth will also be examined. Fecundity and age at first maturation for females of year classes varying in initial abundance will be estimated, and the density effects on these rates will be tested. Finally, the importance of these density-dependent effects in calculating biological reference points and overfishing thresholds will be evaluated.

*Grantee:* Virginia Institute of Marine Science, Gloucester Point, Virginia  
*Grant No.:* NA16FD2294 *NMFS Contact:* F/NER  
*Project Title:* Population Structure Analysis of Atlantic Bluefin Tuna Using Hypervariable, Nuclear DNA Markers  
*Funding:* *Federal:* \$126,793 *Recipient:* \$23,445

*Description:* To critically examine population structure of the Atlantic bluefin tuna. Through an ongoing Saltonstall-Kennedy award, the investigator has developed a suite of hypervariable, nuclear-DNA markers that reveal considerable genetic variation within the Atlantic bluefin tuna. The investigator will use these genetic tools to screen biologically meaningful collections of young bluefin collected from the western and eastern North Atlantic Ocean to determine if there is significant spatial or temporal partitioning of genetic variation among collections. Hypotheses of stock structure of the Atlantic bluefin tuna will be tested. The investigators also will use these markers to screen bluefin taken in the central North Atlantic.

*Grantee:* Gulf & South Atlantic Fisheries Foundation, Inc., Tampa, Florida  
*Grant No.:* NA17FD2367 *NMFS Contact:* F/SER  
*Project Title:* Development of a Vessel Buyout Business Plan for the Southeastern U.S. Commercial Shark Fishery  
*Funding:* *Federal:* \$366,560 *Recipient:* \$43,999

*Description:* To involve industry representatives in work with Gulf & South Atlantic Fisheries Foundation, Inc., project staff and subcontracted experts to draft a Preliminary Commercial Shark Fishery Vessel Buyout Business Plan. This will be followed by integrated research involving field data collection, processing, and analysis to evaluate the technical, financial, socioeconomic, and management feasibility of the preliminary plan, as well as different commercial shark fishing vessel buyout options. The results of this multidisciplinary study will then be used to develop and refine a Final Commercial Shark Fishery Vessel Buyout Business Plan acceptable to the majority of those engaged in the industry, the Gulf of Mexico and the South Atlantic Fishery Management Councils, and NMFS.

*Grantee:* Florida State University, Tampa, Florida  
*Grant No.:* NA03NMF4270086 *NMFS Contact:* F/SER  
*Project Title:* Incorporating Fisher Behavior into Management Models: A Case Study of the Reef Fish Fishery of the Eastern Gulf of Mexico  
*Funding:* *Federal:* \$210,425 *Recipient:* \$37,319

*Description:* To characterize fisher behavior using data from NMFS logbooks and the Florida Marine Research Institute trip tickets for grouper-snapper fishers operating in the eastern Gulf of Mexico. All data will be kept confidential. The intent is simply to produce a predictive model of fisher behavior in response to fishery regulations, particularly spatially explicit regulations including marine protected areas. Results will be integrated with a stage-based life history model of groupers being developed by one of the investigators.

*Grantee:* Texas A&M Research Foundation, College Station, Texas  
*Grant No.:* NA03NMF4270091 *NMFS Contact:* F/SER  
*Project Title:* Characterization of Atlantic Bluefin Tuna Stock Structure Using Stable 13C and 18O Isotopes in Otolith  
*Funding:* *Federal:* \$112,779 *Recipient:* \$19,946

*Description:* To quantify stable d13C and d18O isotopes in otoliths of Atlantic bluefin tuna to predict nursery origin and use these natural markers to estimate mixing rates of sub-adult and adult bluefin tuna. Past research by this group supported by Saltonstall-Kennedy grants has developed and evaluated protocols for quantifying trace element chemistry to delineate stocks of Atlantic bluefin tuna from western or eastern nurseries. This project will take the next logical step, and integrate stable d13C and d18O isotopes into our current evaluation of population connectivity. The aims of the proposed study are to (1) assess the utility of stable d13C and d18O isotopes as a tool to examine stock structure, and (2) estimate mixing rates of Atlantic bluefin tuna between eastern and western nurseries.

*Grantee:* University of California, Santa Cruz, California  
*Grant No.:* NA03NMF4270155 *NMFS Contact:* F/SWR  
*Project Title:* Measuring Impacts on Fishing Communities: A Framework for Integrated Socioeconomic Assessment  
*Funding:* *Federal:* \$149,987 *Recipient:* \$24,998

*Description:* To conduct a two-part study using the combined approaches of fisheries sociology and economics to (1) conduct ethnographic interviews and small surveys and archival research to estimate an input-output (I/O) matrix for the Moss Landing fishing community, compute community-specific multipliers, and compare the community-level and county-level I/O data and multipliers, as well as the tradeoffs of these two approaches; and (2) using this information, work with the Moss Landing community to develop and analyze scenarios that reflect alternative definitions of community and potential management actions, to determine and compare their potential socioeconomic impacts on the community.

## **FISHERIES BYCATCH**

*Grantee:* William E. Donaldson, Dublin, New Hampshire  
*Grant No.:* NA16FD2388 *NMFS Contact:* F/AKR  
*Project Title:* Development of a Field Techniques Manual for the Collection of Data on King Crabs, *Lithodes* and *Paralithodes*  
*Funding:* *Federal:* \$29,800 *Recipient:* \$7,055

*Description:* To develop a manual of field sampling techniques for *Lithodes* and *Paralithodes* king crabs for use by biological agencies and fishery observers, thereby allowing standardization of data collected and improved fisheries management. When this project is completed, research and management agencies and shellfish observers will have an objective and descriptive field manual of techniques for data collection on king crabs in Alaskan waters, and the fishing industry will be able to avail itself of the same techniques and instructions. This project has the potential to significantly and directly benefit the Alaskan crab fishing community and groundfish fisheries affected by bycatch caps.



*King crab circa 1967,  
DOC/NOAA Photo Library*

*Grantee:* Massachusetts Division of Marine Fisheries, Boston, Massachusetts  
*Grant No.:* NA03NMF4270139 *NMFS Contact:* F/NER  
*Project Title:* Further Testing of Cod Avoiding Trawl Net Designs  
*Funding:* *Federal:* \$318,760 *Recipient:* \$44,085

*Description:* To further verify the effectiveness of two cod-avoiding trawl net designs, the “Ribas” and “Topless” trawls, using larger versions of the designs and including nighttime testing.

*Grantee:* New England Aquarium Corporation, Boston, Massachusetts  
*Grant No.:* NA03NMF4270126 *NMFS Contact:* F/NER  
*Project Title:* Juvenile Bycatch and Survival Assessment of Spiny Dogfish (*Squalus acanthias*) in a Western Atlantic Trawl Fishery  
*Funding:* *Federal:* \$169,580 *Recipient:* \$28,147

*Description:* To conduct the first survivability study on elasmobranchs and, more specifically, *Squalus acanthias*, that includes stress measurements. In addition, investigate short- and long-term survivorship following trawl exposure and discard.

*Grantee:* Manomet, Inc., Manomet, Massachusetts  
*Grant No.:* NA03NMF4270208 *NMFS Contact:* F/NER  
*Project Title:* Relating Fish Shape to Mesh Size: How Morphometric Variability Affects Trawl Net Selectivity in the Gulf of Maine  
*Funding:* *Federal:* \$92,776 *Recipient:* \$18,877

*Description:* To collect morphometric measurements of key groundfish species during standard fishing operations on commercial fishing vessels in the Gulf of Maine. Variability of body measurements for each length class of fish will be calculated. A simple model will be formulated to estimate the mesh size and configuration through which commercial fish species of any size will be most likely to escape. The model will enable managers and the fishing industry to predict potential retention rates of major commercial fish species for a range of mesh sizes and configurations.

*Grantee:* University of Rhode Island, Kingston, Rhode Island  
*Grant No.:* NA03NMF4270107 *NMFS Contact:* F/NER  
*Project Title:* Development of a Southern New England Working Group: Focus on Bycatch and Gear Conservation Engineering  
*Funding:* *Federal:* \$52,912 *Recipient:* \$8,043

*Description:* To share knowledge and skills of fishermen and gear researchers for the development of collaborative efforts in conservation gear engineering projects.



*Grantee:* Massachusetts Division of Marine Fisheries, Boston, Massachusetts  
*Grant No.:* NA16FD2297 *NMFS Contact:* F/NER  
*Project Title:* Reducing Blue Shark Bycatch in Pelagic Longline Fisheries  
*Funding:* *Federal:* \$53,050 *Recipient:* \$8,311

*Description:* To gain knowledge of blue shark behavior toward a variety of baits, both natural and artificial, to learn which bait characteristics are distasteful to that species. During 10 sea trials offshore, blue sharks will be presented with a series of natural and artificial baits. Shark responses will be recorded, and comparisons will be made between reactions to artificial baits and control baits that are widely used by pelagic longliners for tunas and swordfish. A wide variety of artificial baits will be developed.

