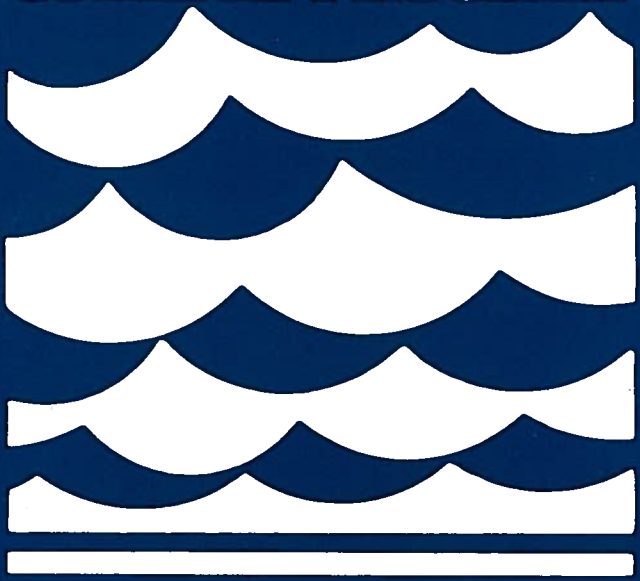
TEXAS A&M SEA GRANT COLLEGE PROGRAM



An organization of professionals dedicated to the better understanding of our marine environment

1990 - 1991 Program Directory

TAMU-SG-91-601

TEXAS SEA GRANT COLLEGE PROGRAM

The Texas A&M University 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 with the passage of the Sea Grant Program and College Act. Patterned after the Land Grant Act of the 1860s, the Sea Grant concept is a practical, broad-based effort to promote better understanding and use of marine resources through research, education, extension and information transfer.

TEXAS A&M UNIVERSITY

In 1968 Texas A&M University had the distinction of being named among the nation's first six institutional award recipients. Three years later the school was designated a Sea Grant College. The University has a rich heritage of oceanographic research dating back to 1949. The Texas A&M Sea Grant College Program itself is made possible through an institutional award from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and matching appropriations from the Texas Legislature and local governments, and support from coastal and marine-related industry.

Texas Sea Grant Program at College Station

Sea Grant College Program
Texas A&M University
College Station, Texas 77843-4115
FAX ..... (409) 845-7525

Administration ..... (409) 845-3854
Thomas J. Bright, Executive Director
Cindy Liles, Administrative Assistant

Fiscal Office ..... (409) 845-3855
Allen Martin, Fiscal Officer/Assistant to the Director
Connie Wager, Accounting Assistant

Marine Advisory Service ..... (409) 845-7524
Mike Hightower, Deputy Director, Marine Advisory Service Coordinator
Debbie Carlile, Staff Assistant

MARINE INFORMATION SERVICE

The projects that make up the Texas Sea Grant Program result in a large volume of important information, and distributing that information to the many "publics" that need it is the responsibility of the Marine Information Service. The audience for this information is varied, including congressmen and legislative aides, state regulatory agencies, coastal planners, scientists, fishermen, businessmen, homemakers, consumers, engineers and teachers. Publications include peer-reviewed journal reprints, technical reports and proceedings, educational and advisory materials, media releases, video documentaries, and three periodicals.

Texas Sea Grant Program at Galveston

Sea Grant College Program
Texas A&M University
P.O. Box 1675
Galveston, Texas 77553-1675
FAX ..... (409) 762-8276

Administration ..... (409) 762-9800
Amy Broussard, Associate Director, Head, Marine Information Service

Video Productions
Chris Sigurdson, Associate Editor, Television Productions and Media Relations
Jamey Tidwell, Video Photographer/Editor

Texas Shores Magazine
Pamela Casteel, Editor

Advisory Publications
David O'Neal, Editor

Distribution
Nathaniel Emmert, Manager

MARINE ADVISORY SERVICE

The Marine Advisory Service is the extension arm of the Texas A&M Sea Grant College Program, in cooperation with the Texas Agricultural Extension Service and county commissioners' courts in ten coastal counties. The eight county marine extension agents are backed by a group of specialists, each an expert in a particular marine field. MAS currently includes specialists in marine recreation, fisheries, business management, environmental quality, and seafood marketing, technology and consumer education. MAS personnel respond to requests for information, provide assistance in solving specific problems, work with 4-H programs, fishermen, businessmen and home economists, and fulfill the public service role of the Sea Grant program along the Texas coast.

Administration ..... (409) 845-7524
Texas Marine Advisory Service
Sea Grant College Program
Texas A&M University
College Station, Texas 77843-4115
Mike Hightower, Program Coordinator

County Marine Extension Agents

Aransas and San Patricio Counties
Richard Tillman
953 N. Commercial
Aransas Pass, Texas 78336
(512) 758-5671

Brazoria County
Charles G. Moss
Rt. 2, 1800 County Road 171
Angleton, Texas 77515
(409) 849-5711, ext. 1564
(409) 265-4261, ext. 1564
FAX: (409) 849-4837

Calhoun County
Joe T. Surovik
P.O. Box 86
Port Lavaca, Texas 77979
(512) 552-9747

Cameron County
Tony Reisinger
650 E. Highway 77
San Benito, Texas 78586
(512) 399-0125
FAX: (512) 428-3356

