Science Serving Coastal Florida

Florida Sea Grant College Program Year 2000 Implementation Plan

A partnership program among the State University System of Florida Sea Grant College Program

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National Sea Grant College Program
Oceanic and Atmospheric Research
National Oceanic and Atmospheric Administration

Florida's citizens, industries and governments

Technical Paper 100

May 2000

FLORIDA SEA GRANT COLLEGE PROGRAM
M/PM-12

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The Florida Sea Grant College Program is committed to enhancing the practical use and development of coastal and marine resources while at the same time creating a sustainable economy and environment. Florida Sea Grant's Strategic Plan for 1998-2001[1] defines the purpose of the program, highlights Florida's coastal wealth, and demonstrates the need for research and education. The plan also recognizes the three strategic areas of economic leadership, coastal ecosystem health and public safety, and education and human resources for Sea Grant investments and describes the programmatic framework for implementing the strategic plan.

The implementation plan for 1999 covered research, extension, communication and administrative goals and tasks scheduled to end in 1999 and beyond. The 1999 Florida Sea Grant annual progress report reported accomplishments and benefits against those tasks ending in 1999. This implementation plan updates the 1999 plan to include research, extension, communication and administrative tasks scheduled for completion during 2000 and beyond. The 2000 annual progress report will cover accomplishments and benefits resulting from each of these tasks. Copies of the 1998-2001 Strategic Plan, previous Implementation Plans and annual progress reports for 1998 and 1999 can be obtained from the Florida Sea Grant College Program office.

Sea Grant
Florida

[1] Florida Sea Grant College Program Strategic Plan 1998-2001. Florida Sea Grant College Program Technical Paper 90. Gainesville: University of Florida. April 1998.

Table of Contents

Economic Leadership

Goal 1: Create Products and Processes from Florida's Coastal Resources Using Marine Biotechnology 1

Goal 2: Determine Production and Management Techniques Which Make Florida's Fisheries Sustainable and Competitive 3

Goal 3: Develop the Food and Hobby Segments of Florida's Marine Aquaculture Industry 6

Goal 4: Improve the Product Quality and Safety of Florida's Seafood Products 9

Goal 5: Increase the Economic Competitiveness and Environmental Sustainability of Coastal Water-Dependent Businesses 11

Coastal Ecosystem Health and Public Safety

Goal 6: Protect and Enhance Coastal Water Quality and Safety 14

Goal 7: Protect, Restore, and Enhance Coastal Ecosystem Habitats 15

Goal 8: Prepare and Respond to Coastal Storms 18

Education and Human Resources

Goal 9: Produce a Highly Trained Workforce 20

Goal 10: Create a Scientifically and Environmentally Informed Citizenry 21

Key to Individual Responsibilities 23

Economic Leadership

Goal 1: Create Products and Processes from Florida's Coastal Resources Using Marine Biotechnology

1.1 A statewide faculty task force formed by Florida Sea Grant in 1998 to advance marine biotechnology will continue to operate. The goal is to partner with industry in a way that will yield both state and industry funds to support marine biotechnology research and economic growth in Florida. (2000) (Seaman/Cato)

1.2 The presence of carcinogens in the environment is a serious health and social problem. A method to detect carcinogens in Florida's coastal marine waters will be developed as a way to reduce human exposure to these agents. (2000) (Paul: R/LR-MB-3)

1.3 Marine microbes associated with invertebrate species are relatively unexplored and an exciting potential new source of disease-fighting substances. Microbes will be collected, cultured and bioassayed to determine if they are potential anticancer and antibiotic substances with new drug potential. (2000) (Baker/Grimwade/Leonard: R/LR-MB-4)

1.4 Marine invertebrate cell culture technology can be used to produce useful natural marine products. Sponges and tunicates will be used to identify, clone, and express growth-regulating genes to enhance the production of compounds with therapeutic potential. (2000) (Pomponi: R/LR-MB-5)

1.5 Preclinical and clinical development of promising pharmaceutical agents is frequently compromised by inadequate supplies. Novel techniques will be used to develop production methods for two groups of bioactive marine alkaloids in sustainable supplies necessary to produce sufficient quantities of new drugs and protect the marine environment. (2000) (Kerr/Pomponi: R/LR-MB-6)

1.6 Discodermolide is a potent anti-proliferative compound similar to but more potent than Taxol®. Supply for ongoing preclinical evaluation is a critical issue. It will be determined if discodermolide is produced by a microorganism associated with sponges as a renewable resource. (2000) (Sennett/McCarthy/Pomponi/Gunasekera: R/LR-MB-7)

1.7 A mixture of pseudopterosins is sold commercially in skin creams and some have potential as anti-inflammatory and analgesic agents. The overall goal of this project is to develop a biotechnological production method of the pseudopterosins and seco-pseudopterosins from the sea whip and to test them for their anti-inflammatory activity. (2002) (Kerr: R/LR-MB-8)

1.8 Protection of marine surfaces against fouling organisms is not only a big business, but also a difficult process to make coatings environmentally friendly. The world market for marine paints is over $2 billion annually. A worldwide ban on some paint ingredients will occur in 2003. The goal of this project is to develop nemertine bipyridyls from marine species, which have potential as potent antifouling agents. (2002) (Kem/Soti: R/LR-MB-9)

1.9 One solution to increase resistance by humans to pathogen treatment therapy is to identify novel antimicrobial compounds, which can serve as leads in drug discovery programs. Marine microbes are an exciting potential source of compounds. Bacteria will be isolated from several species of Floridian tunicates and sponges that produce bioactive compounds and tested for potential as clinical antimicrobiological agents. (2002) (Baker/Grimwade/Leonard: R/LR-MB-10)

1.10 Traditional isolation methods from marine environments are thought to recover only 0.1-12.5% of the microbial community. It is thus necessary to develop and implement methods to enhance the recovery of a novel suite of microorganisms associated with deep sea sponges. This will yield new isolates, which may lead to minimizing the need for the continued collection of the host sponge. (2001) (Olson/McCarthy: R/LR-MB-11 [T-99-57])

1.11 When wastewater contaminates coastal waters there is an increased risk of infection by human pathogenic microbes, including viruses, bacteria and protozoans. This could affect water-based industries that create multi-billion dollar economic impacts in Florida. This project will improve enteroviral detection methods for use in coastal waters, to ensure the safety and quality of human uses of these waters, and to provide a method that can be used to improve water quality. (2000) (Paul/Rose: R/LR-MB-12 [T-99-5])