*Grantee:* Washington Department of Fish and Wildlife, Olympia, Washington  
*Grant No.:* NA03NMF4270133 *NMFS Contact:* F/NWR  
*Project Title:* Evaluate Selective Fishing Methods  
*Funding:* *Federal:* \$174,370 *Recipient:* \$35,910

*Description:* To evaluate and compare selective fishing methods for coho salmon in an estuarine environment (Willapa Bay, Washington). The objectives include: (1) compare the number of and condition of coho caught in tangle nets and conventional gill nets; (2) estimate and compare the immediate and long-term survival of hatchery coho salmon caught in the tangle net and conventional gill net and hook and line gear; (3) enumerate the immediate mortality of untargeted animals caught in the tangle net and conventional gill net and hook and line gear; (4) estimate the egg-to-fry mortality of hatchery coho released from the tangle net, gill net, and hook and line gear and that return to the hatchery; and (5) estimate hooking mortality rate for hatchery coho captured in an estuary.

*Grantee:* Pacific Whiting Conservation Cooperative, Seattle, Washington  
*Grant No.:* NA16FD2447 *NMFS Contact:* F/NWR  
*Project Title:* A Project to Evaluate the Influence of Oceanographic Variables on Non-Target Species of Bycatch in the At-Sea Pacific Whiting Fishery  
*Funding:* *Federal:* \$17,022 *Recipient:* \$11,000

*Description:* To equip fishing vessels with conductivity, temperature, and depth (CTD) meters to collect physical oceanographic data. Annually, six vessels operate in the at-sea catch processor fleet in the Pacific whiting fishery. These vessels have 100 percent observer coverage, and every haul is sampled for species composition. On each vessel a CTD meter will be deployed on the net and data recorded for each haul. The data will be downloaded daily to a computer for storage. A database for analysis will be constructed using the physical oceanographic data collected, along with observer data on catch composition. Two forms of statistical analysis will be utilized—factorial analysis and principal components analysis. An analysis will also be conducted in which water mass characteristics and bycatch will be examined in a spatial construct. If a significant quantifiable relationship is found between physical oceanographic parameters and bycatch, then a bycatch warning program will be written to analyze CTD data during daily downloads to provide an alert to vessel masters.

*Grantee:* University of Hawaii, Kaneohe, Hawaii  
*Grant No.:* NA03NMF4270187 *NMFS Contact:* F/PIR  
*Project Title:* Broadband Sonar Identification of Hawaiian Bottom Fish Species  
*Funding:* *Federal:* \$128,155 *Recipient:* \$14,240

*Description:* To obtain critical information that will allow for the design and fabrication of a prototype broadband sonar that may be used to identify and monitor bottom fish species from the surface. Specifically, to develop a management tool to monitor the state of overfished areas set aside as a reserve and monitor critical fishing areas for conservation and management.

*Grantee:* University of North Florida, Jacksonville, Florida  
*Grant No.:* NA03NMF4270084 *NMFS Contact:* F/SER  
*Project Title:* The Effectiveness of Bycatch Reduction Devices on Crab Pots on Reducing Capture and Mortality of Diamondback Terrapins and Enhancing Capture of Blue Crabs  
*Funding:* *Federal:* \$51,733 *Recipient:* \$9,512

*Description:* To study the effects of Bycatch Reduction Devices (BRDs), 15 standard crab pots will be equipped with wire rectangle BRDs (4.5 x 12.0 cm) attached to the inside openings of all entrance funnels. Another 15 pots without BRDs will be used as controls. Pots will be deployed in tidal creeks in rows with alternating pot treatments no more than 20 m apart. All pots will be baited with fish and checked daily. The 30 pots will be fished for 10-day periods in two different counties during the month of May in each year, for a total of four counties. All terrapins will be sexed, measured, weighed, microchipped, and released. Crabs will be sexed and carapace length, height, and width measured. One crab trapper from each county will be selected to assist with the project, to suggest appropriate placement of the pots, and to help set and collect the pots. As incentives, the trapper will receive a \$200 stipend and all legal-sized crabs caught during the project.

*Grantee:* The Regents of the University of California, Santa Cruz, California  
*Grant No.:* NA03NMF4270098 *NMFS Contact:* F/SWR  
*Project Title:* Pilot Project: Testing the Feasibility of Pot Gear to Catch Petrale Sole and Reduce Rockfish Bycatch  
*Funding:* *Federal:* \$117,400 *Recipient:* \$35,282

*Description:* To determine appropriate bait for petrale sole by returning live fish to the laboratory facility and introducing different types of fish, mollusks, and crustacea. The investigators will then work with expert fishermen and gear designers to develop up to four trap designs for initial testing on petrale sole. The most effective design will be more thoroughly tested for its effectiveness in catching petrale and minimizing bycatch of overfished species of rockfish.

*Grantee:* Pflieger Institute of Environmental Research, Oceanside, California  
*Grant No.:* NA16FD2470 *NMFS Contact:* F/SWR  
*Project Title:* Can Leatherback Sea Turtle Bycatch Be Reduced in the Swordfish Longline Fishery by Modifying Fishing Methods?  
*Funding:* *Federal:* \$105,518 *Recipient:* \$25,168

*Description:* To use pop-up satellite tags to map the habitat use of swordfish and leatherback turtles to search for regions in time and space where the overlap between the species is minimal. This will indicate if and how modifications to fishing methods can be used to reduce bycatch. The project will be conducted with fishermen and will be implemented such that the same methods are applicable for use by fishermen in other fisheries or regions.



*Leatherback turtle,  
DOC/NOAA Photo Library*

## **PRODUCT QUALITY AND SAFETY**

*Grantee:* Kenai Peninsula Borough, Soldotna, Alaska  
*Grant No.:* NA03NMF4270109 *NMFS Contact:* F/AKR  
*Project Title:* Cook Inlet Sockeye Salmon Branding Program  
*Funding:* *Federal:* \$399,659 *Recipient:* \$75,672

*Description:* To create a sustainable fishery for the Cook Inlet fishing community by establishing a quality certification program to produce high-quality Cook Inlet Sockeye salmon for marketing under a branded label, thereby re-establishing a demand for Alaska salmon that will command a premium price. This will benefit fisherman and processors alike.

*Grantee:* University of Rhode Island, Kingston, Rhode Island  
*Grant No.:* NA16FD2301 *NMFS Contact:* F/NER  
*Project Title:* Quality and Safety Assessment of Commercially Produced Tasteless Smoked Seafood Products  
*Funding:* *Federal:* \$98,948 *Recipient:* \$28,969

*Description:* To evaluate commercially processed tasteless smoked seafood products and compare their overall quality to similarly stored untreated product. The controversy surrounding this product/process within the fishing industry raises issues requiring investigation to verify or refute claims. Indicators of quality, safety, color, microbial growth, and sensory attributes will be studied over storage periods. Three species, treated and untreated, will be stored on ice, in refrigeration with no ice, and at room temperature. Samples will be collected over the storage period to obtain a full range of quality. Expert sensory assessment will be completed, and all results will be analyzed.

*Grantee:* Pacific Shellfish Institute, Olympia, Washington  
*Grant No.:* NA03NMF4270186 *NMFS Contact:* F/NWR  
*Project Title:* Risk Management of a New U.S. Oyster Disease Threat  
*Funding:* *Federal:* \$76,791 *Recipient:* \$14,732

*Description:* To ensure the continued ability of West Coast shellfish seed procurers to export seed free of Denman Island disease, a disease in oysters that is caused by a parasite. Denman Island disease was found in oysters for the first time in Washington State in 2002. The disease has the highest international alert status (must be reported to the World Organization for Animal Health (OIE) by the U.S. Department of Agriculture). Through background research, the investigators will conduct a risk assessment and management process, produce a report, and gather input on the report at a 2-day conference. The project will critically evaluate whether the status of the disease as internationally reportable is justified, provide a systematic analysis of disease transfer, and support the sustainability of a healthy shellfish resource.

*Grantee:* Louisiana State University, New Orleans, Louisiana  
*Grant No.:* NA03NMF4270085 *NMFS Contact:* F/SER  
*Project Title:* Anti-*V. vulnificus* Oyster Defensin: Its Synthesis and Use to Reduce the *V. vulnificus* Load in Oysters That Are to Be Eaten Raw  
*Funding:* *Federal:* \$190,189 *Recipient:* \$94,029

*Description:* To synthesize and study the effects of anti-*V. vulnificus* oyster defensins (AVVOD). Acetic acid extracts of the oyster (*Crassostrea virginica*) were shown to inactivate the Gram-negative pathogen *Vibrio vulnificus*. These extracts contained at least two heat-stable peptides considered to be AVVOD. A seasonal relationship appears to exist where AVVOD is induced in oysters when Gulf waters are warm and the *V. vulnificus* populations in such waters are dense. In contrast, when Gulf waters are cool and unfavorable for *V. vulnificus* growth, AVVOD levels in the oyster tissue are low or absent, suggesting that AVVOD may be a means of protection against tissue invasion by *V. vulnificus*. We have shown that the *V. vulnificus* load in oysters can be reduced after exposure to AVVOD and subsequent refrigeration.

