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Serving Science into the 21st Century

1999-2000 Program Directory

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Texas A&M Sea Grant Program
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TEXAS SEA GRANT COLLEGE PROGRAM

The Texas Sea Grant College Program is a partnership of university, government and industry, focusing on marine research, education and advisory service. Nationally, Sea Grant began in 1966 when Congress passed the National Sea Grant College and Program Act. Patterned after the Land Grant Act of the 1860s, the Sea Grant Program is a practical, broad-based effort to promote better understanding and use of marine resources through research, education, extension and information transfer.

A Word From the Director ...

The Texas Sea Grant College Program is pleased to welcome Mr. Ralph Rayburn as the Associate Director who will be responsible for the Marine Advisory Service (MAS). Ralph joins the administrative team at the Bryan offices of the Program and brings to his new position a considerable amount of experience in the area of natural resources science and management as well as a background as a MAS agent. The vision he has for the program can be expected to reap considerable benefit to our constituents throughout the state and nation.

Our goal is to put approximately 50 percent of the federal dollars that are received each year into research. The remainder go for administration and operating the MAS and Marine Information Service (MIS). MAS and MIS provide the outreach and educational activities of Sea Grant. Research is conducted through universities around the state, and in some cases in conjunction with universities in other states through regional projects.

Even though about 50 percent of our federal dollars go toward research, we are limited in the number and breadth of studies that we can support. Thus, we develop, with input from our Advisory Committee and MAS, a list of priorities for research to be conducted during each funding cycle. The current cycle runs from March, 1998 through February, 2001. Several priorities were identified as being appropriate during this cycle; many of the proposals dealt with investigations of natural and human-induced changes to the environment that can significantly alter habitat, thereby impacting the ability of commercially and recreationally valuable fish and shellfish to successfully grow and become accessible in their respective fisheries. Thus, many of the projects fell under the recruitment umbrella.

We will obviously not resolve all the recruitment issues facing our state's coastal waters in one proposal cycle, and with the current emphasis under the re-authorized Magnuson-Stevens Fisheries Management and Conservation Act on Essential Fish Habitat, recruitment issues have been elevated at the national level. Careful consideration will be given to the amount of emphasis we wish to continue placing on recruitment during the upcoming proposal cycle (March, 2001 through February, 2004).

In addition to the support we provide for research through our core funding, Texas Sea Grant also re-

ceived additional support through an allocation for regional projects. During the current cycle, there are two such projects. Both involve Texas and Florida, and one also includes North Carolina. There are also opportunities for additional funding through National Research Investments, which are programs initiated in the National Sea Grant Office and funded through national competitions.

In the middle of this current proposal cycle (May, 1999), the Texas Sea Grant College Program underwent a review by a Program Assessment Team. All aspects of our program were examined. I am pleased to indicate that we were judged overall excellent and that we are dedicated to maintaining that level of performance.

Our advisory committee will meet during fall, 1999 to discuss priorities for research funding in the next proposal cycle. Input from MAS will also be solicited. In the past, the two groups have shown remarkable agreement and we trust that will continue. Early in 2000 we will distribute our Request for Proposals. This will be followed by meetings around the state with potential investigators, the receipt and review of preproposals, requests for full proposals from those selected for further consideration from among the preproposals, review of final proposals, and solicitation of funding recommendations from a panel of experts convened for that purpose. Announcement of funded projects should come by late summer, 2000 for funding in March, 2001.

The beginning of a new millennium brings the promise of changing demographics for the state of Texas. It has been estimated that the majority of the millions of new residents expected over the next few decades will settle in the coastal zone. Increased pressures on our natural resources will make the work we do with regard to our research activities and the activities of our MAS and MIS personnel even more important than it is today. We are prepared to meet that challenge and are dedicated to finding new ways to enhance our ability to do so.

The following pages of this directory tell you who we are and how you can get in touch with us. There are also reports on the various research projects being conducted during the current proposal cycle. Additional information on research activities can be obtained from the principal investigators associated with the various projects.

Robert R. Stickney, Director

TEXAS A&M UNIVERSITY

In 1968, Texas A&M University became one of the nation's first six institutional award recipients. Building on a rich heritage of oceanographic research dating back to 1949, the successful Land Grant college was a perfect match for the Sea Grant concept. Three years later the school was designated a Sea Grant College. The Texas Sea Grant College Program is made possible through federal funding from the National Oceanic and Atmospheric Administration under the U.S. Department of Commerce, matching appropriations from the Texas Legislature, local governments, and partnerships with coastal and marine-related industries.