1.12 Marine sponges are known to produce thousands of biologically active natural products with potential as pharmaceuticals and other bioproducts. Sponges are thus targets for cell culture and aquaculture efforts to supply sufficient quantities for preclinical and clinical evaluation. DNA microarray technology will be evaluated as a novel technology for simultaneous screening/hybridization of thousands of probes and targets, increasing the probability of discovery of novel genes with commercial application potential. (2001) (Pomponi/Willoughby/Russell: R/LR-MB-13 [T-99-43])

1.13 A marine biotechnology summit meeting of Florida faculty and business interests will be organized, in order to establish long-range priorities for research, education and outreach. This will allow the identification of partnerships and approaches for developing national academic and commercial leadership in this field. (2000) (Seaman)

Goal 2: Determine Production and Management Techniques Which Make Florida's Fisheries Sustainable and Competitive

2.1 The spiny lobster, stone crab, king mackerel and snapper and grouper fisheries in the Florida Keys are harvested by the same group of fishermen and vessels on a seasonal basis. The biological and economic effects of managing these fisheries on a single species versus multispecies basis will be determined. (2000) (Milon/Lee/Adams/Ehrhardt: R/LR-E-18)

2.2 Managers of the Florida spiny lobster fishery will be provided with a model that accurately predicts adult spiny lobster stocks based on ecology and biology characteristics of the Florida Keys primary spiny lobster nursery area. (2000) (Herrnkind/Butler: R/LR-B-45)

2.3 Blue crabs are a popular and valuable marine species along the coasts of both the Atlantic Ocean and the Gulf of Mexico--even though their habitats may be quite different throughout their range. This project, conducted jointly by Florida Sea Grant and North Carolina Sea Grant, examines how blue crabs use different habitats and how these habitats function with regard to the crabs. The project includes extensive field sampling along both the mid-Atlantic coast and the Gulf of Mexico's northern coast. (2000) (Frazer/Posey: R/LR-B-46)

2.4 Commercial catches of small coastal shark species have increased dramatically in recent years, as large coastal sharks have been over fished. Management quotas have been set for small coastal sharks. A scientific framework for assessing the current status of small coastal sharks and to access the impact of future harvest strategies will be completed. (2002) (Simpendorfer/Burgess: R/LR-B-48)

2.5 The gag grouper is one of the most valuable fisheries in the Southeast United States. The fishery is presently under intense management scrutiny and is a priority for federal fisheries research related to essential fish habitat. Thus, it is important to test the role of habitat in mediating predator-prey interactions and individual fish growth dynamics in gag grouper to ensure that appropriate management measures can be implemented to ensure fishery sustainability. (2002) (Lindberg/Mason /Murie: R/LR-B-49)

2.6 The Florida spiny lobster is the most valuable fishery in Florida, when both the commercial and recreational economic impact of the fishery are considered. The stock relies on continued input of post larvae and the suitability of the habitat. This project builds on previous research investments and will provide Florida spiny lobster managers with an accurate method to predict the fishable lobster population several years in advance and to track the health of the essential nursery habitat. (2002) (Herrnkind/Butler: R/LR-B-50)

2.7 A vessel-level economic behavior analyses on the pelagic longline fleet in the North Atlantic will be completed. The study is funded by the NOAA/NMFS Highly Migratory Pelagics Program. Ten federal managers will become more aware of the

economic/diversification characteristics of the pelagic longline fleet. (2000) (Adams)

2.8 A vessel cost and earnings brochure will be developed for pelagic longline vessels utilizing logbook data as provided by NMFS. At least 20 vessel operators will have a better understanding of the financial characteristics of the pelagic longline fleet by vessel size and trip category. (2000) (Adams)

2.9 Assistance will be provided in the development of the Menhaden Management Plan for the Gulf States Marine Fisheries Commission. Ten state and federal managers will have a more complete knowledge of the economic contribution of the menhaden fishery to the Gulf region economy. (2000) (Adams)

2.10 Service will continue as a member of the Scientific and Statistical Committees of the Gulf of Mexico and South Atlantic Regional Fishery Management Councils. Ten federal and Council fisheries managers will better understand the economic consequences of proposed fishery regulations. (2000) (Adams)

2.11 On-going applied research efforts will continue on effort distribution among the complement of major commercial fisheries in South Florida, the harvest sector and market characteristics of the Florida marine life industry and the economic consequences of red tide events in southwest Florida. (2000) (Adams)

2.12 An informational brochure for the FL 317 State Major Program, Sustainable Fisheries, will be developed. (2000) (Adams)

2.13 The 2000 Coastal Pelagics Stock Assessment Report to the Scientific and Statistical Committee of the Gulf and South Atlantic Fisheries Council and the Industry Advisory Panel of the Gulf of Mexico Regional Fishery Management Council will be co-chaired, co-authored and presented. Ten federal fishery managers and ten commercial/recreational fishery representatives will become better informed regarding the status of coastal pelagics stocks in the Gulf and South Atlantic region. (2000) (Adams: Gregory)

2.14 Four industry workshops regarding proposed fishery management regulations will be held. 100 commercial fishermen will become involved in the process of developing alternative management measures that minimize the socio-economic impact while achieving the biological goals of the management agency. (2000) (Adams: Gregory)

2.15 Assistance will be provided in administering disaster aid grants to lobster fishermen affected by Hurricane Georges. 25 fishermen will become aware of what is required to comply with disaster assistance applications. (2000) (Adams: Gregory)

2.16 Lobster monitoring research on the Florida Keys National Marine Sanctuary Ecological reserve in the Lower Keys region will be conducted. One commercial fisherman will be contracted to provide data collection support. (2000) (Adams: Gregory)

2.17 Service will be continued on the Scientific and Statistical Committees of the Gulf of Mexico and South Atlantic Regional Fishery Management Councils. Ten federal and Council fisheries managers will better understand the biological consequences of proposed fishery regulations. (2000) (Adams: Gregory)

2.18 Four fishing tournaments will be officiated. (2000) (Adams: Novak)

2.19 Sustainable fisheries general information will be provided to marine related businesses. At least 20 bait/tackle stores, party boat operations, scuba shops, and marinas will be better informed regarding fish venting techniques, use of circle hooks, fish identification and eco-friendly anchorage sites. (2000) (Adams: Stevely)

2.20 Data will be collected, analyzed and distributed on the recovery of sponge populations in the middle and upper Keys. Funding will be obtained from the FWC Marine Research Institute. (2000) (Adams: Sweat/Stevely)

2.21 Assistance will be provided in the implementation of the Sea Grant strategic investment project for evaluating scallop enhancement technologies as a way to increase scallop wild stocks. (2000) (Adams: Stevely)