*Grantee:* South Carolina Department of Natural Resources, Charleston, South Carolina  
*Grant No.:* NA03NMF4270090 *NMFS Contact:* F/SER  
*Project Title:* Evaluation of Ecological and Commercial Impact of White Spot Syndrome Virus (WSSV) Infection in the White Shrimp (*Litopenaeus setiferus*) and the Blue Crab (*Callinectes sapidus*) in Southeastern United States Using an Immunoassay Technique  
*Funding:* *Federal:* \$175,631 *Recipient:* \$24,884

*Description:* To evaluate the potential impact of WSSV in reproductive stocks of the white shrimp (*L. setiferus*) and blue crab (*C. sapidus*) using an immunoassay technique to detect infection. Sensitivity of this technique will be assessed. Recently funded S-K work confirmed the presence of WSSV in South Atlantic stocks of *L. setiferus* and in brown shrimp (*Farfantepenaeus aztecus*); however, the extent of infection is not known. Published reports have indicated that stress due to spawning increased shrimps' susceptibility to viral infection, hence reproductive populations will be the subjects of this study. Participation of shrimpers in disease diagnosis is a major component of this project. Information generated will provide a crucial foundation for disease risk assessment and risk management practices, as well as development of regional management protocols.

*Grantee:* University of Florida, Gainesville, Florida  
*Grant No.:* NA03NMF4270088 *NMFS Contact:* F/SER  
*Project Title:* Effect of High-Pressure Treatment on Omega-3 Fatty Acids in Fish Muscle  
*Funding:* *Federal:* \$51,759 *Recipient:* \$16,273

*Description:* To evaluate the effect of high-pressure treatment on the lipid fraction of fish muscle and on the activities of endogenous muscle pro- and antioxidants. The effect of high-pressure treatment will be evaluated by comparing the fatty acid profile of treated and untreated sample (intact muscle and extracted lipids), as well as comparing the pro- and antioxidant capacity of soluble muscle compounds before and after treatment. Thiobarbituric acid and lipid hydroperoxides will be used as indexes of oxidation. A storage study will be carried out to examine the stability of high-pressure treated samples during refrigerated and frozen storage.

## **AQUACULTURE**

*Grantee:* Pisces Molecular LLC, Boulder, Colorado  
*Grant No.:* NA03NMF4270132 *NMFS Contact:* F/NER  
*Project Title:* Development of a Reverse Genetics System to Produce Live, Attenuated Infectious Salmon Anemia Virus (ISAV) Vaccine Candidates  
*Funding:* *Federal:* \$252,834 *Recipient:* \$33,129

*Description:* To develop a reverse genetics system for reconstituting ISAV particles from laboratory constructed plasmid molecules and to demonstrate the ability to produce attenuated virion particles that will be compelling candidates for a live attenuated ISAV vaccine.

*Grantee:* Micro Technologies, Inc., Richmond, Maine  
*Grant No.:* NA03NMF4270118 *NMFS Contact:* F/NER  
*Project Title:* Environmental Monitoring for Infectious Salmon Anemia Virus (ISAV) in and around Atlantic Salmon Marine Aquaculture Sites  
*Funding:* *Federal:* \$134,019 *Recipient:* \$20,876

*Description:* To develop an environmental monitoring model for the detection and quantification of ISAV, determine how long ISAV stays viable outside of the host, offer an early detection management tool for ISAV to salmon farmers, provide insight into the epizootiology of ISAV, and serve as a testing model for new and emerging aquatic animal pathogens.

*Grantee:* Atlantic Salmon Federation, Inc., Calais, Maine  
*Grant No.:* NA03NMF4270184 *NMFS Contact:* F/NER  
*Project Title:* Tracking Experimentally Released Escaped Farmed Salmon in the Bay of Fundy Region to Determine Recapture Feasibility and Potential Interactions with Wild Atlantic Salmon  
*Funding:* *Federal:* \$227,020 *Recipient:* \$46,500

*Description:* To conduct experimental releases of farmed salmon fitted with sonic tags, monitor dispersal rates and distances from controlled release points, and monitor movements into wild Atlantic salmon rivers in the region.

*Grantee:* Maine BioTek, Inc., Winterport, Maine  
*Grant No.:* NA03NMF4270119 *NMFS Contact:* F/NER  
*Project Title:* Whole Killed ISA Virus Vaccine  
*Funding:* *Federal:* \$157,591 *Recipient:* \$31,326

*Description:* To refine a prototype ISA virus vaccine with respect to virus inactivation, dose, and heterologous protection. The project will also define the role of the humoral immune response in virus clearance from ISA virus-infected Atlantic salmon. The study will enhance the preparation of an efficacious whole killed vaccine by identifying the optimal vaccine formulation required for a robust immune response.

*Grantee:* MER Assessment Corporation, Brunswick, Maine  
*Grant No.:* NA03NMF4270151 *NMFS Contact:* F/NER  
*Project Title:* Evaluation of LiftUp System in the Mitigation of Environmental and Fish Disease Impacts in Net-Pen Aquaculture  
*Funding:* *Federal:* \$110,704 *Recipient:* \$54,742

*Description:* To determine the level of environmental and fish health benefits and cost-effectiveness of LiftUp use in marine net-pen aquaculture.

*Grantee:* University of Southern Maine, Portland, Maine  
*Grant No.:* NA03NMF4270123 *NMFS Contact:* F/NER  
*Project Title:* Atlantic Salmon Aquaculture Considering Endangered Status of Atlantic Salmon and Clean Water Act  
*Funding:* *Federal:* \$76,204 *Recipient:* \$13,413

*Description:* To publish guides to be used during preliminary discussions with stakeholders (e.g., “How Does the ESA Apply to Aquaculture Operations in Maine?” and “How Does the Clean Water Act Apply to Aquaculture Operations in Maine?”). Identify ESA and Clean Water Act (CWA) enforcement impacts on Maine Atlantic salmon aquaculture operations, provide aquaculture operators with information on achieving compliance with ESA and CWA, and facilitate communication between nongovernmental organizations and aquaculture operators as part of overall efforts to reduce litigation.

*Grantee:* Capricorn Products, Incorporated, Scarborough, Maine  
*Grant No.:* NA03NMF4270174 *NMFS Contact:* F/NER  
*Project Title:* Development of Three Rapid, Sensitive, Reproducible Blood Tests for the Detection of Infectious Salmon Anemia Virus  
*Funding:* *Federal:* \$333,748 *Recipient:* \$57,275

*Description:* To develop three assay formats for the detection of ISAV for the aquaculture industry. These assays are designed to accommodate both laboratory and pen-side testing. The tests offer improved sensitivity, speed, and reproducibility over currently used assays.

*Grantee:* University of Maryland Biotechnology Institute, Baltimore, Maryland  
*Grant No.:* NA03NMF4270153 *NMFS Contact:* F/NER  
*Project Title:* Ensuring Biosecurity in the Atlantic Salmon Farming Industry through a Novel Approach to Inducing Sterility: Disrupting Establishment of the GnRH System  
*Funding:* *Federal:* \$159,484 *Recipient:* \$58,321

*Description:* To develop a simple and generic treatment for inducing sterility in Atlantic salmon, based on altering the migration pattern of gonadotropin-releasing hormone (GnRH) neurons during early development by exposing fish to GABA, a naturally occurring neurotransmitter in fish and other vertebrates.

*Grantee:* University of Maryland Biotechnology Institute, Baltimore, Maryland  
*Grant No.:* NA03NMF4270150 *NMFS Contact:* F/NER  
*Project Title:* Ultrasound Mediated Delivery of Vaccines for Aquaculture  
*Funding:* *Federal:* \$150,079 *Recipient:* \$54,724

*Description:* To develop an ultrasound protocol for noninvasive, mass vaccination of Atlantic salmon against ISA virus using a whole-killed viral vaccine.

*Grantee:* Advanced BioNutrition Corporation, Columbia, Maryland  
*Grant No.:* NA03NMF4270163 *NMFS Contact:* F/NER  
*Project Title:* Novel Oral Vaccine for Infectious Salmon Anemia  
*Funding:* *Federal:* \$190,400 *Recipient:* \$56,290

*Description:* To develop and test methods for producing an orally active ISA vaccine built on multifunctional display of antigens on an IPNV virus–like particle platform. The project will include design, implementation, and testing of the dual functionality of the vaccine to deliver effective control of both ISA and IPN at a low cost.