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MARINE INFORMATION SERVICE

Projects funded by the Texas Sea Grant Program produce a large volume of important information. The Marine Information Service (MIS), the publication arm of the Texas Sea Grant College Program, distributes current information on marine issues to a wide variety of interested publics. Congressmen, legislative aids, federal and state regulatory agencies, coastal planners, scientists, fishermen, businessmen, homemakers, consumers, engineers and teachers are representatives of the varied audiences that benefit from Sea Grant information. Publications include peer-reviewed journal reprints, technical reports and proceedings, education and advisory materials, media releases and the award-winning *Texas Shores* magazine.

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MARINE ADVISORY SERVICE

The Marine Advisory Service (MAS) is an extension of the Texas A&M Sea Grant College Program, in cooperation with the Texas Agricultural Extension Service and county commissioners' courts in five coastal counties. The five Marine Advisory Service agents are backed by seven specialists, each an expert in a particular marine field. MAS currently includes specialists in fisheries, business management, environmental quality, seafood marketing, marine education and aquaculture. MAS personnel respond to information requests, assist in solving specific marine-related problems, work with 4-H programs, fishermen, businessmen and economists, and fulfill the public service role of the Sea Grant Program in the coastal area.

Ralph Rayburn, *Program Coordinator*

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AQUACULTURE

Culture Techniques for Marine Ornamental and Consumable Fish: A Better Larval Diet?

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Interest in ornamental fish is on the increase worldwide. In the United States alone, 5.6 million marine tropical fish are held in more than 1 million tanks. The annual worldwide market for marine tropical fish is more than $100 million. To date, this demand has been met primarily with fish caught in the wild because most fish sold to aquarium enthusiasts have not been raised on farms. This has caused concern about the impact of the aquarium hobby on fish populations. The chief exporters of wild-caught marine ornamental fish are the Philippines and Indonesia. In the United States, most of these fish are collected from the waters off of Florida and Hawaii. Although aquaculture is the fastest growing sector in the U.S. agriculture industry, a major limit to rapid growth is the unreliable production of young fish. In the past, the larvae of farm-raised red drum have been fed small marine animals such as rotifers. Scientists have found the eggs and larva of copepods, such as plankton, are the natural food source for fish larvae. However, copepods have not been used extensively in aquaculture as a food because the animals vary in abundance and nutrition and are difficult to keep alive. In this project, researchers will evaluate the use of copepod eggs as a natural food source for young fish larvae.

Nutritional Strategies for the Reduction of Mariculture Waste Production

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Given the current status of world fisheries, continued expansion of marine products can only be achieved if aquaculture production is increased and significant im-

provements are made in the conservation and management of world fisheries. The continued growth of aquaculture has economic and environmental benefits; however, these systems produce waste that can adversely affect the environment and taint fish habitat and nursery grounds. Consequently, to meet the expanding demand for seafood products, steps must be taken to ensure that aquaculture is both profitable and has little effect on the environment. This project will adjust the nutrients used in fish feed in order to enhance the amount of nutrients retained by fish and reduce the amount of sewage produced by fish that is released in aquaculture ponds and tanks. This research will determine the protein and energy requirements of young red drum. Results from these studies are expected to significantly improve feeds for these species. Transferring improved feed technologies and improving feeding protocols is expected to reduce the nutrient loading associated with aquaculture systems, thus reducing both feed costs and nutrient loading of the culture systems as well as reducing the waste released into coastal waters.

Nutritional and Environmental Manipulations to Reduce Waste in Mariculture

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Nutritional and environmental manipulations to minimize waste production and maximize nutrient utilization and growth efficiency are needed to enhance the economic competitiveness and environmental sustainability of commercial aquaculture. This project will conduct a series of laboratory and field investigations to evaluate several of these manipulations. Nutritional investigations will be conducted with red drum and include: a) evaluation of the ideal protein basis for optimizing protein and amino acid nutrition to increase protein utilization and limit nitrogenous waste production; and b) determination of the effects of practical-diet supplementation with enzymes, such as phytases, proteases and polysaccharidases, on retention and excretion of phosphorus, nitrogen and organic matter. Environmental studies will involve: a) development and evaluation of an integrated water treatment system, using adaptations of dissolved air floatation technology for removal of solid and dissolved wastes in pond and recirculating aquaculture systems; and b)integration of an activated biosolids treatment process for nutrient removal in pond systems. These dietary manipulations and water

treatment technologies will be transferred and evaluated in commercial-scale red drum production facilities of HarvestFresh Seafoods in Bacliff, Texas or other appropriate facilities. Water treatment technologies developed with red drum also will be applied and evaluated in pond culture of Penaeus setiferus. Results from this project should sunstantially improve nutrient utilization and production efficiency in aquaculture and substantially reduce waste production so that the industry can become more economically viable and environmentally sound.