Chambers and Harris Counties
Robert Nailon
Courthouse Annex, 1222 Main Street, P.O. Box 699
Anahuac, Texas 77514
(409) 267-3185
FAX (409) 267-3962

No. 2 Abercrombie Drive
Houston, Texas 77804
(713) 855-5600
Pager: (713) 684-3453
FAX: (713) 855-5638

Galveston County
Mel C. Russell
5115 Highway 3
Dickinson, Texas 77539
(713) 534-3413
Houston: (713) 337-2575, ext. 196
Galveston: (409) 948-2581, ext. 196
FAX: (713) 337-2575, ext. 105

Jefferson County
Malon Scogin
1295 Pearl Street
Beaumont, Texas 77701
(409) 835-8461
FAX: (409) 835-8782

Matagorda County
Willie Younger
Room 326 Courthouse
Bay City, Texas 77414
(409) 244-7650
Palacios: (512) 972-5556
FAX: (409) 244-7628

Specialists

Business
Dewayne Hollin
Marine Business Management Specialist
Sea Grant College Program
Texas A&M University
College Station, Texas 77843-4115
(409) 845-3857
FAX: (409) 845-7525

Environmental Quality
Mike Hightower
Sea Grant College Program
Texas A&M University
College Station, Texas 77843-4115
(409) 845-7524
FAX: (409) 845-7525

Fisheries
Gary Graham
Marine Fisheries Specialist
Sea Grant Program
P.O. Box 1675
Galveston, Texas 77553-1675
(409) 762-9800
FAX: (409) 762-8276

Russell J. Miget
Marine Fisheries Specialist
P.O. Box 158
Port Aransas, Texas 78373
(512) 749-5207
FAX: (512) 749-4609

Aquaculture
Granvil Treece
Aquaculture Specialist
Sea Grant College Program
Texas A&M University
College Station, Texas 77843-4115
(409) 845-7527
FAX: (409) 845-7525

Recreation
Ken Pagans
Marine Recreation Specialist
Texas A&M Research and Extension Center
Route 2, Box 589
Corpus Christi, Texas 78410
(512) 265-9203
FAX: (512) 265-9434

Seafood
Michael Haby
Seafood Marketing Specialist
P.O. Box 158
Port Aransas, Texas 78373
(512) 749-5207
FAX: (512) 749-4609

Annette Reddell Hegen
Seafood Consumer Education Specialist
P.O. Box 158
Port Aransas, Texas 78373
(512) 749-5207
FAX: (512) 749-4609

1990-1991 Research Projects

Education and Training

Marine Fellowship Program
Dr. L. F. Guseman, Jr. .....*(409) 845-3631*
Graduate College, Texas A&M University, College Station, Texas 77843

The Texas A&M University Marine Fellowship Program is in its fifteenth year of supporting top graduate scholars in marine-related fields. The program is designed to identify and encourage outstanding graduate students to conduct research and study in the various marine-related fields at the University. As a comparative fellowship program, it will continue to attract and support those scholars most capable of conducting research under the direction of faculty advisors, and most likely to pursue productive careers in marine research and ocean management.

Marine Education: An Interdisciplinary Approach to All-Level Teacher Education
Richard K. Tinnin.....*(512) 749-6729*
The University of Texas Marine Science Institute, Port Aransas, Texas 78373

Public awareness of coastal zone environmental problems, processes and possible solutions is increasing each year as is the demand for oceanography programs in the public schools. This project will acquaint up to 250 teachers per year with hands-on marine science experiences through a series of weekend workshops and will expose a group of all-level classroom teachers to exemplary marine science curricula through specific teacher institutes. A cadre of resource teachers will be developed by introducing at least one staff development person from each of the 20 Regional Education Service Centers to the same marine curricula and then requiring them to train other teachers in their region.

Aquaculture

Hormonal Regulation of Reproduction in Penaeid Shrimp
Dr. Larry Keeley .....*(409) 845-9727*
Laboratory (409) 845-3117
Department of Entomology, Texas A&M University, College Station, Texas 77843

The overall objective is to explain the hormonal regulation of egg development in the South American white shrimp, *Penaeus vannamei*, the species most favored for commercial shrimp farming in the United States. Specifically, the project will establish a long-term *in vitro* system for culturing shrimp tissues; establish assays specific for monitoring the synthesis of yolk proteins *in vitro*; and use existing antibody probes with culture systems to investigate the roles of several known and putative crustacean hormones for regulation of reproduction. This research is directed toward the production of numerous choice animals with known bloodlines.

Biochemical Genetic Analysis of Osmotic Response in Penaeid Shrimp
Dr. Ronald S. Burton .....*(713) 749-4778*
Department of Biology, University of Houston, Houston, Texas 77204-5513

While penaeid shrimp are euryhaline, their productivity is strongly influenced by environmental salinity variation. The objective of this project is to employ a physiological genetic approach to understand and manipulate the free amino acid (FAA) component of osmotic response in order to enhance productivity of penaeid shrimp in aquaculture. Adjustment in intracellular FAA concentrations to balance changes in hemolymph osmotic concentrations during salinity acclimation plays a central role in cell volume regulation in these species. As FAA concentrations reach very high levels, the cost of synthesizing and maintaining the FAA pool is substantial. Research will focus on the relationships between intraspecific physiological variation and genetic variations at loci encoding FAA metabolizing enzymes in two native species, *Penaeus aztecus* and *P. setiferus*, and the commercially important non-native, *P. vannamei*. Effects of genotype on patterns of FAA accumulation and loss, and on standard metabolic rate under different salinity regimes will be determined. Differences among genotypes in standard

metabolic rate will reflect utilization of resources for maintenance metabolism. Growth and survivorship of genotypes associated with patterns of FAA metabolism resulting in differential energy expenditure during osmotic response will be compared to determine if stock improvement might be achieved through selection for specific biochemical genotypes.