*Grantee:* New England Aquarium Corporation, Boston, Massachusetts  
*Grant No.:* NA03NMF4270121 *NMFS Contact:* F/NER  
*Project Title:* The Use of Acoustic Conditioning to Reduce the Impact of Escapement in Atlantic Salmon Net Pen Aquaculture  
*Funding:* *Federal:* \$128,845 *Recipient:* \$23,081

*Description:* To reduce the impact of aquaculture escapees on native populations by developing a methodology to recapture the escapees through acoustic conditioning and enticement into a fish trap.

*Grantee:* University of New Hampshire, Durham, New Hampshire  
*Grant No.:* NA03NMF4270183 *NMFS Contact:* F/NER  
*Project Title:* Engineering Design and Analysis for More Secure Salmon Net Pen Systems  
*Funding:* *Federal:* \$472,662 *Recipient:* \$61,648

*Description:* To work at Heritage Salmon’s 20-cage site in Broad Cove near Eastport, Maine, to evaluate the structural integrity of the system for offshore application. To perform the analysis, computer models calibrated with field measurements will be used to provide mooring and cage stress and reliability analysis to minimize the escapement of the contained salmon in an offshore application.



*Grantee:* Great Bay Aquaculture, LLC, Portsmouth, New Hampshire  
*Grant No.:* NA03NMF4270114 *NMFS Contact:* F/NER  
*Project Title:* Development of Disease-Free Cod Broodstock and Juveniles for Cage Culture  
*Funding:* *Federal:* \$289,774 *Recipient:* \$80,747

*Description:* To produce a commercial number of disease-free cod juveniles for stocking into commercial cage sites, providing diversification opportunity to salmon growers; and to establish the foundation of a breeding program for Atlantic cod, ensuring future competitiveness within the global market.

*Grantee:* University of Maine, Orono, Maine  
*Grant No.:* NA03NMF4270167 *NMFS Contact:* F/NER  
*Project Title:* Demonstration of Sustainable Cod Farming from Egg to Grow-out in Maine  
*Funding:* *Federal:* \$358,022 *Recipient:* \$187,883

*Description:* To assess the economics of Atlantic cod production in net pens in Maine and to establish a disease-free industry source of Atlantic cod eggs.

*Grantee:* Woods Hole Oceanographic Institution, Woods Hole, Massachusetts  
*Grant No.:* NA16FD2291 *NMFS Contact:* F/NER  
*Project Title:* Open-Ocean Aquaculture: Economic Measures for Mitigating Risk and Encouraging Development  
*Funding:* *Federal:* \$107,257 *Recipient:* \$46,501

*Description:* To identify and characterize institutions and public policies appropriate for reducing the costs of risks and uncertainty precluding the emergence and development of an open-ocean aquaculture industry. Specifically, the investigators will (1) identify specific sources of risk and uncertainty associated with open-ocean aquaculture development; (2) estimate the levels of those risks that are quantifiable; (3) describe uncertainties for which risks cannot be estimated; (4) estimate the expected net economic benefits from aquaculture operations under risk and uncertainty to firms and market sectors, and develop estimates of potential industry investment levels; (5) identify institutions or specific policy instruments for managing risk and uncertainty; and (6) present findings to industry, natural resource management agencies, and the public.

*Grantee:* Texas A&M Research Foundation, College Station, Texas  
*Grant No.:* NA16FD2295 *NMFS Contact:* F/NER  
*Project Title:* Estimation of Wave Conditions Influencing Distribution of Fish Farm Wastes and Structural Integrity of Aquaculture Units  
*Funding:* *Federal:* \$145,059 *Recipient:* \$28,768

*Description:* To develop appropriate wave modeling methodology and determine wave conditions in four bays in Maine for aquaculture applications. A dynamic wave environment enhances the dispersal of net pen wastes. However, it also causes damage to fish farms, allowing

escape of aquacultured fish. This project will use field data and models to estimate the frequency of various wave conditions in Maine.

*Grantee:* University of Washington, Seattle, Washington  
*Grant No.:* NA03NMF4270112 *NMFS Contact:* F/NWR  
*Project Title:* Restoration and Aquaculture of Northern Abalone (*Haliotis kamtschatkana*) in Washington State: Status of the Resource, Population Genetics, Habitat and Culture of Captive Abalone  
*Funding:* *Federal:* \$274,418 *Recipient:* \$80,776

*Description:* To (1) quantify adult and juvenile northern abalone densities and characterize abalone habitat at eight to 12 sites in the San Juan Islands; (2) analyze abalone genetic variation and effective population size for use in species management and enhancement efforts; (3) develop captive breeding and rearing protocols for pinto abalone aquaculture development; (4) develop rearing methods for enhancement; (5) quantify behavioral differences in juvenile abalone reared in “natural habitats” versus those reared using conventional methods; and (6) convene a workshop to engage the public in abalone restoration.

*Grantee:* Florida Fish and Wildlife Conservation Commission, Port Charlotte, Florida  
*Grant No.:* NA03NMF4270093 *NMFS Contact:* F/SER  
*Project Title:* Restoration of Bay Scallop (*Argopecten irradians*) Populations on the West Coast of Florida  
*Funding:* *Federal:* \$251,979 *Recipient:* \$44,361

*Description:* To continue successful bay scallop population restoration efforts along the Florida west coast between Anclote and Crystal River, which, so far, have resulted in a 2-order-of-magnitude increase in scallop abundance in that area. Scallops will be collected, spawned in the laboratory, and the resultant offspring planted in protective cages in each area from which the parental stock was harvested. Separately, as part of a continuing State-funded monitoring program, changes in recruitment and adult abundance in the target area will be monitored to assess the success of those efforts. The recently initiated scallop restoration program in Sarasota Bay will be continued, in an effort to expand the range of viable local populations comprising the bay scallop metapopulation in the eastern Gulf of Mexico. Parental stock will be collected from Sarasota Bay or the geographically closest population (because scallops are extremely rare in Sarasota Bay) and cultured in the laboratory, and the resultant broodstock will be planted in protective cages at three sites in Sarasota Bay. Additional scallops will be free-planted in those same seagrass beds. Survival, growth, and reproductive development will be closely monitored for each planting treatment, including biochemical assessment of the health of eggs produced by scallops under each treatment. Potential offspring harvested from recruit collectors will be tested for relatedness using a variety of genetic techniques. A hydrodynamic model will be used to determine sites least likely to be exposed to red tide and to predict the dispersal of larvae from those sites. Results will be disseminated via local public meetings, reports to NMFS, and publication in international peer-reviewed journals.

*Grantee:* Florida Marine Research Institute, St. Petersburg, Florida  
*Grant No.:* NA17FD2368 *NMFS Contact:* F/SER  
*Project Title:* Bay Scallop (*Argopecten irradians*) Population Restoration on the West Coast of Florida  
*Funding:* *Federal:* \$206,753 *Recipient:* \$41,798

*Description:* To (1) continue the successful bay scallop population restoration efforts along the Florida west coast between Anclote and Crystal River; and (2) continue the recently initiated scallop restoration program in Sarasota Bay, in an effort to expand the range of viable local populations comprising the bay scallop metapopulation in the eastern Gulf of Mexico. The investigators will collect parental stock from the target site (Sarasota Bay, or the geographically closest population because scallops are extremely rare in Sarasota Bay), culture them in the laboratory, and plant the resultant broodstock in protective cages at three sites in Sarasota Bay. Additional scallops will be free-planted in those same seagrass beds. Survival, growth, and reproductive development will be closely monitored for each planting treatment, including a biochemical assessment of the health of eggs produced by scallops under each planting regime. Potential offspring harvested from recruit collectors will be tested for relatedness using mitochondrial DNA.

*Grantee:* University of West Florida, Pensacola, Florida  
*Grant No.:* NA03NMF4270089 *NMFS Contact:* F/SER  
*Project Title:* Evaluation of Ciliate Protozoans as a First Food for Red Snapper (*Lutjanus campechanus*) Larvae  
*Funding:* *Federal:* \$87,151 *Recipient:* \$14,426

*Description:* To isolate microzooplankton protozoans from Gulf of Mexico waters and establish culture techniques. The species most practical to culture will be offered as a first food to red snapper larvae, and the fish survival and growth compared to that obtained using only copepod nauplii. Microzooplankton enrichments will be evaluated as a less-intensive alternative to culturing, and assessed for larval survival and any prey preference by snapper larvae among microzooplankton organisms.