MARINE RESOURCES

Field Test of an Ecophysiological Model to Predict Habitat Value for Recruitment of Juvenile Redfish

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This project will examine the effectiveness of a model in predicting the overall health of marine habitats for juvenile redfish. The project is part of a regional effort (Texas, North Carolina and Florida) to improve the scientific basis for enhancing of marine fish stocks by measuring and modeling effects of factors such as the temperature, salinity and dissolved oxygen content of coastal waters. Two Texas bays will be surveyed, and the resulting information mapped using an existing ecophysiological model, as scope for performance of juvenile red drum. Model predictions of survival, growth and distribution will be compared with results of wild fish surveys and with the results of experimental closure and release studies on hatchery fish, in "good" and "bad" habitat. The findings of regional projects will be communicated through publications and a workshop.

ENVIRONMENTAL

A Reporter Gene system for Detecting and Investigating Marine Pollutants With Endocrine Disruptive Activities

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Environmental pollutants that interact with cellular estrogen receptors to initiated or inhibit gene expression have been categorized as xenoestrogens. Estrogenic activity has been found for a wide variety of chemicals, including pesticides, herbicides and detergents. These xenoestrogenic pollutants can adversely affect human hormones, impacting sex determination, reproduction and the immune system. Some research suggests these types of pollutants may even promote the growth of some types of cancer. Marine animals, particularly those living close to shore, may be regularly exposed to chemicals used in industry and agriculture as pollutants of water and sediment. Some of these chemicals are known to exert estrogenic effects. In this project, scientists will construct two reporter gene systems that will allow them to (1) detect low levels of xenoestrogenic pollutants in sediment and water samples, and (2) determine whether specific pollutant chemicals exert estrogenic effects in cells of marine organisms. The gene systems will contain an estrogen response element (ERE) coupled to a promoter and a reporter gene, green fluorescent protein (GFP). The reporter sequence will be inserted into either a prokaryotic-specific expression vector for transfection into E. coli or into a eukaryotic-specific expression vector for transfer into eukaryotic cells. The E. coli system will permit the rapid and inexpensive determination of whether water and sediment samples contain environmental contaminants and allow further investigation of the effects of chemicals on marine animals. Estrogenicity of chemicals will be determined in eukaryotic cells, where expression of the reporter gene stimulated by test chemicals will be compared with that initiated by the alcohol 17b-estradiol (E_2). The eukaryotic reporter gene system, which is adaptable for use in cells from fish or mammals or could be transferred into embryos of small marine animals, will allow researchers to determine the degree of

estrogenic activity of chemicals or mixtures of chemicals relative to the estrogenicity of estradiol in that specific cell type.

The Importance of Episodic Events on Turbidity and Mobility of Heavy Metals in Texas Estuaries

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Episodic sediment resuspension events in estuaries , such as storms, shrimp trawling or dredging, can substantially alter biogeochemical characteristics of the sea bottom and also reintroduce sediment particles and pore fluids into the water. Such events prevent sediments from accumulating in the estuary and could allow the re-release of previously deposited contaminants. To determine the geological and geochemical impact of storms, shrimp trawling or dredging in shallow Texas estuaries, this project will study the effects of shrimp trawling and wind storms on sediment resuspension. These results will be integrated with existing studies of dredging to assess the relative importance of these sediment resuspension activities. Investigations will be conducted before, during and after a trawling or storm event relative to a nearby reference site. Monitoring will include continuous and rapid real-time measuring of suspended sediment concentrations (and other physical parameters); monitoring the water column for dissolved and particulate nutrients and selected trace metals; determining nutrient and trace element flux; taking geotechnical measurements to examine changes in bulk sediment properties; determining sediment mixing depths and sediment accumulation rates using radiostopic approaches; and conducting laboratory sediment-water mixing experiments to quantify release characteristics of trace metals and nutrients from sediments.