2.22 Feature stories on fish venting will be developed with at least two outdoor writers for major daily newspapers in Southwest Florida. (2000) (Adams: Stevely)

2.23 The annual Pier Fishing Tournament in St. Petersburg will be conducted. 200 youngsters and their adult sponsors will be provided an introduction to fisheries conservation and fishing ethics. (2000) (Adams: Sweat)

2.24 The Boater's Pledge and Code of Angling Ethics will be presented to Taylor County fishers and boaters. At least 10 participants will alter at least two existing behaviors. (2000) (Adams: Aubrey)

2.25 The feasibility of conducting a 4-H Sport Fishing Leaders Training Program in Taylor County will be determined. (2000) (Culen: Aubrey)

2.26 Fish populations living in estuaries can be improved by adding fish raised in hatcheries and by protecting their habitats. However, for these techniques to be effective, methods need to be developed to determine which habitats in the estuary are the "best" for stocking and protecting. The purpose of this project is to develop tools such as computer models and surveying techniques that can be used to accurately evaluate fish nursery habitats in estuaries. The project is being conducted in cooperation with Texas and North Carolina Sea Grant. (2002) (Leber/Miller/Neill: R/LR-A-25)

2.27 Florida Sea Grant has made a long-term investment in the Florida spiny lobster industry. Project participants have always interacted with scientists working in this area through an international lobster biology and management workshop. The Sixth International Conference and Workshop on Lobster Biology and Management will be held in Key West, Florida, in September, 2000. Florida Sea Grant will support a one-day symposium titled "Integrating Ecological Research with Lobster Management. (2000) (Herrnkind/Butler: PD-99-8)

Goal 3: Develop the Food and Hobby Segments of Florida's Marine Aquaculture Industry

3.1 A marine ornamental fish industry advisory committee organized in 1999 will meet at least two times. This will allow appropriate guidance to the new Sea Grant priority in marine ornamental fish. (2000) (Seaman)

3.2 Diets will be formulated which will improve the growth and development of cultured ornamental fish and red drum. Texas Sea Grant will participate. (2000) (Marcus: R/LR-A-22)

3.3 A baseline economic analysis will be completed to define the demand for Florida marine ornamental fish, trade patterns, and to determine industry outlook and regulatory needs. This analysis will specify research needs which will lead to the growth and development of the Florida ornamental fish industry. (2000) (Lee/Milon/Adams/Degner: R/LR-A-23)

3.4 Atlantic surgeonfish are routinely collected off the Florida coast for sale through the aquarium trade and for display in oceanaria. The anatomy, histology, blood history, and diets of these fish will be determined in order to respond to specific diseases, nutritional studies and reproductive problems experienced by the handlers of these fish. (2000) (Francis-Floyd: R/LR-A-24)

3.5 In Florida, marine aquarium species are primarily collected from the wild (about $4 million annually) while farm-level sales of freshwater fish reached nearly $60 million in 1997. A Sea Grant goal is to increase the culture of marine ornamentals in order to generate economic activity in Florida while protecting the wild-caught stocks. Market information, the acceptability of various marine ornamental attributes, and the overall demand for marine ornamentals will be determined as a way to measure the potential of this culture industry. (2002) (Degner/Milon/Larkin: R/LR-A-29)

3.6 Certain marine algal species make up an important part of the natural diet of Atlantic surgeonfish, which have economic importance in Florida, and are traded globally for the aquarium trade. An experimental diet that approximates the natural diet of these fish will be developed and tested. The goal is to develop diets that can be used to improve the health and management of Atlantic surgeonfish and to enhance efforts for captive propagation. (2002) (Francis-Floyd/ Phlips/ Berzins/ Cardeilhac: R/LR-A-30)

3.7 Almost all of the 3000 species of marine fishes and invertebrates marketed in the aquarium industry, valued at over $7.2 billion annually worldwide, are collected from coral reef systems. Extensive and improper collection techniques can damage reef systems. Over 18 species of marine shrimps are harvested. The effects of different broodstock diets will be tested on two species of ornamental shrimps. The long-term goal is to produce aquarium shrimp in culture and reduce wild harvest. (2001) (Lin/Creswell: R/LR-A-31 [TAQ-99-16])

3.8 The First International Marine Ornamentals Conference 1999 was held in Hawaii in late 1999. Over 300 attendees discussed the collection, conservation and culture of marine ornamental fish. Attendees voted to hold the second conference, Marine Ornamentals 2001 in Florida. Florida Sea Grant will assume the lead role in organizing the conference. (2001) (Cato)

3.9 Adequate seed availability is a major nuisance to the further development of the hard clam culture industry in the southeastern U.S. Critical shortages have occurred, and remote setting will allow nursery operators and growers to become less dependent upon traditional seed sources. Technical procedures will be developed and the economic feasibility determined of transferring remote setting technology from the Pacific Northwest molluscan shellfish industry to the Florida hard clam industry. (2001) (Adams/Sturmer/Supan: R/LR-A-27)

3.10 The fishery for naturally occurring hard clams is of major cultural and economic importance to many eastern U.S. states. Landings from the traditional stock have declined in the past due to over harvesting and removal of spawning stock. Stock enhancement in natural settings is an alternative to increase stock size. The feasibility of introducing hatchery-sponsored larvae directly to the water column as a cost-effective means of stock enhancement for hard clams will be tested in the Indian River Lagoon. (2002) (Irlandi/Hitchcock/Arnold: R/LR-A-28)

3.11 An economic impact analyses of the hard clam industry by region and entire state will be completed. Fifty clam culturists and 10 state agency representatives will become aware of the economic contribution of the clam industry to the economy of Florida. (2000) (Adams)

3.12 A technical and economic feasibility study of the remote setting of hard clam seed will be conducted, and a demonstration on how the cost of acquiring clam seed can be reduced will be held for commercial growers. Three hundred commercial clam growers will become aware of the economic advantages or disadvantages of utilizing the remote setting to obtain clam seed for growout. (2000) (Adams: Sturmer)

3.13 Data archiving software for use in USDA funded aquaculture crop insurance program development efforts will be developed. Fifty commercial clam farmers will better understand the need for proper recordkeeping necessary to substantiate any losses reported to the USDA aquaculture crop insurance program. These same

individuals will be trained in how to use the recordkeeping software developed by the project. (2000) (Adams: Sturmer)

3.14 The Florida Department of Agriculture and Consumer Services will be assisted in conducting workshops addressing the use of best management practices in lieu of the general permitting process for marine bivalve facilities. Fifty clam hatchery and nursery operators will become informed of how BMPs will affect their businesses. (2000) (Adams: Sturmer)