*Grantee:* University of Georgia Research Foundation, Inc., Athens, Georgia  
*Grant No.:* NA03NMF4270087 *NMFS Contact:* F/SER  
*Project Title:* Examination of Coastal Aquaculture Effluent and Receiving Water Quality throughout the Tidal Cycle  
*Funding:* *Federal:* \$94,094 *Recipient:* \$10,470

*Description:* To examine water quality of the receiving water and effluent at five commercial marine aquaculture facilities throughout several tidal cycles, and estimate effluent dilution factors. Selected facilities will have outfall locations ranging from the intercoastal waterway to small tidal creek tributaries. Study results should suggest the relative magnitude of the need to consider receiving water changes throughout the tidal cycle and effluent changes throughout the daily cycle as part of best management practices. Tidal cycles will be monitored during periods of high discharge (i.e., late season and harvest). At each facility, samples will be collected

throughout the tidal cycle, at both the outfall and in the receiving water prior to effluent discharge. Analyses will include suspended solids, turbidity, total nitrogen, total ammonia nitrogen, biochemical oxygen demand, and chlorophyll. Data sondes will concurrently measure dissolved oxygen, pH, salinity, and temperature in the receiving water and effluent. Semi-continuous measurements with an area velocity meter will monitor effluent volume throughout the tidal cycle. Dye will be used to determine effluent dilution during periods representing an average to lower-than-average tidal height.

*Grantee:* Texas Agricultural Experiment Station, College Station, Texas  
*Grant No.:* NA17FD2371 *NMFS Contact:* F/SER  
*Project Title:* Development of DNA Microsatellites for Genetic Applications in Cobia  
(*Rachycentron canadum*)  
*Funding:* *Federal:* \$120,627 *Recipient:* \$40,542

*Description:* To develop 25 to 30 polymorphic microsatellite DNA markers specific for cobia that can be used in forensic, quantitative genetic (broodstock enhancement), and stock-structure applications. Optimization of experimental conditions for assay of the microsatellites is a key experimental objective. Effective distribution/dissemination of project results is another key objective.

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## IV. PENDING NATIONAL PROGRAM PROJECTS

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This section contains a description of all pending (ongoing) projects under the S-K National Program, along with project number, project title, federal funding level, and the NMFS contact.

### PRODUCT QUALITY AND SAFETY

*Grantee:* Gulf and South Atlantic Fisheries Foundation, Inc., Tampa, Florida  
*Grant No.:* NA03NMF4270393 *NMFS Contact:* F/SER  
*Project Title:* At-Risk *Vibrio vulnificus* Educational Program Targeting the Medical/Professional Community  
*Funding:* *Federal:* \$1,473,800\* *Recipient:* \$0

*Description:* To evaluate the success or failure of past at-risk consumer education efforts and to identify and develop appropriate strategies, programs, and educational materials aimed at reducing *V. vulnificus*-related illnesses among the at-risk segment of the population. The target audience is the *V. vulnificus* at-risk segment and the medical and health care professionals who diagnose and provide medical advice to such patients and clients. The core states of Florida, Louisiana, and Texas will be targeted for a multifaceted educational campaign regarding the dangers to at-risk individuals of *V. vulnificus* illness from raw oyster consumption. Direct mailing to health care professionals will be made to educate and warn them of symptoms and treatments and the risks of raw oyster consumption, and to characterize the at-risk consumer. Radio and television advertisements will be created to educate the general public. In addition, a website will be developed that will focus on educating the public at-large.

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\*Award will be amended to add \$1 million provided in FY 2005 budget; amendment pending.

*Grantee:* Wild American Shrimp, Inc., Tarpon Springs, Florida  
*Grant No.:* NA05NMF4271149 *NMFS Contact:* F/SER  
*Project Title:* Wild American Shrimp Certification Program  
*Funding:* *Federal:* \$1,000,000\* *Recipient:* \$0

*Description:* To develop a certification program to ensure all shrimp branded as “Wild American Shrimp” meet quality standards developed in cooperation with the NMFS Seafood Inspection Program. This will be accomplished with assistance from Sea Grant College participants in the Southeast United States.

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\*Award pending.

## **AQUACULTURE**

*Project No.:* 05-HQ-AQ

*NMFS Contact:* F/MB5

*Project Title:* Development of a Permitting System for Marine Aquaculture

*Funding:* *Federal:* \$300,000\* *Recipient:* \$0

*Description:* To support the establishment of a comprehensive, environmentally sound permitting system for marine aquaculture. Such a system was recommended in the September 2004 Report to Congress of the U.S. Commission on Ocean Policy and positively responded to in the Administration's December 2004 U.S. Ocean Action Plan. Multiple contracts will be awarded for environmental and economic studies for such a system, and education and outreach tools and materials to inform the public on marine aquaculture issues.

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\*Award pending.

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## V. COMPLETED GRANT PROGRAM PROJECTS

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This section contains an assessment of each S-K Grant Program project completed during the period June 1, 2004, through May 31, 2005, regarding the extent to which the objectives of the project were attained and the project contributed to fishery development. The projects are listed by grantee within each subject area, along with the grant number, project title, federal funding level, recipient funding level (i.e., cost share), and the NMFS contact.

### FISHERIES UTILIZATION

*Grantee:* University of Alaska, Fairbanks, Alaska  
*Grant No.:* NA06FD0172      *NMFS Contact:* F/AKR  
*Project Title:* Utilization Options for Bitter Crab  
*Funding:*      *Federal:* \$76,669      *Recipient:* \$16,111

*Assessment:* The objectives were to (1) identify the chemical compound(s) responsible for the flavor found in bitter crab and develop a bitterness scale for product evaluation; (2) develop processing methods that can be used prior to cooking, during cooking, or during cooling and/or subsequent handling to eliminate, reduce, or mask bitter flavors; and (3) develop a secondary product from picked crab meat should results from earlier tests be only partially successful. Since 1985 crab processors operating in Southeast Alaska have purchased hundreds of thousands of pounds of bairdi tanner crab (*Chionoecetes bairdi*) that were found to have an aspirin-like aftertaste. The problem was first detected in 1974, when crab harvesters in Southeast Alaska began to notice the appearance of “pinkies.” These were bairdi tanner crabs that had developed a bright pink coloration to the carapace, abdomen, and the intersegmental membranes of the walking legs—all clear indications of infection, now known as Bitter Crab Disease (BCD).

Bitterness in BCD crab is caused by the accumulation of amino acids and peptides in the muscle. These bitter compounds were found in two fractions isolated using high-performance liquid chromatography methods. Both fractions contained almost 50 percent bitter amino acids. As the BCD infection intensified, the moisture content in the crabmeat rose and protein levels fell. In the early stages of infection (levels 1 and 2), there was a low level of bitterness. Above level 3 infection, bitterness rapidly increased, making utilization impossible. These tests indicated potential use for crab with level 3 infection and below. Pre-cook treatments were not effective in reducing bitterness, whereas post-treatment soaks were very effective. Ascorbic acid treatment virtually eliminated the bitterness, although its use resulted in an undesirable tartness. Combining ascorbic acid with a sweet masking agent, such as sorbitol, produced the best solution to utilizing bitter crab.

*Grantee:* Copper River Watershed Project, Cordova, Alaska  
*Grant No.:* NA03NMF4270108 *NMFS Contact:* F/AKR  
*Project Title:* Designing a Fish Byproduct Utilization Project for Cordova's Fishing Industry  
*Funding:* *Federal:* \$83,012 *Recipient:* \$64,000

*Assessment:* The objective was to design a pilot waste processing project involving Cordova's fish processing plants and fish waste planning team members, by conducting primary market research and crafting an operations plan for operating fish byproduct processing machinery on a demonstration project basis. The community planning process has been very successful in conducting research on fish byproduct markets, identifying technologies for producing secondary products from fish byproducts, and developing an operations plan for implementing one of these technologies. Funding from the Saltonstall-Kennedy program enabled the investigators to secure valuable expertise from consultants and to make decisions based on real market research. It also greatly facilitated a public, very inclusive process, so all stakeholders were able to participate and follow every decision step of the process. This broad participation meant that everyone agreed to all steps taken. The group was able to enlist City support for a subsequent grant application seeking equipment funds from the State of Alaska.

*Grantee:* University of Maine, Orono, Maine  
*Grant No.:* NA16FD2298 *NMFS Contact:* F/NER  
*Project Title:* Optimizing Crustacean Resources with the Development of Extruded Snacks from Processing Byproducts and Green Crab  
*Funding:* *Federal:* \$79,735 *Recipient:* \$55,225

*Assessment:* The goal of this project was to investigate the use of lobster, shrimp, and crab processing waste and the currently noncommercialized green crab in the production of a co-extruded snack food. Millions of pounds of byproduct are generated by crustacean processors annually. Crustacean processing byproduct (CPB) of rock crab and lobsters, which consists of shell and unpicked meat, is currently of low commercial value. Green crab is a marine nuisance species with little commercial value that has become increasingly pervasive in the nearshore areas of the North Atlantic. The investigators were able to develop an extruded snack from Jonah crab processing byproducts that was crispy, well-textured and flavored, and was also accepted by a consumer sensory panel. They found that other crustacean species such as green crab have similar composition and should also produce similar snack results.