Tower-Based Conditional Sampling to Monitor the Impact of Freshwater Management on Coastal Wetlands

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While many coastal wetlands are deteriorating as freshwater is diverted by dams, a team of Texas A&M University researchers is looking at ways to monitor the impact and timing of periodic influxes of freshwater on marshes and estuaries. Soil and crop scientists are measuring the rates at which carbon dioxide is taken up and released by marsh plants and using this information to determine when injections of freshwater can have the most beneficial effects on plant production. The scientists are measuring the rate of exchange of carbon dioxide between wetland plants and the atmosphere, determining at what times plants grow at rapid rates. During times of rapid growth, plants use greater amounts of atmospheric carbon dioxide for photosynthesis. This knowledge will help researchers devise ways to better care for marshes and estuaries, particularly those wetlands that have been disturbed or have had their supplies of freshwater diverted. By better managing marsh systems, scientists can help to maintain and improve marsh productivity while providing habitat for fish and wildlife.

Bioavailability of Colloid-Associated Metals to Estuarine Bivalves

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Oysters and mussels, or bivalves, have been used as indicators of pollution for several decades. They are uniquely capable of concentrating pollutants from the large volumes of water that they filter. However, how these animals take up and accumulate these metals and other pollutants has not been thoroughly studied. Previous studies examined the availability and toxicity of metals to marine animals, especially those forms dissolved in the water or consisting of small particles. However, those metals dissolved in the water are often associated with organic, large molecules and tiny particles. The role of these colloids in metal availability and toxicity to oysters and mussels has never been studied systematically. This research will determine the extent to which oysters and mussels take up and accumulate colloid-associated metals and examine whether the presence of colloidal organic carbon alters the availability of metals to marine animals. Our research will combine laboratory experiments with radiotracer, ultrafiltration and clean techniques to determine parameters that are necessary for kinetic model development to predict metal concentrations in oysters and mussels under different conditions. The results of this study will be very useful to state and federal agencies in environmental assessment,

monitoring and regulation programs.

Hydrodynamic and Circulation Data Set for Matagorda Bay

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Data from the long-lost circulation project on Matagorda Bay has been recovered. This was an extensive hydrodynamic survey of the bay system that was performed in the late 1950s, including current measurements over many tidal cycles, salinity determinations at a network of stations throughout the bay and a system of eight consistently leveled tide gauges, supplemented by aerial photography, barymetric surveys and sediment texture analyses. The project was carried out during one year, and encountered varied conditions such as summer lowflows, spring floods, frontal passages and storms. This valuable data set is virtually useless in its current form of photocopies of tide traces, field data sheets and maps. This project will digitize the data and compile it into a magnetic data base to disseminate among estuary scientists. A preliminary analysis of the data will be performed, including tidal propagation mechanics, hydrometeorological responses and salinity intrusion. In view of the current controversies in Matagorda Bay, including loss of the natural inlet, diversion of the Colorado river and remediation of the mercury contamination, this data set and the hydrodynamic insight it will afford, is expected to be of great value to coastal oceanographers.

FISHERIES

The Influence of Salinity on Reproduction, Egg and Larval Development of Spotted Seatrout *Cynoscion nebulosus*

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Reproduction in fish is especially sensitive to changes in environmental conditions, including salinity changes. Therefore, major changes in freshwater inflow through upstream allocations could have long-term consequences on recruitment and thus fish population size. Spotted seatrout, found throughout the Gulf of Mexico and the Atlantic coast to Chesapeake Bay, generally spend their entire lives in the bay/estuary. The species is found to spawn over a wide range of salinities, but populations within a specific bay appear to be adapted to a relatively narrow range. In earlier studies, we found that egg size varies with salinity, young larvae are the most sensitive to salinity shifts, and sexually mature adults do not make short-term adjustment to changes in spawning salinity. These findings may be a result of long-term adaptation or of genetic differences at the population level. This project will bring adult fish – from bays with extreme salinities – into the lab, condition them to spawn under a variety of salinities and evaluate the offspring for quality, size, growth and survival. Patterns of salinity tolerance of larvae will be established and compared among offspring from different experiments. The results will allow us to determine how short- and long-term changes in salinity affect recruitment potential through changes in reproduction and early stage survival.