Cultchless Oyster Culture in Texas

Dr. Leonard DiMichele .....*(409) 845-5777*
Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843

The growth performance of an inbred strain of oysters that was developed for cultchless oyster culture on the East Coast has been studied. A comparison of that strain with native Chesapeake Bay and Texas oysters has revealed several genetic characteristics that may be related to its rapid growth. That comparison will be used as a model to develop a strain suitable for aquaculture on the Gulf of Mexico coast and to examine the physiology and genetic characteristics of growth. An aquaculture system also will be developed based on hatchery and growout technologies developed for other areas to create an economically feasible system for Texas.

Fatty Acid and Lipid Nutrition of Red Drum: Effects of Cold Adaptation, Immunocompetency and Product Quality

Dr. Delbert M. Gatlin .....*(409) 845-5777*
Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843

A series of experiments will be conducted to determine the dietary essential fatty acid (EFA) requirements of the red drum (*Sciaenops ocellatus*) for optimal growth, health and immunocompetency. Influences of EFAs and various dietary lipid supplements will also be evaluated in terms of cold adaptation and product quality of red drum. Dietary lipid manipulation to increase unsaturation of fatty acids in tissue lipids of the red drum may improve the fish's limited tolerance to low water temperatures, which currently constrains its aquacultural development. Increasing the concentration of unsaturated fatty acids of the n-3 (also known as omega-3) series may also enhance the nutritional value of red drum for humans.

Physiology of Gonadotropins in Atlantic Croaker and Red Drum

Dr. Peter Thomas .....*(512) 749-6768*
The University of Texas Marine Science Institute, Port Aransas, Texas 78373

This project will determine the physiological roles of maturational gonadotropin and the newly isolated gonadotropin in the control of reproduction in two commercially important marine fishes, Atlantic croaker and red drum. After they have been chemically characterized, the biological actions of the two gonadotropins will be compared in two bioassay systems. The neuroendocrine control of maturational gonadotropin secretion during ovulation will be examined in detail. A radioimmunoassay for the second gonadotropin will also be developed. Finally, changes in plasma levels and pituitary contents of both gonadotropins during the entire reproductive cycle will be monitored using the two gonadotropin radioimmunoassays.

Interactions of the Environment and the Pathogen *Perkinsus marinus*, with Internal Defenses of Oysters

Dr. Phillip Lee .....*(409) 761-2133*
Marine Biomedical Institute, The University of Texas Medical Branch, Galveston, Texas 77550-2772

The economic potential of the Texas oyster fishery has been greatly reduced by the protistan disease agent *Perkinsus marinus*. Although it has existed for more than 30 years and consistently causes 50 percent mortality of Gulf coast oysters, little is known about host defenses against this disease. It is not known which mechanisms are responsible for defense against *P. marinus* or why these defenses are ineffective, nor have the roles of season, environment and habitat on oyster defenses been investigated, even though these are known to have a major influence on the defense capacity of Atlantic coast oysters. This project will examine the influence of environment, season and habitat on defenses of Gulf coast oysters and attempt to relate specific defense responses with disease to relate specific defense responses with disease incidence and intensity. It will also examine defense responses and disease susceptibility of different oyster stocks known to exhibit resistance to some diseases. Results will establish seasonal changes in oyster defense capacity at different Gulf coast habitats and potential relationships to disease. Results also will indicate the effectiveness of specific defense mecha-

nisms against *P. marinus*, which can lead to optimization of defensive traits in oyster breeding programs.

Disease Agent Distribution in Coastal Shrimp

Dr. S.K. Johnson .....*(409) 845-5777*
Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843

The natural distribution of virus is essentially unknown in native Texas shrimp stocks. This study will add critical information on the distribution and prevalence of viruses in commercially important species. Both larval and juvenile stages of three native shrimp will be collected from two natural coastal sites at intervals during the spring and summer. Live specimens will be maintained through an incubation period, and subsequently analyzed for viral presence via light and electron microscopy and by histopathology.

Fisheries

Satellite Analyses for Fishery Oceanography

Dr. Andrew C. Vastano .....*(409) 845-9826*
Department of Oceanography, Texas A&M University, College Station, Texas 77843

The Texas Sea Grant Satellite Analysis System can quantitatively assess temperature distribution and flow dynamics of surface waters as well as the distribution and movement of phytoplankton. The spatial and temporal resolutions and coverages of the AVHRR and CZCS satellite sensors define these features in mesoscale and sub-mesoscale ranges for Gulf of Mexico coastal, shelf and oceanic regions. This project will extract satellite-determined surface flow patterns in the northwestern Gulf to determine surface transport from November 1988 through April 1989; analyze and interpret R/V GYRE 1989 postlarval brown shrimp observations and shore-based, estuary entrance, postlarval recruitment with satellite-determined surface transport; determine physical and biological spatial scales and geographic distributions taken from sea surface temperature and pigment concentration satellite images for the Texas-Louisiana shelf and adjacent waters; and correlates sea-surface temperature and pigment concentration satellite images for the Texas Louisiana shelf and adjacent waters; and correlate sea-surface temperature and chlorophyll concentration features using underway *in vivo* fluorescence and SST observations.