*Grantee:* University of Rhode Island, Kingston, Rhode Island  
*Grant No.:* NA16FD2299 *NMFS Contact:* F/NER  
*Project Title:* Bioconversion of Squid Processing Waste for the Production of Specialty Aquaculture Feed Ingredients  
*Funding:* *Federal:* \$108,848 *Recipient:* \$25,644

*Assessment:* The objective was to use squid processing waste and finfish waste as needed through bioconversion into fish feed ingredients for target fish species of commercial importance and indigenous to the Northeast. Squid protein is known to have properties of growth



promotion, better digestibility, feed attractant, and increased survival rate. Pilot plant production of squid hydrolysate and microparticulated starter feed was successfully accomplished. The field feeding trials on Atlantic cod larvae and brood black sea bass, as well as a lab feeding trial on summer flounder, demonstrated that a squid hydrolysate diet exhibited a superior feeding performance compared to commercial diets in terms of survival and growth, as well as stress tolerance.

## MANAGEMENT ALTERNATIVES AND FISHERIES USER CONFLICTS

*Grantee:* University of Alaska, Fairbanks, Alaska  
*Grant No.:* NA06FD0171 *NMFS Contact:* F/AKR  
*Project Title:* Population Structure of Rougheye, Shortraker, and Northern Rockfish Based on Analysis of Mitochondrial DNA Variation and Microsatellites: Completion  
*Funding:* *Federal:* \$135,466 *Recipient:* \$28,624

*Assessment:* The objective was to combine the use of mitochondrial DNA (mtDNA) and microsatellite variation to characterize additional collections of rougheye and northern rockfish and complete analyses of shortraker rockfish. Three collections of northern rockfish (*Sebastes polypinus*) sampled at widely separated locations from Kodiak Island to the western tip of the Aleutian Islands were surveyed for genetic variation in two mtDNA regions and at five microsatellite loci. A common haplotype was shared by all three collections. The predominance of a single haplotype resulted in low haplotype diversity and nucleotide diversity for the total set of samples. A test of homogeneity of haplotype frequencies among populations was not significant ( $P=0.67$ ). The expected heterozygosities of the five microsatellite loci surveyed ranged from 0.475 to 0.945. These results provide no evidence for population structure in northern rockfish. However, failure to find divergence does not demonstrate the absence of divergence. This was a preliminary study, which used few loci and few samples. A more thorough examination of northern rockfish is warranted.

Both Type A and B rougheye rockfish populations warrant a more detailed examination of their genetic structure as well. Moreover, effective management and conservation of slope rockfish will need additional information, including morphological characters to distinguish them. Information is needed on the geographical and ecological differences in their distributions, including basic biological information such as the geographic distribution of rougheye rockfish, size at age of maturity, and general life history descriptions for rougheye and shortraker rockfish. Information is also lacking on where larvae and juveniles are located in the water column, and where juveniles disperse and ultimately settle out. These latter questions are important in identifying any environmental factors that influence production, and for determining how to manage these species most effectively. The paucity of such information is not restricted to slope rockfish, as relatively little is known about any of the northern species of *Sebastes*. Although abundance assessments can be effective in helping to determine when conservation problems arise, those data are largely ineffective in contributing to actually solving such problems. Because many rockfish species are long-lived and slow growing, it is crucial to learn about their life histories so that conservation problems can be remedied quickly, or, even better, avoided.

*Grantee:* Bristol Bay Economic Development Corporation, Dillingham, Alaska  
*Grant No.:* NA03NMF4270110 *NMFS Contact:* F/AKR  
*Project Title:* Community Impact Analysis of Alternatives to Restructure the Bristol Bay Salmon Fishery  
*Funding:* *Federal:* \$144,276 *Recipient:* \$38,759

*Assessment:* The objective of the study was to assess the community-level economic impacts of various options for restructuring the Bristol Bay salmon fishery. The primary focus was on fishery socioeconomics, but the project also assessed impacts of buyback programs as part of the study. The project goal and objectives were met, and the project's final report offers resource material for consideration in restructuring the Bristol Bay salmon fishery. The Bristol Bay sockeye salmon fishery is in poor economic condition. Although the resource is relatively healthy, prices—and therefore, incomes earned by both harvesters and processors—have been at historically low levels since 1997 and are expected to remain low for the foreseeable future. In addition, the current limited-entry management that allocates the fishery resource through a “race for fish” encourages inefficiency and practically eliminates incentives to find more efficient ways to harvest and process salmon.

*Grantee:* University of Maryland Center for Environmental Science, Cambridge, Maryland  
*Grant No.:* NA16FD2290 *NMFS Contact:* F/NER  
*Project Title:* Use of Otolith Microconstituent Analysis to Characterize Atlantic Bluefin Tuna Stock Structure  
*Funding:* *Federal:* \$173,406 *Recipient:* \$24,025

*Assessment:* The goal was to develop and apply techniques in otolith microconstituent analysis to support estimation of mixing rates between populations of Atlantic bluefin tuna. The project focused on a method for isolating the juvenile phase of otolith growth and on using ICP-MS analysis to measure concentrations of ultra-trace metals in juvenile tuna otoliths. The hypothesis was that these concentrations would differentiate among bluefin tuna from different nursery habitats (e.g., eastern Atlantic vs. western Atlantic). Cautionary data generated in the research appear to support prior research suggesting that elemental analyses may have limited use in stock identification. However, the report highlights the potential of stable isotopes, specifically the oxygen isotope, which captures the signatures of environmental conditions affecting juvenile bluefin tuna.

*Grantee:* Virginia Institute of Marine Science, Gloucester Point, Virginia  
*Grant No.:* NA17FD2365 *NMFS Contact:* F/SER  
*Project Title:* A Delineation of Winter Nursery Grounds, Migratory Patterns, and Critical Habitat of Juvenile Sandbar Sharks (*Carcharhinus plumbeus*) in the Western Atlantic Ocean  
*Funding:* *Federal:* \$186,939 *Recipient:* \$86,983

*Assessment:* The goals of the project were to provide a fisheries-independent assessment of the relative abundance, species, size, and sex composition of Virginia sharks and to characterize the

seasonal and geographic extent of the sandbar shark pupping and nursery grounds within Virginia waters. Included in the study were tagging and telemetry studies to define wintering areas of juvenile sandbar sharks while they were away from Virginia waters. The researchers successfully completed the goals of the project. The relative abundance of sharks in Virginia waters was compared from 1974 through 2002. Although the abundance of sharks has increased recently from all-time lows, the current levels of abundance are substantially less than in the 1970s. This is attributed to increased levels of commercial and recreational fishing pressure, together with the low reproductive capacity of sharks. Movement of sharks within nursery areas was documented, with most juveniles moving with the tide. Also, the wintering grounds of sandbar sharks were found to be in shallow waters off the Carolina coasts, with higher concentrations of animals potentially occurring off the central North Carolina coast. Coastal sharks are now managed under a federal fishery management plan. The results of this study will enhance the management of coastal sharks.

## **FISHERIES BYCATCH**

*Grantee:* University of Rhode Island, Kingston, Rhode Island  
*Grant No.:* NA16FD2293 *NMFS Contact:* F/NER  
*Project Title:* Effects of Increasing Mesh Size in the Multispecies Fisheries of New England Waters: Applied Research and Outreach  
*Funding:* *Federal:* \$128,750 *Recipient:* \$34,570

*Assessment:* The objective was to conduct mesh size selectivity studies aboard a commercial fishing vessel and integrate the results of the study into yield-per-recruit (YPR) and spawning-stock biomass-per-recruit (SSBPR) models evaluating the effects of incrementally increasing mesh sizes. The investigators (1) conducted mesh selectivity studies using an alternative tow method aboard commercial fishing vessels, (2) conducted selectivity analyses on resulting data and generated selectivity curves for each species by mesh size and shape, and (3) conducted YPR and SSBPR analyses and generated isopleth diagrams. They found that, for the regulated minimum codend mesh size of 16.5 cm square and diamond shapes, the minimum legal fish size for winter flounder and yellowtail flounder should be increased to 14 inches. The current minimum codend mesh size is suitable for cod and pollock. An increase of the mesh size from 16.5 to 17.8 cm diamond-shaped codend mesh would decrease the YPR a minimal amount while providing a relatively large increase in the SSBPR. The additional spawning stock biomass given by the 17.8 cm diamond-shaped codend mesh may allow for greater population growth, increasing the potential future YPR.