3.15 The American bay scallop is a commercially important species along the U.S. east coast. However, commercial fishing for wild stocks has declined in many states and is banned in Florida. Ten commercial fishermen will be provided juvenile bay scallops and taught the technical growout, economic feasibility and marketing potential for bay scallops as a cultured species. (2000) (Blake/Sweat: R/LR-A-33 [TAQ-99-15])

3.16 Depletion of bay scallops in the Eastern Gulf of Mexico is largely due to loss of seagrasses which form an essential habitat. Seagrasses are recovering, but bay scallop spawning stocks are at an all-time low abundance in Tampa Bay. The goal is to significantly advance developing hatchery-release technology to replenish bay scallop populations on the Florida West Coast and to test the relative efficiency of cage versus free-planting cultured scallops in the field. (2001) (Leber/Halstead/Arnold/Blake: R/LR-A-34 [TAQ-99-104])

3.17 An economic feasibility analysis for bay scallop culture utilizing alternative cage designs will be completed. Ten scallop culturists will become better informed of the differences in production and economic characteristics of culturing bay scallops with alternative growout cage designs. (2000) (Adams: Sweat)

3.18 Five net ban fishermen and clam growers will be apprenticed into scallop aquaculture. (2000) (Adams: Sweat)

3.19 Overharvesting, adverse environmental conditions, oyster diseases and human health related diseases from oyster consumption have lead to overall industry declines. The goal of this project is to determine Dermo (*Perkiusus marinus*) tolerance or resistance of the Caribbean oyster and compare the tolerance to that of the American oyster. If successful, these traits can be hybridized from the Caribbean oyster to the American oyster for use in culture. (2001) (Scarpa/Bushek: R/LR-A-32 [OD-99-47])

3.20 A principal barrier for the development of a solid marine fish aquaculture industry in the U.S. is the consistent, large-scale production of fingerlings. Previous research and development aquaculture techniques for mutton snapper and greater amberjacks will be refined, the technology transferred to industry and the feasibility of producing commercial quantities of fingerlings tested at Grassy Key, Florida. (2001) (Benetti/Feeley/Mader: R/LR-A-35 [TAQ-99-108])

3.21 A workshop addressing the feasibility of small scale, outdoor, low tech, and low cost tilapia culture in Florida will be assisted. One hundred aquaculturists will become informed of the economics of tilapia culture in Florida utilizing low cost methods of production. (2000) (Adams)

3.22 A preliminary economic analysis on the culture of sturgeon in outdoor ponds will be completed with the assistance of the staff of the UF Mitchell Aquaculture Facility in Blountstown, FL. Ten prospective sturgeon growers will become informed of the financial characteristics of small-scale, outdoor culture of sturgeon in Florida. (2000) (Adams)

3.23 Sturgeon is a high value aquaculture species in some regions of the world. Very little is known about the demand for and the value of sturgeon in Florida. Little is known about the production of sturgeon in ponds as opposed to tanks. The performance of sturgeon in ponds will be evaluated, market demand and packaging techniques for the meat will be tested and the economic feasibility of pond growout techniques will be determined. (2002) (Lazur/O'Keefe/Wirth/Zajicek/Zimet: R/LR-A-26)

3.24 The shrimp industry in Nicaragua has been decimated during the last two years by natural disasters such as hurricanes and virus contamination. Research and training will be initiated that focuses on the economic feasibility of shrimp culture techniques that minimizes virus contamination possibilities and that focuses on making shrimp safe for seafood consumption. This work will be conducted as part of a USAID funded activity involving Michigan and Puerto Rico Sea Grant. (2002) (Cato: Adams/Otwell/Garrido)

Goal 4: Improve the Product Quality and Safety of Florida's Seafood Products

4.1 A smoked fish processing school will be organized to cover all aspects of processing, storage, distribution, HACCP and SSOPs. Initial attendance is expected to exceed over 100 companies representing over 90% of Florida production. (2000) (Otwell)

4.2 Bacteriophage has proven to be effective in killing pathogenic bacteria in mice and farm animals. *Vibrio vulnificus* are a bacteria present in oysters. *V. vulnificus* is lethal when consumed by people in certain risk categories. Bacteriophage may offer a practical and realistic method for making oysters safe for human consumption. They will be used to test their ability to kill *V. vulnificus* in oysters. (2001) (Duckwork/Gulig: R/LR-Q-20 [GMO-99-1])

4.3 Preliminary tests have shown *Vibrio vulnificus* could not be detected in oysters processed using certain freezing techniques. Oyster processors and consumers are not aware of this process, which could insure the viability of the raw oyster market. Additional tests will be conducted, the potential market demand for frozen (raw)

oysters determined, and the results will be transferred to processors and consumers. (2000) (McNeely/Otwell/Rodrick/Zimet: R/LR-Q-21 [GMO-99-3])

4.4 Federal regulations imposed by the U.S. Food and Drug Administration (FDA) in December 1997 mandated that all domestic seafood processors and importers adopt HACCP to identify and prevent the occurrence of hazards that could affect the safety of seafood. A Seafood Education Alliance was formed in 1994 to organize a HACCP training program. To date, over 10,000 graduates of over 350 HACCP courses have learned the procedures. Ninety-three percent of the industry benefited from the training and 83 percent indicated they could not have complied with HACCP without the training. The project is completing and making a transition to sanitation training. Courses will henceforth be provided in varying locations about Florida to accommodate the continuing need to train new firms and inspectors and to provide remedial help. The course is being offered at a rate of one course per 6 to 8 weeks at numerous locations about Florida based on student demand, marine agent requests, and request from the respective regulatory agencies. About 8 to 10 Florida courses are anticipated in 2000. (2000) (Otwell: E/TP-1)

4.5 Based on the training needs identified by the Seafood HACCP Alliance, sanitation training has been identified as a critical need in processing plants. The HACCP Alliance will complete reorganization during 2000 to focus on training in the use of Sanitation Standard Operating Procedures (SSOPs) in commercial and regulatory programs. (2000) (Otwell: E/TP-2)

4.6 One hundred percent of the new shellfish producers in Levy County will implement HACCP plans and existing shellfish producers will continue to update their record keeping requirements. (2000) (Otwell: Sturmer)

4.7 Based on popular demand, the Florida Sea Grant Annual Shrimp School will be expanded to biannual sessions (spring and fall both in Gainesville), plus the First Annual Latin American Shrimp School to commence in Nicaragua. (2000 and 2001) (Otwell)

4.8 Annual processor schools will continue for Florida processors for blue crabs, hard clams, oysters and stone crabs. The schools will meet at various locations in Florida depending on convenience of the processors. (2000) (Otwell)