Mitochondrial DNA Variation in Red Drum and Evaluation of Red Drum Stocking Success in Texas Bays

Dr. John R. Gold .....*(409) 845-5777*
Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843

The red drum or redfish (*Sciaenops ocellatus)* is an important sport and commercial fish along the Gulf and Atlantic coasts. The decline in the red drum fishery in the last decade has accentuated the need for research on both wild and domesticated red drum populations, especially in the area of genetics. This project has two components, the first of which is the continued investigation of variation in mitochondrial (mt) DNA molecules among yearling red drum in the Gulf of Mexico. The data to be obtained will be used to address questions regarding geographic and temporal substructuring in the red drum fishery. The

second component is to initiate a program involving the use of mtDNA molecules among yearling red drum in the Gulf of Mexico. The data to be obtained will be used to address questions regarding geographic and temporal substructuring in the red drum fishery. The second component is to initiate a program involving the use of mtDNAs ultimately to evaluate and monitor red drum stocking programs. MtDNA haplotype profiles of red drum along the Texas coast will be established, and up to 50 adult female red drum will be non-destructively screened to determine if they carry rare or unique mtDNA geotypes (haplotypes). Introductions of genetically tagged offspring from rare mtDNA haplotype females into the upper Laguna Madre could occur as early as late Fall 1990. Among other questions that could be addressed by using reliable genetic tags are what are the survival rates of stocked fish, and what are the optimal times to stock to ensure high rates of survival.

Larval Red Drum (*Sciaenops ocellatus*) Transport in Non-Stratified Estuaries

Scott A. Holt .....(512)749-6715
The University of Texas Marine Science Institute, Port Aransas, Texas 78373

Populations of several commercially and recreationally important fish species in the coastal regions of the Gulf of Mexico have declined significantly in recent years. Information on the mechanisms of transport from spawning area to nursery ground will aid managers in protecting the wild stocks and will significantly improve prospects for larval stocking or enhancement programs that are currently being pursued in several states. Red drum larvae migrate vertically in response to tidal stage, presumably to take advantage of lower current speeds near the water sediment boundary layer, in a process called selective tidal stream transport. This project will examine the temporal precision of this migration through die sampling of fish larvae at the surface and bottom over a tidal cycle in both the tidal inlet and in the lower estuary. The biological data will be compared to concurrently acquired hydrographic data and a hydrographic model to evaluate the relative importance of behavioral responses] relative to physical processes. These results will substantially improve understanding of the timing of vertical movement relative to tidal stage and will aid in elucidating the cues involved in initiating the response.

Field Verification and Application of a Host-Parasite Model for Fisheries Management of Significantly Impacted Oyster Populations

Dr. Eric N. Powell .....(409) 845-3921
Department of Oceanography, Texas A&M University, College Station, Texas 77843

Parasites such as *Perkinsus marinus* and *Boonea impressa* can reduce oyster growth rates, adversely affect reproductive capacity and produce mortality. In most Texas bays, oysters are energy limited either because food availability is low or parasites reduce oyster net productivity by using some of the oyster's assimilated energy. This project will finish development of a host-parasite energetics model to assess the ecological and commercial impact of parasitism on oyster populations in food-limited and food-unlimited conditions; assess management under the working hypothesis that most recruitment is locally derived, and test selected predictions to ascertain the adequacy of the model; and lay the groundwork for developing a model to examine the primary alternative condition, that most recruitment is not locally derived. In concern with model development and testing, additional data required to strengthen the model will be collected on the division of energy between growth and reproduction, growth rates and transmission rates of *P. marinus*, and feeding rates in the field under various regimes of current flow and food content.

Biology of the Kemp's Ridley Turtle

Dr. David W. Owens .....(409) 845-7783
Department of Biology, Texas A&M University, College Station, Texas 77843

This project will study the behavior and physiology of hibernation in three species of sea turtles using laboratory experiments. Similarly, the behavioral and hormonal regulation of courtship, mating, ovulation and nesting in a captive colony of adult Kemp's ridleys will be studies at Sea World of Texas in San Antonio. The important question of chemosensory imprinting will be tested in ridleys at a new facility constructed for that purpose at Texas A&M University. Using aerial surveys along the coast of south Texas and northern Mexico we will search for the courtship and mating grounds of the Kemp's ridleys. Several studies designed to evaluate the biological meaning of temperature-dependent sex determination that produces skewed sex ratios in nearly all sea turtle populations studied to date will be continued.

Natural History Analysis of Sea Turtles in the Northwestern Gulf of Mexico

Dr. Andre M. Landry, Jr. .....*(409) 740-4448*
Department of Marine Biology, Texas A&M University at Galveston, P. O. Box 1675, Galveston, Texas 77553

Natural history data prerequisite to understanding the biology of critically endangered sea turtle species such as the Kemp's ridley and ensuring their survival will be generated through Aug. 31, 1991. Netting surveys and tag-release-recapture experiments will define species composition, spatial and temporal occurrence and habitat preference of sea turtles in nearshore and estuarine habitats along the Texas and southwestern Louisiana coasts. Radio-and sonic-tracking experiments conducted by the National Marine Fisheries Service on turtles taken during these netting surveys will provide information on behavior movements and habitat use by sea turtles in nearshore Gulf and estuarine waters. Aerial surveys and ground-truthing will document nesting activity along selected Texas barrier island beaches and provide information on sea turtle occurrence in nearshore Gulf waters. Necropsy of stranded carcasses will produce natural history information on sex, reproductive status, food preferences, possible food origin and ingestion of debris, as well as data on human-inflicted mutilation.