## PRODUCT QUALITY AND SAFETY

*Grantee:* University of North Carolina, Charlotte, North Carolina  
*Grant No.:* NA17FD2364 *NMFS Contact:* F/SER  
*Project Title:* The Role of the rpoS Gene in Virulence of *Vibrio vulnificus*.  
*Funding:* *Federal:* \$87,725 *Recipient:* \$14,265

*Assessment:* The purpose of the studies was to characterize the conditions necessary for induction of rpoS, a gene involved in disease production by *Vibrio vulnificus*. The objectives were to (1) isolate and sequence the stress gene regulator, rpoS, from *V. vulnificus*; (2) use this sequence to construct an rpoS mutant of *V. vulnificus*; and (3) characterize the phenotype, especially as regards virulence, of the mutant and parent strains. All goals were accomplished and three publications resulted from the study. After isolating and sequencing the rpoS gene from *V. vulnificus*, the researchers constructed an rpoS mutant in *V. vulnificus*. The researchers determined that rpoS plays a major role in regulating capsule status, a finding that could become an important factor in eliminating the public health hazard of *V. vulnificus* in oysters. Strains of *V. vulnificus* that lack the rpoS gene are about 50 times less virulent than the wild type. This project fully satisfied the conditions of the grant.

*Grantee:* Virginia Institute of Marine Science, Gloucester Point, Virginia  
*Grant No.:* NA17FD2366 *NMFS Contact:* F/SER  
*Project Title:* Epidemiology Studies on Spiny Lobsters (*Panulirus argus*) Infected with a Pathogenic Herpes-like Virus  
*Funding:* *Federal:* \$183,444 *Recipient:* \$36,823

*Assessment:* The objectives of the study were to (1) document the current distribution and prevalence of the disease in lobsters in important nursery habitats in south Florida; (2) determine how the pathogen is transmitted and document mortality rates in lobsters exposed to the virus; (3) describe the pathology of lobsters infected with the virus; and (4) develop diagnostic immuno-probes for field identification of infected lobsters, especially during early stages of the disease. The project found that the virus, PaV1, represents a significant threat to the spiny lobster population of south Florida and the Florida Keys. The overall prevalence of overt infections in juvenile lobsters was about 6 percent, and these animals will contribute to an atypical social pattern in the normal population before they die from the disease. The infection rate in some localities exceeded 35 percent. Smaller lobsters were more susceptible to the virus. The practice of using juvenile lobsters as “bait” could be a contributing factor to the spread of the disease. This is the first naturally occurring pathogenic virus reported for lobster. The study successfully met the objectives of the project.

## AQUACULTURE

*Grantee:* Cook Inlet Aquaculture Association, Kenai, Alaska  
*Grant No.:* NA16FD2386 *NMFS Contact:* F/AKR  
*Project Title:* Evaluation of the Cook Inlet Regional Salmon Enhancement Plan 1981–2000  
*Funding:* *Federal:* \$112,878 *Recipient:* \$50,969

*Assessment:* The objective was to evaluate the 1981–2000 Cook Inlet Regional Salmon Enhancement Plan (Original Plan). Recent low returns and declining commercial fishing values are placing greater demand on wild salmon stocks. The Original Plan was written in 1981 by the Regional Planning Team (RPT) to be used as a guide for the Alaska Department of Fish and Game’s Fisheries Rehabilitation and Enhancement Division and any private entities involved with salmon enhancement in Cook Inlet. The Original Plan anticipated continuation of existing enhancement programs and projects, as well as implementation of new programs throughout the Inlet. Cook Inlet Aquaculture Association (CIAA), the only regional aquaculture association in existence at the writing of the Original Plan, participated actively in the writing. For this project, CIAA updated the chapters of the Original Plan and examined why its goals were not met.

The authors of the Original Plan set a goal of 12 million harvestable salmon by the year 2000. However, according to the project report, numerous projects that the RPT anticipated would achieve this goal did not occur, or were short-lived. For example, harvest and return goals for salmon production of 4,061,000 and 5,509,000, respectively, were expected from existing or planned projects at the time the Original Plan was written. The actual direct production of salmon in the region’s hatcheries and those resulting from lake fertilization or habitat projects totaled about one-half of the goals (2,033,701 and 2,753,897). Despite the limitations of numerous anticipated projects from the Original Plan, due to factors such as the unforeseen disbanding of the Fisheries Rehabilitation and Enhancement Division and the phenomenal growth in the farmed salmon industry, Cook Inlet salmon returns continue to be among the most consistent and sought-after catches in the world. As identified in the project report, the mainstay of the enhancement effort in the Inlet has been hatchery production, which has been reduced to just four hatcheries running at or near capacity. In the next 20 years, numerous changes will need to be made as management, resource use, and nature attempt to find a balance to perpetuate Cook Inlet’s salmon resources.

*Grantee:* University of Rhode Island, Kingston, Rhode Island  
*Grant No.:* NA16FD2292 *NMFS Contact:* F/NER  
*Project Title:* Off-shore Aquaculture: Stress Reduction and Performance of Flatfish  
*Funding:* *Federal:* \$72,793 *Recipient:* \$11,064

*Assessment:* The goal of this research project was to provide aquaculture growers with methodologies for the use of anesthetics to reduce stress in cultured and transported marine fish. Products from the research include culture technology that improves survival of juvenile finfish and mitigates stress in larvae. Project data define dosage levels for various anesthetics as well as the detrimental effects, safety margin, and efficacy of these anesthetics at different temperature and salinity regimes. These findings will help minimize the post-handling stress response in

marine fish, thereby reducing the likelihood of a stress-induced disease event. Criteria developed concerning the use of anesthetics should enable researchers and fish culture personnel to increase the survival of flatfish following periods of handling or relocation.

*Grantee:* University of New Hampshire, Durham, New Hampshire  
*Grant No.:* NA16FD2296 *NMFS Contact:* F/NER  
*Project Title:* Development of Sea Urchin Hatchery System for Aquaculture  
*Funding:* *Federal:* \$116,377 *Recipient:* \$24,436

*Assessment:* The objective was to refine and test a cost-effective hatchery system for green sea urchins that includes larval cultivation, cage grow-out of juvenile urchins, and procedures for maximizing survival of out-planted urchins for sea ranching and reseeded of overfished beds. The investigators were successful in building a hatchery facility that is ready for commercial scale production of sea urchins. By January 2005, they had cultivated an estimated 2 million juvenile sea urchins from an initial spawning. The results with larval culture, suspended cages for juvenile growout, and initial out-planting experiments suggest it should be economically feasible to have commercial aquaculture of sea urchins in the Gulf of Maine.

*Grantee:* Black Pearls, Inc., Holualoa, Hawaii  
*Grant No.:* NA06FD0303 *NMFS Contact:* F/PIR  
*Project Title:* Re-Training of Hawaiian Micronesian Fisherfolk as Pearl Culture Seeding Technicians  
*Funding:* *Federal:* \$97,903 *Recipient:* \$29,880

*Assessment:* The objective was to train a minimum of two seeding technicians in all aspects of oyster biology and pearl farm husbandry and seeding of mabe pearls. The goal was to produce trainees who achieve oyster survival rates and nucleus retention rates comparable with other seeding technicians employed in the industry. Ultimately, the project sought to provide alternative employment opportunities for Hawaiian and Pacific Island fisherfolk by training them in the exacting skill of pearl seeding. The original plan was modified to provide formal training for five Marshallese participants. The master seeding technician conducted three seeding training sessions in the Marshall Islands, and was very pleased with the progress of the trainees over the course of the training. However, there was attrition of two of the trainees, for reasons unrelated to the seeding itself. Catch bag results by the trainees from the final seeding sessions were disappointing, but reflected the need for continuing guidance and practice. Two remaining trainees hope to continue with additional training, and will eventually earn the confidence of the pearl farm owners to allow them to assume a leading role in the industry development in the U.S. affiliated Pacific Islands.

*Grantee:* University of Arizona, Tucson, Arizona  
*Grant No.:* NA03NMF4270131 *NMFS Contact:* F/PIR  
*Project Title:* Specific Pathogen-Free (SPF) Marine Shrimp Culture on Guam  
*Funding:* *Federal:* \$80,135 *Recipient:* \$24,125

*Assessment:* The goal of this project was to revitalize the aquaculture center on Guam by establishing stocks of specific pathogen-free (SPF) marine shrimp. During the past few years, the shrimp culture on Guam has suffered from viral disease and also from low growth rate, thought to have resulted from in-breeding depression. The objectives were to establish a biosecurity protocol for the Guam hatchery, stock with SPF broodstock to increase genetic diversity, monitor the health status of stocks, and provide training to Guam participants. The objectives were achieved. The project established protocols for maintaining biosecurity and for certifying the products. SPF shrimp for the Guam hatchery were secured. Intensive training in shrimp diseases at the University of Arizona was provided to key individuals on Guam. A workshop was conducted on Guam presenting the topics of shrimp diseases, biosecurity, and best management practices. Shrimp imported into Guam were screened for viral diseases.

During the project, a white spot syndrome virus (WSSV) outbreak occurred in a farm on Guam; subsequently, the infected farm was closed immediately and disinfected with proper procedures. Follow-up one year later showed the shrimp are free of WSSV and other major pathogens.