4.9 Demonstration studies will be conducted to integrate the use of simple time-temperature controls with HACCP and SCP to allow for continued use of modified atmospheric packaging (MAP). The established MAP processes and retail use is threatened by federal mandates for termination of all MAP use for fresh seafood due to time-temperature related issues pertinent to potential *Clostridium botulinum* safety problems. All field work will be conducted in St. Petersburg, Tampa, Orlando and Lakeland, Florida. (2000) (Otwell)

4.10 Demonstration trials will be conducted to determine consequences of carbon monoxide gas (CO) to impact 'fixed' colors in various fish species. The introduction of CO treatments has stirred regulatory confusion, aligned competition among fresh vs. frozen fish products, and complicated regulatory procedures and guidelines for traditional fisheries (tuna) and emerging aquaculture (tilapia). (2000) (Otwell)

Goal 5: Increase the Economic Competitiveness and Environmental Sustainability of Coastal Water-Dependent Businesses

5.1 Both federal and state governments have recently begun encouraging or requiring local governments to prepare various plans and strategies for reducing the impact of hurricanes and for dealing with post-storm problems. Local communities have, however, been reluctant to get involved in these activities. This project seeks to develop a gaming simulation that can be used in training local officials to prepare for hurricanes and their aftermath. In addition, the simulation will illustrate the impact of policy changes at higher levels of government on local communities. The resulting simulation will be implemented throughout the state by the Florida Department of Community Affairs. (2000) (Deyle: R/C-P-22)

5.2 Continued growth of the boating industry cannot be sustained unless conflicts are reduced among urban baywater resource users and the impact of marine facility development on coastal resources is minimized. The legal and institutional framework for regional coastal waterway management in Southwest Florida will be developed and implemented. (2000) (Hamann/Ankersen: R/C-P-23)

5.3 Marina owners are facing economic and environmental conditions and regulations that restrict profitable operation. As part of a national project, designed to educate marina owners on techniques to increase economic efficiency and reduce environmental impacts and costs, Florida Sea Grant is assisting in conference coordination for the group. (2000) (Jackson: E/T-7)

5.4 An in-service training workshop on Eco-Tourism and Geographic Information Systems (GIS) will be held on "Applications of GIS Technology to Eco-Heritage Tourism Development in Your Community." (2000) (Antonini: Halusky/Swett)

5.5 An Eco-Heritage Tourism provider training field trip will be held at Marineland Environmental Center. Quarterly events will be held for providers at University North Florida. (2000) (Antonini: Halusky)

5.6 A non-motorized boaters' survey and development of a paddlers' guide for Northwest Florida will be completed. (2000) (Antonini: Aubrey)

5.7 Quarterly regional workshops in Eco-Heritage Tourism will be held with the regional councils in Northwest Florida (inventory, networking, training and education, marketing and promotion, protection of resources). (2000) (Antonini: Halusky)

5.8 Sixteen kiosks on boater education will be constructed and maintained in Charlotte County. (2000) (Antonini: Novak)

5.9 The Charlotte County Boaters' Guide will be distributed throughout the year. (2000) (Antonini: Novak)

5.10 Fact sheets on personal watercraft safety, ethics and courtesy, and paddlecraft safety, ethics and courtesy will be written for Manatee County. (2000) (Antonini: Stevely)

5.11 Volume One of the Southwest Florida Waterway Atlas will be distributed to marinas and boating facilities in Southwest Florida. (2000) (Antonini: Stevely/Novak)

5.12 Volume Two of Southwest Florida Waterway Atlas for Charlotte Harbor and points south will be completed. (2000) (Antonini: Fann)

5.13 Phases One and Two of the Lee County Regional Waterway Management System mapping and analysis will be completed, and two Sea Grant technical documents including maps and metadata will be published on CD-ROM. (2000) (Antonini: Swett/Fann)

5.14 Map Atlases of the Regional Waterway Management System Pilot Study (south Manatee County and north Sarasota County, FSG/TP-83) and South Sarasota Project (south Sarasota County, TD-1) will be reformatted to include digital ortho-photography base map coverage. (2000) (Antonini: Swett)

5.15 A Regional Waterway Management Manual will be published as a Florida Sea Grant Technical Paper to provide all the necessary information required to perform regional waterway management analysis. The manual will cover project planning and preparation, field and survey procedures, post-processing methods, data analysis, production of final maps/tables, and include all necessary computer programs and automated procedures. (2000) (Antonini: Swett/Fann)

5.16 Cooperative work with the Florida Marine Research Institute will be completed by carrying out Project Blueways recreational boating-use evaluation to estimate boat traffic potential for Charlotte Harbor as a function of trip origins, destinations, and travel paths. (2000) (Sidman: Antonini)

5.17 Cooperative work will occur with the NOAA National Ocean Service/Marine Chart Division in formulating improvements to small-craft chart series. (2000) (Antonini: Sidman/Swett)

5.18 The Florida Sea Grant Anchorage Web Site will be updated to include the legal and jurisdictional rights to navigation. (2000) (Antonini: Sidman/Ankersen)

5.19 Five new anchorages in southwest Florida will be inventoried. (2000) (Antonini: Stevely/Sidman)

5.20 Regional Harbor Board Memorandum of Agreements with local governments in Southwest Florida will be formalized. (2000) (Antonini: Stevely)

5.21 An annotated model ordinance for local harbor management based upon the Regional Harbor Board's framework principles will be developed. (2000) (Antonini: Ankersen/Hamann)

5.22 The legal and policy framework for a regional approach to waterway maintenance and improvement in Southwest Florida will be developed. (2000) (Antonini: Ankersen/Hamann)

5.23 Six Clean Boatyard Program workshops will be held statewide and 250 more tool kits will be distributed. (2000) (Antonini: Jackson)

Coastal Ecosystem Health and Public Safety

Goal 6: Protect and Enhance Coastal Water Quality and Safety

6.1 An organized outreach program on Florida Bay water quality and quantity will be continued (begun in 1997) as a part of the overall NOAA South Florida Ecosystem Restoration Prediction and Modeling Effort and under the direction of the Florida Bay Program Management Committee. (2000) (Gregory)

6.2 A major and rapidly growing source of non-point source contamination in the coastal zone is nutrient loading from septic and other types of on-site disposal systems. This project will develop new approaches to study rates of water and nutrient transport via groundwater from on-site disposal systems. It will simulate both short- and long-term flow rates on St. George Island, Florida. (2002) (Burnett/Chanton/Corbett: R/C-E-42)