The Role of Water Level Fluctuations in Recruitment of Red Drum Larvae: Stable Isotopes as Tracers

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Variability in the year class strength of many marine fish species is attributed to physical and biological processes acting upon the early-life stages. Differences in spacing and timing of fish larvae have been correlated with recruitment variability. Previous studies suggest differences in abundance of pre-settlement red drum, an important recreational species in Texas, are associated with water level fluctuations. A three-year study is proposed to evaluate the role of water level fluctuations and environmental variables, such as wind speed and direction, barometric pressure and temperature, on the supply of larvae and recruitment to estuarine nursery habitat. Coupling between larval supply and settlement to nursery habitat will be evaluated. Differences in the stable isotope ratios of recent settlers and "residents" of seagrass nursery habitat will be used to confirm settlement pulses and to separate recent settlement from redistribution within the nursery habitat. The results of this study will be integrated with a hydrodynamic particle transport model being developed at Texas A&M University to increase our understanding of the processes leading to successful recruitment of red drum and similar estuary-dependent species.

Simulation of Larval Transport from the Texas Coastal Ocean to a Bay

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Texas bays and estuaries form the transition region between land and sea. The health of their fisheries, in particular and their ecosystems in general, is determined by their interaction with Texas coastal waters. Populations of species such as red drum, croaker and various penaeid shrimp depend on their larvae's ability to move between the ocean and the bays, enhancing their swimming ability by riding the currents. In order to understand how this phenomenon is carried out, knowledge of their behavior traits must be combined with knowledge of the physical environment in which they move. This project will unite the relevant biology and physics using computer simulations of water and larval exchange between bay and ocean that incorporate different larval behavior stages. Results will be tested against observations from the Aransas Pass region. The project goals are to understand how planktonic larvae return to bays and their estuarine waters and how changes in the physical environment affect them. Results should add to the understanding of the factors that affect

recruitment success of such commercially important species as brown shrimp and red drum. (Completion: February 1998)

Recruitment and Population Status of Kemp's ridley Sea Turtles in Nearshore Gulf waters

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The use of coastal waters next to Sabine Pass, Texas/Louisiana by the critically endangered Kemp's ridley sea turtle (Lepidochelys kempii) and the importance of the area as an "index habitat" for understanding this species' population dynamics, migration and survivorship will be examined to fulfill mandates of the Kemp's Ridley Recovery Plan. From May 1, 1998 through August 31, 2001, researchers will capture live turtles, tag them in order to track their movements and recapture them at a later time, examine the accumulation of contaminant s in these animals and characterize their submergence stress/resuscitation activities. Standardized entanglement netting operations at jettied beachfront habitats will assess abundance, size composition and spatial/temporal distribution of turtles living along the coast. Recapture successes will describe life history of hatchlings tagged at the Rancho Nuevo, Mexico nesting beach. Catch-per-unit effort statistics and tracking/recapture efforts will estimate abundance/survival and growth, and define migratory/foraging behavior. Laparascopy and blood analyses will determine sex ratio, fecundity/maturation, and reproductive condition and provide plasma samples for other studies on trace metal uptake of population constituents. Submergence studies will quantify capture stress and develop resuscitation techniques as an aid to enhancing ridley recovery. This research responds to Recovery Plan mandates by: 1) yielding in-water information on where and how ridleys spend their time; 2) utilizing an index habitat within which to continue long-term monitoring/tagging efforts and expand in-water, live-ridley capture; 3) describing the role health, capture stress, and toxic contamination play in ridley survival/recovery; and 4) evaluating possible seasonal closure of nearshore waters to shrimping as a management strategy in reducing incidental capture and death of ridleys.

EDUCATION

Field Testing, Revision, and dissemination of Marine Education Resource Manual for Middle Schools

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The project will field test, revise and disseminate an interdisciplinary Marine education Resource Unit developed for middle schools to fill the void in the availability of marine education materials. The manual focuses on the marine environment and its resources with specific emphasis on the Texas coastal zone and Gulf of Mexico to develop "marine literate" teachers and students. The unit is correlated to the Texas Essential Knowledge Skills, to national standards in science, mathematics, social studies and language arts, and utilizes effective research-based strategies for teaching and learning. The manual will provide teachers with lessons that can be incorporated into existing courses, or used as separate marine units, interdisciplinary thematic units or semester-long courses. Lessons in the initial draft will be formally tested and evaluated by 40 to 50 trained middle school teachers and their students. These evaluations will be the basis for revision. Workshops for 30 teachers in each of the 20 Texas Education Service Center regions and 30-60 teachers at 10 different state and national meetings will provide training in the unit to enable the teachers to effectively use the unit and to serve as disseminators and trainers in their respective schools and region.