Acid-base Consequences of Enforced Diving in *Lepidochelys kempi*

Dr. T.A. Heming .....*(409) 761-2436*
Laboratory (409) 761-3120
Pulmonary Medicine, The University of Texas Medical Branch, Galveston, Texas 77550

The enforced submergence of Kemp's ridley sea turtles, for even the short period of time required for successful trawl escapement via a turtle excluder device (TED), can induce a significant metabolically related blood acid-base imbalance. Other research suggests that sea turtles may be ill-equipped to compensate for such acid-base imbalances. These data raise interesting questions regarding the effect of submergence time on blood acid-base status and on the recovery period required to compensate for the resultant imbalance. This project is determining the effects of extended enforced submergence on blood acid-base status and monitoring post-dive acid-base recovery through serial blood sampling. The physiological constraints required to correct measured blood pH, and blood gas levels to animal body temperature will be determined. The resulting data will be used to design and evaluate management strategies to minimize mortality of sea turtles due to incidental capture in shrimp trawls.

Vulnerability of Red Drum (*Sciaenops ocellatus*) Larvae to Predatory Fishes

Dr. Lee A. Fuiman .....*(512) 749-6775*
The University of Texas Marine Science Institute, Port Aransas, Texas 78373

Mesocosms are important tools for fishery research but are used primarily with less mobile predators (invertebrate macrozooplankton) in deep water. The great importance of fishes as predators of fish larvae demands that mesocosm studies be extended, and the shallow bay habitat of Texas places additional constraints on mesocosm design. This research will establish a protocol for conducting predation experiments in mesocosms. The size of mesocosm necessary to minimize effects of containment on predation rates will be determined, appropriate initial stocking levels will be established, and predator species amenable to this type of experimentation will be identified.

Environmental Studies

Pollutant Metal Removal and Release Via Reactions with Sedimentary Pyrite

Dr. John Morse .....(409) 845-9630
Department of Oceanography, Texas A&M University, College Station, Texas 77843

Transition and heavy metals constitute an important group of toxicants in many marine and estuarine environments. A knowledge of their concentration, distribution, chemical form, reactivity and availability to organisms is essential to understanding their potential impact on the ecosystem. The primary sink for these metals is in sediments. One of the most important chemical transformations that occurs to metals in sediments is their movement to pyrite as coprecipitates. While pyrite is stable under the anoxic conditions found in sediments, it can rapidly oxidize if resuspended, resulting in release of metals in a reactive form to the water column. The resuspension of sediments is a common occurrence in coastal Texas, such occurring both as the result of natural processes such as storms and through human activities such as dredging and bottom trawling. The primary objective of this research is to determine the potential impact of activities that suspend anoxic sediments, such as dredging, on the release of toxic metals to the water column in Galveston Bay. It will be possible to assess which areas of the bay will be most severely impacted by such activities, and make significantly better estimates of the likely magnitude of metal release to be encountered.

Predictive Methods for Salinity Intrusion in Galveston Bay

Dr. George H. Ward .....(512) 471-0114
Center for Research in Water Resources, The University of Texas at Austin, 10100 Burnet Road, Austin, Texas 78758-4497

A central feature of the hydrography of many estuaries, including the major Texas bays, is salinity intrusion induced by ship channels. The physical process is that of a density current, but in order to evaluate and predict its effect on salinity, three major mathematical aspects pose problems that must be overcome-nonlinear coupled equations of motion and transport (including density effects on turbulence; representation of three-dimensional processes; and resolution of a very small geometrical feature (the channel) within a larger water body. This study will examine methods for handling these problems in a numerical model. The approach will be to test various solution methods using a geometrically idealized model, then extend the most satisfactory schemes to a numerical model of Galveston Bay and compare the model predictions to historical salinity data.

Nutrient Flow from Seagrass Detritus to Food Webs in the Laguna Madre Estuary

Dr. Ronald Benner .....(512) 749-6772
The University of Texas Marine Science Institute, Port Aransas, Texas 78373

The Laguna Madre estuary on the south Texas coast is one of the most productive estuaries in the region. Seagrass flourishes in the clear, shallow waters of the estuary, and there is strong evidence that seagrass-derived nutrients support food webs leading to economically important finfish. Direct grazing of seagrass biomass by animals is minimal because of the abundance of relatively indigestible structural polysaccharides and the occurrence of inhibitory phenolic compounds in seagrass tissues. Microorganisms, predominantly bacteria, are primarily responsible for the degradation of vascular plant tissues in marine environments, and it, therefore, follows that bacteria may play a vital role in the transfer of nutrients from seagrass detritus to animals. In addition to an abundance of particulate detrititis in the Laguna Madre, concentrations of dissolved organic matter (DOM) are high and likely to be of seagrass origin. Bacterial utilization of this DOM may also function to channel seagrass-derived nutrients to animals via the microbial loop. A variety of state-of-the-art techniques and methods will be used to investigate the role of bacteria as a link or sink in food webs of the Laguna Madre.