6.3 In 1987, persistent and widespread phytoplankton and cyanobacterial blooms have coincided with the large-scale decimation of sponge communities in Florida Bay. One hypothesis is that the large-scale loss of suspension feeding sponges has rendered the ecosystem susceptible to these recurring blooms. The goal is to experimentally determine the potential for suspension feeding sponges to control nuisance phytoplankton blooms caused by internal non-point source pollution. (2002) (Peterson/Forqurean: R/C-E-43)

6.4 When wastewater contaminates coastal waters there is an increased risk of infection by human pathogenic microbes, including viruses, bacteria and protozoans. This could affect water-based industries, which create multi-billion dollar economic impacts in Florida. This project will improve enteroviral detection methods for use in coastal waters, to ensure the safety and quality of human uses of these waters, and to provide a method that can be used to improve water quality. (2000) (Paul/Rose: R/LR-MB-12 [T-99-55])

6.5 An Extension bulletin on groundwater in estuaries will be produced. (2000) (Seaman: Design Team)

6.6 At least 50 Master Gardeners in Hillsborough, Manatee and Sarasota counties (and as requested by other counties) will increase their knowledge in water quality issues and coastal plant identification and ecology. (2000) (Seaman: Stevely)

6.7 The Manatee County overall extension program will be assisted in conducting "Water School," which will increase the ability of 25 community leaders in making informed decisions regarding water quality related issues. (2000) (Seaman: Stevely)

6.8 An existing water quality testing program will be expanded to establish a more comprehensive database for educational use. Twenty people will become trained in water quality testing procedures. (2000) (Adams: Novak)

6.9 The FSGEP Boater's and Angler's Pledge Program will be continued. 200 boat owners will receive published materials describing the program and will join the effort to clean up Florida's coastal waters. (2000) (Adams: Sweat)

Goal 7: Protect, Restore, and Enhance Coastal Ecosystem Habitats

7.1 A web site for the nation's 20 most invasive non-indigenous aquatic plants will be developed. The site will include information for identification, eradication and native replacements. Seven plants will be documented during 1999 and 13 plants will be added during 2000. (2000) (Ramey: E/NS-1 [ANS-99-107])

7.2 A workshop to identify ballast water research needs will be conducted in cooperation with the Gulf of Mexico Program, Louisiana Sea Grant, Environmental Protection Agency, Center for Marine Conservation, National Marine Fisheries Service, Tampa Port Authority, Florida Marine Research Institute, and the Tampa Bay Estuarine Program along with representatives from the shipping industry. (2000) (Jackson: A/ZM-2)

7.3 A regional project in cooperation with other Sea Grant Programs is designed to increase awareness of the potential problems that can occur as a result of the introduction of nonindigenous species in the Gulf of Mexico Region and stimulate a common interest in the management of nonindigenous species. Educational techniques being used include low power radio messages at Florida Welcome Stations and an education program for growers and suppliers of exotic aquatic plants and animals. (2000) (Jackson: E/ZM-2)

7.4 Seagrass, oyster and saltmarsh habitat required by blue crabs will be examined in Florida and North Carolina to determine which habitats are most productive for juvenile blue crabs in a cooperative Florida and North Carolina Sea Grant project. (2000) (Frazer: R/LR-B-46)

7.5 Stock enhancement and habitat enhancement are methods being used to enhance and conserve estuarine fishes. The variability of environmental factors in known and potential nursery areas for red drum, snook and flounder will be determined by Florida, Texas and North Carolina Sea Grant as a way to improve the success rate of stock enhancement programs. (2001) (Leber: R/LR-A-25)

7.6 Habitat loss and degredation pose serious threats to the long-term sustainability of coastal marine fish and shellfish resources. A geographic information system in conjunction with habitat suitability models is being used to map and analyze fish and invertebrate habitats. The goal is to develop a practical, biologically sound, statistically robust methodology for quantitative assessment of what constitutes essential habitat for economically and ecologically important coastland marine fish and invertebrates. (2000) (Ault/Monaco: R/LR-B-47)

7.7 Establishment of sea oats on restored beaches is critical for combating erosion losses. However, concerns about genetic diversity have lead to restrictions in harvesting and planting sea oats. The overall goal is to enhance ecologically sound establishment of micropropagated sea oats by developing compatible plant/mycorrhizal fungus ecotype combinations for out planting onto Florida beaches. (2002) (Sylvia/Kane: R/C-S-38)

7.8 A power point "Estuaries 101" presentation will be developed with the format adoptable to slides, posters, etc., with the option to customize for local settings. (2000) (Seaman: Design Team)

7.9 A prototype series of slides on estuaries will be organized for catalog into the Sea Grant digital photographic archives. (2000) (Seaman: Design Team)

7.10 Design team meetings will be held in March and October to coordinate preparation of educational materials, advise on the search for the extension specialist for estuaries, and coordinate with other design teams. (2000) (Seaman/Kearl: Design Team)

7.11 At least 10 youth will be involved with at least one "environmental" community service project (e.g., Don't kill pelicans with kindness. Center for Marine Conservation's Annual Coastal Cleanup), and at least five local youth will be involved in environmental education summer 4-H camps. (2000) (Seaman: Mahan)

7.12 The knowledge of marine and horticulture extension agents and Master Gardeners in water quality will be increased through the production and use of a "Nutrient Loading Fact Sheet." (2000) (Seaman: Stevely)

7.13 The role and potential of Sea Grant Extension Program involvement in a national initiative to develop a NOAA-wide Restoration Network will be evaluated. (2000) (Seaman: Stevely)

7.14 The Sarasota Bay National Estuary Program will be assisted in maintaining a functional Technical Advisory Committee by serving as committee chair. (2000) (Seaman: Stevely)

7.15 West Florida shelf-edge reefs are of major importance to reef fish fishery production in the Gulf of Mexico. These reefs support major fisheries for groupers and other reef fish. However, little is known of the biological and geological

characteristics of these reef systems, and some of the fisheries are overfished and some species are threatened. The goal of this project is to monitor changes in these fish stocks in relation to the reef habitat. (2002) (Koenig, Coleman, Levitan, Miller, Baker: R/LR-B-51)

7.16 Artificial reefs are a potentially powerful management tool that can be used to enhance fish production and divert deleterious impacts away from natural habitat. Marine ornamental fish are currently collected from natural reefs with pressure being applied to restrict collection on a worldwide basis. The goal of this project is to begin the examination of the use of artificial structures for marine ornamental fish production, thus preserving the natural reef system. (2002) (Osenberg, St. Mary, Bolker, Bohnsack, Lindberg, Watson: R/LR-B-52)

7.17 Marine conservation training will be continued. 500 youth will become better aware of the values of marine conservation through marine conservation training. (2000) (Adams: Novak)