Endangered Marine Turtles: Symptoms of an Education Necessity

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This project continues the development of an integrated education resource program based on the 20 years of experience Owens has working with marine turtles and con-

servation issues in the Gulf of Mexico and around the world. Researchers are working closely with scientists, resource users, teachers and students to develop and evaluate various materials. During the first year, the project will focus on a major marine issues conference to be held at the Texas A&M George Bush Presidential Library and Conference Center in June of 1998. The title of the meeting is "Sharing Our Gulf – A Challenge for Us All." As part of the conference, researchers plan to produce a series of up to 20 Status Pages on specific topics, such as Galveston Bay, Kemp's ridleys, shrimping productivity, Mantas rays, etc. These will be available both as published sheets and as part of a marine education site linked to the Texas Sea Grant College Program World Wide Web page. Researchers will also develop interactive Web-based curriculum materials, employing up-to-date organismal biology, integrated science activities and problem-solving challenges for use in the classroom. After testing in subsequent years, these highly visual, computer-based materials also will be of use in public aquaria, zoos and after-school programs.

SELECTED MAS PROJECTS

Non-Point Source Pollution Reduction/Abatement

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This issue was identified by the five-year conference under the EPA's National Estuary Program for Galveston Bay as a top priority. In 1994, MAS, with the assistance of a $23,090 grant from the U.S. Fish and Wildlife Services, began a Galveston Bay Yards and Neighbors project to educate and introduce bay-friendly landscape, lawn and homecare practices to participating neighborhoods. The program stresses using native or adapted plants for landscaping which reduces excessive watering and use of herbicides and pesticides. Demonstrations have been successfully completed, publications produced and numerous neighborhoods are now participating. All participants receive a monthly newsletter and a schedule of programs for composting, proper pesticide and fertilizer application, landscaping with native plants, attracting wildlife and proper water conservation. Making small changes in landscape and lawn care practices will not only improve the water quality of Galveston Bay but will also reduce maintenance costs and efforts. A model Bay Friendly landscape at a community site now serves as a hands-on demonstrations tool. This project is in its third and final year. The effort will continue through local governments, conservation foundations and community groups.

Marine Education Initiative

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A marine education facility in Palacios, Texas was designated the Texas State Marine Education Center in 1995. MAS and the Sea Grant staff conducted the original feasibility study for this center. In 1996, Sea Grant and the Texas

Agricultural Extension Service signed a Memorandum of Agreement (MOA) with the participants of the center for collaborative marine education efforts and programs. Other center participants include the Matagorda County Navigation District No. 1, the Palacios Independent School District, Wharton County Junior College and Texas State Technical College. In response to this MOA, Sea Grant/MAS has hired a Marine Education Specialist, William Younger, a marine education assistant and a secretary, and the Matagorda County Navigation District No.1 has provided a grant of $142,000 to initiate the effort and help pay for office space and other support. Other grants obtained to support this initiative include $32,000 from the Lower Colorado River Authority and $15,000 from the Formosa Plastics' Environmental Program Fund. Example programs include: a marine education docent/intern program, youth sailing education, marsh ecology for students, video development to promote marine education, aquaculture education and teacher in-service training.

National Sea Grant Marina (MarinaNet): Enhancing the Economic and Environmental Sustainability of the Marina Industry

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MarinaNet is a national network for marinas and the marine-related trades established through the National Sea Grant College Program, with the assistance of a $25,000 grant. This project expands the existing informal network of Sea Grant researchers and outreach staff working with marina operators and creates a system for efficient exchange of information and experience among academia, the marina industry, regulatory agencies and other marina-related organizations. MarinaNet has established an online communication network, including a World Wide Web site and e-mail discussion group. MarinaNet News, a biannual newsletter, distributes information to the Sea Grant network and others about marina-related projects and issues. MarinaNet partners will create an information catalog highlighting marina-related research, outreach and education activities. A national research collegium convened by MarinaNet has identified the future research needs of the marina industry.

Sea Grant HazNet

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This project is designed to enhance the Sea Grant network's contribution to reducing loss of human life, property and environmental resources from coastal hazrds in the United States. HazNet was created as a network of Sea Grant programs to do research, outreach and education projects leading to effective and efficient mitigation. The HazNet provides an organizational framework through which hazrd mitigation information can be shared with the Sea Grant network, outside collaborations and users in the public and private sectors.