*Grantee:* Black Pearls, Inc., Holualoa, Hawaii  
*Grant No.:* NA16FD2642 *NMFS Contact:* F/PIR  
*Project Title:* Relief for Hawaii's Bottomfish: Solutions through Aquaculture  
*Funding:* *Federal:* \$159,040 *Recipient:* \$17,850

*Assessment:* The objective was to address captive rearing and grow-out of three species of economically important deepwater snappers in Hawaii: *Pristipomoides filamentosus* (opakapaka), *Etelis carbunculus* (ehu), and *Aprion virescens* (uku). The emphasis was on overcoming hurdles to year-round maturation and spawning, and the problems of first-feeding of larvae. Hatchery success was to lead to commercial offshore cage culture projects. Because challenges in collecting ehū broodstock proved insurmountable, the project goals were significantly revised and efforts were concentrated on working with uku. Two tanks of uku broodstock were established. Five of the 13 captive broodstock died. All remaining broodstock stopped feeding. After many tests and water changes, the broodstock began to feed again. A spawn of 348,000 eggs was collected from the uku tanks during the project. Unfortunately, only 1 percent of the eggs were fertilized. Twelve larvae actually hatched, but none survived. Opakapaka broodstock could be collected with a strong survival rate, but infections once in tanks proved to be devastating. The project was able to successfully culture opakapaka larvae through to metamorphosis, but not with any consistency and in only limited numbers. The opakapaka fingerlings' growth after metamorphosis was extremely slow, rendering them clearly unsuitable as commercial aquaculture species. No offshore net pens were established. The project was terminated upon the grantee's request, due to the unlikely prospect of securing successful results compared to the project goals.

*Grantee:* North Carolina State University, Raleigh, North Carolina  
*Grant No.:* NA17FD2369 *NMFS Contact:* F/SER  
*Project Title:* Temperature Effects on Sex Determination in Flounder: Timing, Latitudinal Variation and Controlled Breeding in Mariculture  
*Funding:* *Federal:* \$81,895 *Recipient:* \$71,103

*Assessment:* The objective was to provide information and technologies for generating predictable sex ratios to produce monosex stocks of faster-growing females for mariculture, and tools (biomarkers) for use in evaluating the environmental control of sex determination and growth of southern flounder both in hatchery and wild populations. Commercial-scale production of southern flounder through mariculture can reduce fishing pressure, stabilize supply, and provide the hatchery technologies needed for potential stock enhancement efforts. Because female flounder grow faster and achieve much larger adult sizes than males, techniques to generate all-female stocks are desirable for commercial operations. Interestingly, southern flounder exhibit temperature-dependent sex determination where sex ratios may be skewed by rearing temperature. The larger sizes attained by females, coupled with the influence of temperature on sex determination, allows design of a scheme for controlled breeding and all-female culture.

To effectively control sex and improve production of southern flounder, the researchers defined or established (1) a greater sensitivity of the temperature-dependent sex determination response; (2) the developmental period during which temperature can influence sex differentiation; (3) a biomarker for sexual differentiation (P450 aromatase); (4) a biomarker for assessment of growth status (insulin-like growth factor I) validated through studies on the nutritional and temperature control of growth; and (5) methods for induction of diploid gynogenesis, or production of exclusively XX-genotype flounder larvae, with homologous and heterologous sperm. These gynogenetic flounder have been sex-reversed with temperature to produce XX-male broodstock needed to generate all-female flounder populations for mariculture.

This project met its objectives. Many of these findings are currently being implemented into commercial-scale evaluations of flounder production. With further refinement, the sex differentiation and growth biomarkers should prove useful for assessment of essential fish habitats for flounder and possibly other species.

*Grantee:* University of Puerto Rico, Mayaguez, Puerto Rico  
*Grant No.:* NA17FD2370 *NMFS Contact:* F/SER  
*Project Title:* Offshore Cage Culture: Environmental Impact and Perceptions by Local Fishing Community  
*Funding:* *Federal:* \$363,357 *Recipient:* \$67,152

*Assessment:* The overall goal of the project was to determine the environmental, social, and legal aspects of finfish open-ocean cage culture on tropical marine waters located near Puerto Rico. In addition, the project examined the environmental feasibility of open-ocean cage culture of cobia (*Rachycentrum canadum*) and mutton snapper (*Lutjanus analis*). The project was the first large-scale environmental evaluation of open-ocean submerged cages in the Caribbean to



assess the technological feasibility and possible environmental effects involved in the culture of cobia and mutton snapper. The study provides “baseline” information useful for future aquaculture projects. The study showed that the cages attracted many (40 species) commercial species to the site. Results indicated no evidence of anaerobic sediments beneath the cages. Inorganic nitrogen near the cages was similar to background levels, and macroinvertebrate populations and sediment were only affected directly beneath the cages just before harvest, when feeding rates were highest. Because biofouling grows rapidly (and needs to be cleaned biweekly), it should be addressed to remove nutrients from the water column to ameliorate effects on the environment.

Knowledgeable residents near the project had a positive attitude concerning the open-aquaculture project. However, 55 percent of the members of the general community of Culebra did not have general or specific knowledge about the open-ocean aquaculture project and did not have specific information about the advantages and disadvantages in relation to the impact on the economy, fishing, fishermen, or community life. The study successfully met the objectives of the project.

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## VI. COMPLETED NATIONAL PROGRAM PROJECTS

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This section contains an assessment of each S-K National Program project completed during the period June 1, 2004, through May 31, 2005, regarding the extent to which the objectives of the project were attained and the project contributed to fishery development. The projects are listed by subject area, along with the project number, project title, federal funding level, recipient funding level (i.e., cost share), and the NMFS contact.

### PRODUCT QUALITY AND SAFETY

*Grantee:* University of California, Davis, California  
*Grant No.:* NA03NMF4270161 *NMFS Contact:* F/SWR  
*Project Title:* Minimizing the Risk of Viral Hemorrhagic Septicemia Virus (VHSV) in Pacific Sardines for Export  
*Funding:* *Federal:* \$96,750 *Recipient:* \$23,354

*Description:* The overall goal of the project was to provide additional and new scientific information for conducting risk analyses on the introduction of VHSV to Australia through imported bait fish from California (and the West Coast of North America). The objectives were to (1) assess the spatial and temporal distribution of the virus in sardine populations, tissue concentrations of virus, and potential disease impacts on the population; (2) determine the effects of temperature on the replication and transmission of the virus in sardines; and (3) evaluate freezing and thawing regimes on virus concentrations in sardine tissues. The principal objectives were met, although a more detailed perspective on the prevalence and concentrations of VHSV over time was not obtained. This objective was difficult to meet, as it depended on the availability of sardines throughout the year and in adequate numbers to evaluate a relatively low prevalence of infection. The researchers were able to state the virus is present during the months of February, March, and April, but were less certain about its prevalence during other times of the year, and could not determine the impacts of VHSV on sardine populations in general. A more coordinated and comprehensive sampling program associated with research vessels would be required to complete this objective.

The investigators disseminated the results of this study via presentations at two Trilateral Sardine Forums in 2002 and in 2003. These meetings involved in-depth discussion of the results with leading sardine scientists and fishermen from Canada, the United States, and Mexico. In addition, two peer-reviewed journal articles were prepared, one published and the other in review in *Diseases of Aquatic Organisms*. Finally, the results were disseminated by numerous information exchanges with officials of NOAA and Biosecurity Australia.

## **APPENDIX: NATIONAL MARINE FISHERIES SERVICE OFFICES**

Information regarding the Saltonstall-Kennedy Grant Program may be obtained from the following offices of the National Marine Fisheries Service:

### **NMFS Headquarters**

Charles L. Cooper  
National Marine Fisheries Service  
Financial Services Division  
1315 East-West Highway  
Silver Spring, MD 20910  
Telephone: (301) 713-2396  
Email: charles.cooper@noaa.gov

### **Northeast Region**

Joyce Lacerda  
National Marine Fisheries Service  
State, Federal & Constituent Programs  
Division  
One Blackburn Drive  
Gloucester, MA 01930  
Telephone: (978) 281-9256  
Email: joyce.lacerda@noaa.gov

### **Southeast Region**

Ellie F. Roche  
National Marine Fisheries Service  
Cooperative Programs Division  
263 13<sup>th</sup> Avenue, South  
St. Petersburg, FL 33701  
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Email: ellie.roche@noaa.gov

### **Southwest Region**

Trisha Culver  
National Marine Fisheries Service  
Fisheries Management Division  
501 West Ocean Boulevard, Room 4200  
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### **Pacific Islands Region**

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### **Northwest Region**

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National Marine Fisheries Service  
Trade and Industry Services Division  
7600 Sand Point Way, N.E.  
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### **Alaska Region**

Shawn Carey  
National Marine Fisheries Service  
Office of Management and Information  
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