7.18 Eight educational programs on marine habitat will be presented. 100 individuals will become more aware of the ecological contribution of marine habitats in SW Florida. (2000) (Adams: Novak)

7.19 A regional artificial reef coordinators workshop will be held. 20 county artificial reef coordinators will become educated about the most recent research regarding artificial reefs and become better informed regarding the current status of reef permitting requirements. (2000) (Adams: Novak)

7.20 The artificial reef volunteer training and data base program will be continued. 30 artificial reef monitors will be trained. (2000) (Adams: Novak)

7.21 Two new artificial reefs will be permitted. Two new reefs will be built and at least one existing reef will be renourished with additional materials. At least one additional artificial reef grant application will be developed. (2000) (Adams: Novak)

7.22 Three meetings of the Extension Artificial Reef Advisory Committee will be held. Ten individuals will better understand the process of developing reef construction grant proposals and permits. (2000) (Adams: Stevely)

7.23 An annual workshop/field exercise for artificial reef coordinators in the Citrus, Pasco, Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, and Collier Counties region will be held. 20 county artificial reef coordinators will become educated about the most appropriate design and construction methods for artificial reefs. (2000) (Adams: Stevely/Sweat)

7.24 Manatee County will be assisted in the design and deployment of 400 tons of artificial reef materials at an offshore reef site. Assistance will also be given in the permitting, design, and deployment of at least three inshore reef sites. Monitoring

assessments of at least three Manatee County artificial reef sites will be conducted. (2000) (Adams: Stevely)

7.25 The status of the Taylor County artificial reef program will be accessed. Proper reef permitting and implementation procedures will be learned from the Florida Fish and Wildlife Conservation Commission. Classes needed by the Taylor County Reef Research Team will be identified. (2000) (Adams: Aubrey)

7.26 The brown macroalga *Dictyota* presently dominates the Florida Keys reef tract. However, little is know about the related abundances of each morphology in this area, and little is known on how this bloom is impacting resident macrophytes, invertebrates and fishes. This pilot project will begin to answer this question and lead to more developed research proposals in this area. (2001) (Walters: PD-99-10)

7.27 A number of National Estuarine Research Reserves now exist around the coastal areas of the U.S. The goal of this study is to determine appropriate techniques to manage recreation use in the research reserves. The Rookery Bay reserve in Florida will be used as a model for development information that can be transferred to other reserves. (2001) (Stein: PD-99-11)

7.29 A world-wide goal is to reduce the environmental impact of the harvest of marine ornamental fish from tropical coral reef systems. One possibility is to use artificial reefs as an alternative collection device. This pilot project will initiate the design phase of the following research project funded through the Sea Grant National Fisheries Habitat Program. The long-term goal is to quantify the net contribution of artificial reefs on fish production. (2000) (Osenberg/St. Mary: PD-00-3)

7.30 A book will be produced on the evaluation of artificial reef performance. This involves a 16-author team of experts in biology, engineering, economics and statistics. The book will enable worldwide audiences to document effectiveness of human-made reefs in various fishery, aquaculture, environmental restoration and economic development settings. (2000) (Seaman)

Goal 8: Prepare and Respond to Coastal Storms

8.1 A method to guide the decision-making process for the reconstruction of storm-damaged coastal habitable structure in Florida will be created. This will result in improved and efficient decision-making by regulatory agencies, engineers, and coastal property owners. (2000) (Yazdani: R/C-D-17)

8.2 A gaming simulation technique of community planning for hurricane mitigation and disaster recovery for use in training local officials and testing the impacts of government policy changes on local planning for disaster recovery and hazard mitigation will be developed. (2000) (Deyle: R/C-P-22)

8.3 Coastal dune stabilization by planting nursery propagated sea oats is the most cost-effective practice to control erosion in the southeast United States. Effects of

transporting different plant ecotypes between sites for transplanting is a concern. The goal is to determine the extent of genetic divergence among sea oat populations to determine if transplanting among areas is feasible. (2000) (Kane: R/C-S-36, PD-99-6)

8.4 A method will be developed to predict the severity of the sea at 12 nearshore areas where hurricanes are reaching the Florida coast. This will help guide decisions relating to coastal construction, law, coastal planning and policy and insurance. (2000) (Ochi: R/C-S-37)

8.5 Establishment of sea oats on restored beaches is critical for combating erosion losses. However, concerns about genetic diversity have lead to restrictions in harvesting and planting of sea oats. The overall goal is to enhance ecologically sound establishment of micropropagated sea oats by developing compatible plant/mycorrhizal fungus ecotype combinations for out planting onto Florida beaches. (2000) (Sylvia/Kane/Alagely/Milman: R/C-S-38)

8.6 A recently completed Sea Grant project on long-term shoreline position resulted in the identification of previously unrecognized shoreline characteristics which are important to the long-term management of Florida's and the nation's beaches. This project will investigate these characteristics of sand sediment sources and sinks on Florida's east coast, determine the causes of unpredicted shoreline and advancement, develop more rationale sediment budgets and disseminate the information to professional and lay audiences for use in decision making and shoreline project planning. (2002) (Dean: R/C-S-39)

8.7 Rip currents account for 80 percent of beach rescues, accounting for 36,000 rescues in 1997. About 150 drownings (30 in Florida) occur each year due to rip currents. The ability to predict the occurrence of rip currents will reduce this dramatically. A database of rip currents will be developed and a predictive model will be developed and tested. (2002) (Hanes/Tieke/Dean: R/C-S-40)

8.8 Florida's rapidly increasing coastal population is at risk in serve winds associated with hurricanes. This project is part of a multi-university effort to measure wind field characteristics along the Florida coast. The data will help establish the baseline science and advanced environmental models to improve construction codes, evacuation procedures, public information, weather prediction capabilities and better financial protection for human life and property. (2000) (Gurley: PD-99-7)

Education and Human Resources

Goal 9: Produce a Highly Trained Workforce

9.1 A minimum of two qualified applicants will be submitted annually to the Sea Grant John A. Knauss Marine Policy Fellowship national competition. Over each five-year period, an average of one Knauss Fellow per year (of 25 nationally) will be from Florida. (2000) (Cato)

9.2 At least one national Sea Grant Industrial Fellow candidate (of 2-4 per year nationally) will be successful every three years. (2000) (Cato)

9.3 At least 25 percent of the annual Florida Sea Grant federal core program research budget will be used to support graduate students. (2000) (Cato)

9.4 A minimum of five graduate students will receive scholarship funding through private funds in cooperation with the Aylesworth Foundation for the Advancement of Marine Science and the Old Salt Fishing Club. (2000) (Cato)