Loss of Seagrass Habitat and Its Management in Texas Estuaries: Photosynthesis Production Along an Estuarine Gradient

Dr. Kenneth H. Dunton .....(512) 749-6744
The University of Texas Marine Science Institute, Port Aransas, Texas 78373

Seagrass meadows are the greatest source of primary production along the south Texas coast, serving as food and habitat for a variety of marine animals and waterfowl of substantial economic importance. Despite this, there are no quantitative means to assess the response of these plants to environmental distur-

bances that result from coastal discharges, dredging and boat and ship traffic. This project will use *in situ* continuous measurements of irradiance, the major factor regulating growth and distribution of seagrass beds in a subtropical continuous measurements of irradiance, the major factor regulating growth and distribution of seagrass beds in a subtropical estuarine environment. Research will be conducted along an estuarine gradient of freshwater and nutrient input on two common seagrass species in south Texas. A knowledge of the factors that regulate seagrass production will be used to determine the critical minimum length of time (on a daily basis) that seagrasses require at their photosaturation level to meet both growth and metabolic demands.

Studies of Hydrocarbon Seep Communities on the Texas/Louisiana Continental Slope

Dr. James M. Brooks .....*(409) 690-0095*
10 South Graham Road, College Station, Texas 77845

The widespread occurrence of seep communities, hydrocarbon seepage and gas hydrates on continental slopes suggests that these environments are an important component of slope ecology. The seep areas have been sampled and surveyed using both surface ships and submersibles. Extensive biological communities are observed around numerous hydrocarbon seeps in the northern Gulf of water depths >400m. The common features of these communities are animals (tube worms, clams and mussels) containing endosymbiotic, chemoautotrophic bacteria that use H_2S, CH_4 and possibly other reduced substrates. These communities are closely associated with the seeps and are dependent on them for nutritional input. This project will describe these communities, their surrounding environment and evaluate their interrelationships with hydrocarbon seepage. These slope communities contain significant concentrations of biomass that are located near Gulf of Mexico fisheries and many present day and future sites of oil development.

Detecting Clathrate Concentrations through High Resolution Seismic Velocity Analysis of Shallow Sediments

Dr. P.L. Stoffa .....*(512) 471-0464*
Institute of Geophysics, The University of Texas at Austin, Austin, Texas 78759

Many seismic zones off the coast of South Carolina (some of them single channel) show acoustically transparent areas below the water bottom. If these characteristics can be associated with changes in velocity and changes in gas hydrate content, the amount of methane incorporated as ice in the Blake Ridge area can be estimated. This study will provide an accurate map of the lateral velocity variations in the upper kilometer of sediment in the area of seismic line BA-6 off the South Carolina coast, and look for a correlation between seismic interval velocity and areas of decreased reflectivity several hundred meters below the water bottom.

Isolation of Viral Pathogens Which Infect Toxic and Economically Important Phytoplankton Species

Dr. Curtis A Suttle .....*(512) 749-6733*
The University of Texas Marine Science Institute, Port Aransas, Texas 78373-1267

Toxic and nuisance phytoplankton blooms have severely affected the Texas coast and elsewhere, and isolation of algal viruses may identify biological control agents. The project will concentrate viruses from a variety of marine habitats using ultrafiltration; test viral concentrates against isolates of environmentally and economically important phytoplankton; isolate pathogenic viruses into univiral/unialgal cultures; and characterize viral isolates using electron microscopy.

Histopathology of Demersal Fishes from the Gulf of Mexico: Effect of the MEGA BORG Oil Spill

Dr. William E. Haensly .....*(409) 845-3185*
Department of Veterinary Anatomy, Texas A&M University, College Station, Texas 77843

The June 1990 explosion of the supertanker MEGA BORG and subsequent spill of light crude oil provides an opportunity to study the impact and time course of biological recovery from a pollution incident. This project is assessing the degree of pollutant stress experienced by representative species of fish adjacent to the Gulf of Mexico spill site. A histopathological survey will be conducted on representative demersal fishes sampled at the site one week after the spill, and seasonally thereafter for the next two years.

Mercury Bioavailability from Contaminated Sediments to Oysters and Other Commercially Important Species in Lavaca Bay, Texas

Dr. B.J. Presley .....*(409) 845-5136*
Department of Oceanography, Texas A&M University, College Station, Texas 77843

The closure of parts of Lavaca Bay to the taking of

fish and crabs has had a major economic impact on the local economy. Similar heavy metal contamination events can be anticipated in Texas bays and estuaries unless a better understanding of the sources, sinks and pathways of movement of heavy metals can be obtained and ways to mitigate effects can be devised. This project is documenting the transfer mechanisms of mercury between sediments, water and organisms, and investigate the role of dredging and trawling in transferring mercury from the environment to commercially important fish and shellfish. The spatial and temporal extent of mercy contamination in Lavaca Bay will be determined, and the feasibility of reducing mercury levels in crabs and oysters by depuration or by removing or capping contaminated sediment will be tested.