Improving the Quality and Safety of Retail Foods

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In a 1987 study, the Food Marketing Institute reported that shrinkage (the portion of inventory purchased but not sold because of spoilage, etc.) emanating from retail seafood departments ranged from 10 to 15 percent of departmental sales. With seafood accounting for $12 billion in sales through retail food establishments, this shrinkage factor translates into a $1.2 to $1.8 billion annual loss for the grocery industry. Three objectives must be achieved to achieve sharp reductions in avoidable shrinkage without

compromising product safety: (1) maintain optimally cold product temperatures; (2) minimize various contamination venues; and (3) sell older merchandise first. Progress toward these objectives requires that a set of precisely defined operational procedures be developed that give step-by-step instructions on how to perform each activity. To date, this applied research work, funded both by the National Marine Fisheries Service ($32,400) and the Cooperative States Research Education and Extension Service within USDA ($57,694), has translated these objectives into structured, effective, error-proof standard operating procedures that are easily understood and time-efficient for employees to implement.

Gulf of Mexico Region Project Relative to Invasions of Zebra Mussels and Other Nonindigenous Species

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The Gulf region, as a whole, is subject to numerous problems from aquatic nuisance species because the entire region contains ports known for ballast water exchange, is the recipient of waters from the Mississippi drainage basin, is linked by a network of natural and man-made canals and has a climate conducive to support nonindigenous species. This project will raise the awareness of water from "controlling the foulant zebra mussels" to the concept of "managing and controlling all aquatic nuisance nonindigenous species." It also will continue and expand outreach activities towards already-identified zebra mussel audiences and initiate outreach activities to prevent further spread aquatic nuisance species.

Underwater Investigations Leading to Enhancement of Shrimp Retention and Finfish Reduction in Selected Bycatch Reduction Devices Employed in the Gulf and South Atlantic Shrimp Fisheries

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Through the use of advanced underwater video, interaction of red snapper and other bycatch species with Bycatch Reduction Devices (BRDs) and Turtle Excluder Devices (TEDs) will be documented. Escapement of shrimp from BRDs will be monitored. Potential modifications to trawl gear for enhancement of finfish reduction and decreased shrimp loss will be investigated. A video of BRD performance will be produced as a tool for technology transfer and for use in producing new ideas relative to BRD advancement. Lastly, this effort will provide an opportunity to conduct a pilot study to determine if clear South Texas waters can provide an opportunity for divers to observe gear being fished in an area with abundant yields of commercial shrimp and juvenile red snapper.

Construction of a Specialized Teaching Vessel for the Purpose of Significantly Advancing Marine Literacy in Texas

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The Texas Gulf Coast provides a wealth of uncommon social and economic opportunities for the state's citizens. For example, a full one-third of all tourism activity and over three-quarters of all petrochemical production in Texas occurs along the coast. Yet as important as the Gulf is to the lives of people in this state and this nation, few adequately understand the intricacies of its rich and varied eco-systems and the resources they hold. Thus, most educators and leaders in coastal resource management would agree that a fuller awareness of the enriching marine and coastal features of the state is not only desirable, but it is a rapidly emerging necessity that could best be addressed by providing hands-on experiences and firsthand observations to students and teachers eager to explore the coastal and marine environments. In response to this need, the Marine Advisory Service of the Texas A&M University System intends to contruct a specialized 50' teaching vessel to be headquarted in the state's mid-coast area. The primary purpose of this floating classroom / laboratory will be to serve the marine / coastal field of study needs of 4th through 12th grade students and their teachers from across the state.

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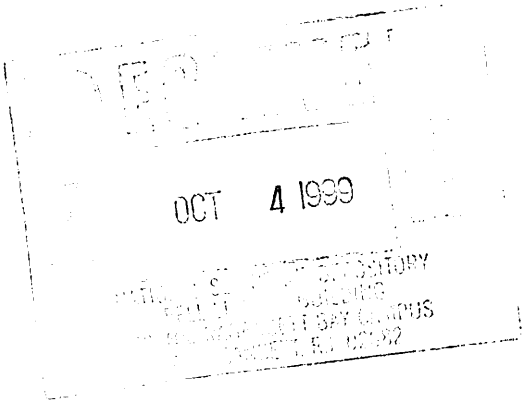

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