9.5 One high school student will receive a college scholarship through the Chuck Skoch Florida Sea Grant Scholarship. (2000) (Cato)

9.6 A minimum of $400,000 per year in non-national Sea Grant CORE program funding will be received from extramural funding sources to support Sea Grant programs. (2000) (Cato)

9.7 Florida Sea Grant will participate in National Strategic Investment, National Outreach and National NOAA/Sea Grant proposal competitions when available. Funding data will be analyzed to measure the success rate of Florida Sea Grant against the other Sea Grant programs. (2000) (Cato)

9.8 At least 15 different academic disciplines and six different Florida universities and research laboratories will receive Florida Sea Grant funding in each proposal cycle. This can only be achieved through the encouragement of competitive proposals from many participants because peer review determines actual funding. At least six institutions participating in Florida Sea Grant will be visited each year to meet faculty and students to keep a high level of participation in Florida Sea Grant. Six faculty progress reports will be distributed annually to 800 faculty statewide to inform them of Sea Grant activities and opportunities. (2000) (Cato/Seaman)

9.9 An average of four Florida Sea Grant supported seminars will be funded annually as a way to increase the skills of faculty and students in ocean and coastal related academic disciplines. (2000) (Seaman/Cato: PD-00-1)

9.10 A minimum of two qualified applicants will be submitted to the NOAA Coastal Services Center Competition each time it is held. (2000) (Cato)

9.11 Florida Sea Grant will organize and participate in a visit by a national Program Assessment Team (PAT). The goal will be to achieve the highest score possible by the quadrennial review process. (2000) (Cato)

9.12 Many problems are studied by scientists using information and skills from many disciplines. Marine science as a course integrates many disciplines. This project will determine how students become more scientifically knowledgeable and literate as they participate in secondary level marine science courses, how their attitudes change regarding coastal science, technology and society as they participate, and what topics, instructional strategies, curriculum and learning experiences lead to students becoming more scientifically literate. (2000) (Marcus: PD-99-9)

Goal 10: Create a Scientifically and Environmentally Informed Citizenry

10.1 A number of educational activities are implemented under the previous goals. The following ones cross many goals and are implemented in general.

10.1.1 High quality publications that effectively communicate the results of Florida Sea Grant activities to both general and specialized audiences will be produced. This includes Sea Grant Reports, Sea Grant Extension Fact Sheets and brochures, Sea Grant Technical Papers, books, book chapters, staff papers, conference proceedings, newsletters, posters and videos. The exact number will depend on the work plans and research results of faculty. (2000) (Kearl/Grantham)

10.1.2 At least ten print news releases will be produced. (2000) (Kearl/Grantham)

10.1.3 The existing Florida Sea Grant Internet home page will be upgraded and maintained. (2000) (Grantham)

10.2 Citizens will be educated about Florida's coastal environment.

10.2.1 Curriculum materials relating to aquatic and marine ecosystems to support county level 4-H programs will be completed. (2000) (Culen: Sea Grant off-campus faculty)

10.2.2 A statewide Marine ecology contest for 4-H youth will be conducted. (2000) (Culen: Sea Grant off-campus faculty)

10.2.3 Two 4-H Summer Marine Institutes will be held (2000) (Culen: Sea Grant off-campus faculty)

10.2.4 Two marine issues in-service training for county extension faculty programs will be conducted. (2000) (Culen: Sea Grant off-campus faculty)

10.2.5 A Sport Fishing 4-H training program will be held. (2000) (Culen: Sea Grant off-campus faculty)

10.2.6 An "Oceans Away" track will be included in the state 4-H Congress. (2000) (Culen: Sea Grant off-campus faculty)

10.3 A "tip sheet" on Florida Sea Grant resources for marine educators, with linkage to other key organizations will be completed. The format will be print and electronic. This will allow teachers, 4-H leaders, students and the media, among others, to access Sea Grant information. (2000) (Seaman)

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Key to Individual Responsibilities

Faculty	Page
Adams	3, 4, 5, 6, 7, 8, 9, 15, 17, 18
Alagely	19
Ankersen	11, 12, 13
Antonini	11, 12, 13
Arnold	7, 8
Aubrey	5, 11, 18
Ault	16
Baker, B.	1, 2
Baker, P.	17
Benetti	8
Berzins	6
Blake	8
Bohnsack	17
Bolker	17
Burgess	3
Burnett	14
Bushek	8
Butler	3, 6
Cardeilhac	6, 9
Cato	1, 7, 20, 21
Chanton	14
Coleman	17
Corbett	14
Creswell	7
Culen	5, 21, 22
Dean	19
Degner	6
Deyle	11, 18
Duckworth	9
Ehrhardt	3
Fann	12
Feeley	8
Forqurean	14
Francis-Floyd	6, 7
Frazer	3, 15
Garrido	9
Grantham	21
Gregory	4, 5, 14
Grimwade	1, 2
Gulig	9
Gunasekera	1
Gurley	19
Halstead	8

Halusky 11
Hamann 11, 13
Hanes 19
Herrnkind 3, 6
Hitchcock 7
Irlandi 7
Jackson 11, 13, 15
Kane 16, 19
Kearl 16, 21
Kem 2
Kerr 1
Koenig 17
Larkin 6
Lazur 9
Leber 5, 8, 15
Lee 3, 6
Leonard 1, 2
Levitan 17
Lin 7
Lindberg 3, 17
Mader 8
Mahan 16
Marcus 6, 21
Mason 3
McCarthy 1, 2
McNeely 10
Miller, J.M. 5
Miller, M. 17
Milman 19
Milon 3, 6
Monaco 16
Murie 3
Neill 5
Novak 5, 12, 15, 17
O'Keefe 9
Ochi 19
Olson 2
Osenberg 9, 17, 18
Otwell 9, 10, 11
Paul 1, 2, 14
Peterson 14
Phlips 6
Pomponi 1, 2
Posey 3
Ramey 15
Rodrick 10
Rose 2, 14

Russell 2
Scarpa 8
Seaman 1, 2, 6, 14, 15, 16, 18, 20, 22
Sennett 1
Sidman 12, 13
Simpendorfer 3
Soti 2
St. Mary 17, 18
Stein 18
Stevely 5, 12, 13, 14, 15, 16, 17, 18
Sturmer 7, 8, 10
Supan 7
Sweat 5, 8, 15, 17
Swett 11, 12
Sylvia 16, 19
Tieke 19
Walters 18
Watson 17
Willoughby 2
Wirth 9
Yazdani 18
Zajicek 9
Zimet 9, 10