Adhesins of *Vibrio vulnificus* as Potential Mediators of Attachment to Human Epithelial Cells

Dr. Rita M. Gander .....*(214) 590-5408*
Department of Pathology, The University of Texas Southwestern Medical Center, 5323 Harry Hines, Dallas, Texas 75235-9072

Vibrio vulnificus is a common contaminant of oysters harvested from the Gulf coast area. In 1988, the Texas Department of Health reported significant morbidity and mortality due to *V. vulnificus* infections. This study will investigate adhesins of *V. vulnificus*, potential virulence factors that may contribute to pathogenesis in humans. Characterization of these adhesins may facilitate development of an oyster screening procedure to detect *V. vulnificus* strains with increased potential for causing disease in man.

Coastal Ocean Program

Nutrient Enhanced Coastal Ocean Productivity

Scales of Spatial and Temporal Variation of Nutrients and Pigments within the Outflow of the Mississippi River Plume Shelf Ecosystem

Dr. Terry E. Whitledge .....*(512) 749-6769*
The University of Texas Marine Science Institute, Port Aransas, Texas 78373

This project will examine the mesoscale variability of the spatial and temporal distributions of nutrients and plant pigments that are associated with the Mississippi River plume and its subsequent farfield effects in the hypoxic and shelf-slope zone of deposition and regeneration. The resulting measurements will be coupled to physical measurements of salinity and temperature determinations on the *in situ* instrumentation and will allow a determination of dominate spatial and temporal scales of physical, chemical and biological parameters. The dominate forces regulating chemical and biological properties at the mouth of the Mississippi River and the nearby shelf-slope area will be documented.

The Fate and Effects of Riverine (and Shelf-derived) Dissolved Organic Matter on Mississippi River Plume/Gulf Shelf Processes

Dr. Ronald Benner .....*(512) 749-6772*
The University of Texas Marine Science Institute, Port Aransas, Texas 78373

A major objective of the Coastal Ocean Program is to understand the effects of riverine nutrients on coastal productivity. The transformations and fates of riverine and marine-derived dissolved organic matter (DOM) will be studied. The production of bacterial biomass and regeneration of nutrients from DOM will be determined, as well as the effects of riverine DOM on heterotrophic oxygen utilization.

NECOP: Benthic Metabolism Measured with the GOMEX Benthic Lander

Dr. Gilbert Rowe .....*(409) 845-7211*
Department of Oceanography, Texas A&M University, College Station, Texas 77843-3146

Benthic metabolism assessment is an integral part of coastal ocean studies since the bottom can be a major loss of fixed carbon produced by river-en-

hanced productivity. This project will determine the fluxes of carbon, nitrogen and oxygen across the sediment-water interface in relation to primary production enhanced by the Mississippi River. Three areas of study (the Galveston transect, regions of seasonal hypoxia, and the river plume) will allow comparison of organic carbon loss to the bottom versus regeneration, relative importance of oxygen metabolism versus other oxidants, relationship of benthic carbon stock size (biomass) to sediment fluxes, and alteration of feedback mechanisms and foodchains by intermittent hypoxia. Results will aid in assessing the role of rivers in the global carbon cycle.

Satellite Estimation of Surface Flow Fields, Mesoscale Variability and River Plume Evolution on the Texas-Louisiana Shelf

Frank Kelly .....*(409) 845-3584*
Department of Civil Engineering, Texas A&M University, College Station, Texas 77843
Dr. Andrew C.Vastano .....*(409) 845-9826*
Department of Oceanography, Texas A&M University, College Station, Texas 77843

From field and satellite observational programs elsewhere, frequent events have been identified in which small-scale, short-duration episodes dominate circulation and plume evolution. The key to adequate spatial and temporal definition of these events is real-time and retrospective satellite observation and analysis. This project will generate satellite-derived synoptic maps of sea surface currents and the Mississippi/Atchafalaya plumes at sub-mesoscale spatial resolution. These maps will be analyzed to determine the environmental variability quantitatively. Corresponding research projects will then be provided with sea-surface temperature distributions and quantitative surface flow fields that allow shipboard modification of cruise tracks and sampling strategies.

The Impacts of Hypoxia on Benthic Populations and Fisheries Resources

Dr. Donald Harper .....*(409) 740-4540*
Department of Marine Biology, Texas A&M University at Galveston, P.O. Box 1675, Galveston, Texas 77553

The largest, most persistent zone of hypoxia in U.S. coastal waters occurs in the northern Gulf of Mexico, which is also one of the nation's richest fishing grounds. Twenty-eight percent of the U.S. total catch comes from Louisiana. Fish, shrimp and benthic organism densities are depressed in these hypoxic zones, and the hypoxic water mass may impede the migration of species moving offshore to spawn. This research will assess the direct impacts of hypoxia on populations of demersal and benthic species.

Nutrient Enhanced Coastal Ocean Productivity: The Role of Phosphate

Dr. James Ammerman .....*(409) 845-5105*
Department of Oceanography, Texas A&M University, College Station, Texas 77843

This project will evaluate the role of phosphate in nutrient-enhanced coastal ocean productivity. The turnover time, biological availability and inventory of various phosphate species and the demand or organize phosphate will be determined.

Determination of Variations in the Dissolved Inorganic Carbon System as Part of NECOP

Dr. John Morse .....*(409) 845-9630*
Department of Oceanography, Texas A&M University, College Station, Texas 77843

Components of the dissolved inorganic carbon system constitute a major fraction of the dissolved carbon in seawater and must be determined as part of any carbon budget. This project will determine the concentration and variability of components of the carbon dioxide-carbonic acid system in the coastal ocean study area, and will estimate fluxes in this system as part of the determination of the carbon budget. Study of this system is central to interpretation of the variability of oxygen and nutrients.

Nutrient Enhanced Coastal Ocean Productivity: Sources and Fate of New Production

Dr. L.A. Cifuentes .....*(409) 845-3380*
Department of Oceanography, Texas A&M University, College Station, Texas 77843

This project will test the hypothesis that inputs of growth-limiting nitrogeneous nutrients from rivers into the adjacent Louisiana Shelf result in enhanced "new" production. The rapid decrease in nitrogeneous nutrient concentrations in river plumes suggests that the bulk of dissolved inorganic nitrogen (DIN) from the river is incorporated quickly into "new" production. The sources of "new" nitrogen, the fate of the enhanced production and its effect on the productivity beyond the plume region will be examined.

Estuarine Habitat Research

An Ecosystem Comparison of Transplanted and Native Salt Marshes: The Chronological Development of Habitat Value for Fishery Species

Dr. James W. Webb .....*(409) 740-4542*
Department of Marine Biology, Texas A&M University at Galveston, P.O. Box 1675, Galveston, Texas 77553

Dr. William J. Wardle .....*(409) 740-4540*
Department of Marine Biology, Texas A&M University at Galveston, P.O. Box 1675, Galveston, Texas 77553

The salt marsh loss rate in the northern Gulf of Mexico is alarming. Although salt marshes can be re-established, development of functional equivalency of restored or transplanted marshes to natural marshes requires knowledge of the requirements or manner in which meiofauna, macroinfauna, and natant macroinfauna utilize the salt marsh plant community. This project will characterize 10 transplanted/restored marshes and five natural marshes by overall morphology, hyrdoperiod, slope, elevation, amount of marsh edge, percent open water, sediment organic content, and grain size and growth of *Spartina alterniflora* and benthic and epiphytic algae.

Texas Marine Advisory Service Projects

Gulf Coast Fishing Vessel Safety Training Program

Dewayne Hollin .....*(409) 845-3857*
Marine Business Management Specialist, Sea Grant College Program, Texas A&M University, College Station, Texas 77843-4115

The Gulf Coast fishing industry is a multi-million dollar industry composed of thousands of small, independently operated fishing businesses that are unable to develop their own safety training materials and programs. Casualty data reflects high accident rates in all sectors of this industry. The Gulf Coast Fishing Vessel Safety Training Program offers a low cost, 12-hour program on vessel safety orientation, basic navigation and rules of the road, survival training, fire fighting, and at-sea medical emergencies. A 270-page manual provides the basic information for the training effort and video tapes are used with hands-on demonstrations of safety and survival equipment. This program is certified by the U.S. Coast Guard and supported by marine insurance brokers and underwriters, commercial fishing trade associations and marine surveyors. It also has been mentioned as a pre-requisite for proposed licensing of commercial fishing vessel personnel.

Fuel Efficiency Analysis of Trawl Nets in Gulf of Mexico Shrimp Fisheries

Gary Graham .....*(409) 762-9800*
Marine Fisheries Specialist, Sea Grant College Program, P.O. Box 1675, Galveston, Texas 77553-1675

Shrimping is a fuel-intensive industry. More than one-third of the diesel fuel consumed in the U.S. fisheries is by Gulf of Mexico shrimp vessels, and more than 70 percent of this consumption is associated with trawling during shrimping operations. Eighty percent of the overall pull on the gear is distributed on the trawl nets. This project is evaluating new technology that permits more durable but smaller diameter twine to be used in shrimp net construction. Mensuaration equipment is being used to measure drag on various sizes of twine used in net construction. Measurements also are being made of the amount of drag on four different types of nets, the net configuration by vertical and horizontal spread, catch efficiency of each net, and over-all fuel consumption

generated by each net. In the second phase of the project, commercial fishermen will perform comparative studies between the new fiber types and traditional nylon webbing. Catch rates, trawl durability and increased fuel economy are parameters being determined by project participants. The resulting data will be published and used at workshops and in on-board demonstrations in 1991.

Texas Recreational Boating Facilities Database

Dewayne Hollin .....*(409) 845-3857*
Marine Business Management Specialist, Sea Grant College Program, Texas A&M University, College Station, Texas 77843-4115

Boating facilities throughout Texas have been inventoried since 1986 to determine operational and business activity levels of more than 300 Texas marine businesses. The size of the marina facilities, vacancy rates, dry storage, launch ramps, types of services, sales volume, employment, management, ownership and other topics were surveyed. Annual updates of this survey have been used extensively by state and local government agencies to document industry impacts and influence. The Texas marina industry uses the data to demonstrate its importance to local and state-wide economies and to measure growth in recreational boating and changes in industry services and boating facilities. The industry also uses the data to stay informed of the needs as well as needed changes in recreational boating statewide. The Marina Association of Texas has been an active co-sponsor of this effort.

Evaluation of Water Filtration Systems for Aquaculture Projects

Dr. Russell Miget .....*(512) 749-5207*
Marine Fisheries Specialist, P.O. Box 158, Port Aransas, Texas 78373

Regulatory agencies have recommended that intake water for coastal aquaculture projects must be filtered through 0.5 mm mesh screen and that the intake velocity not exceed 0.5 feet per second to prevent uptake and possible destruction of fish eggs and larvae. Nearly all aquaculture operators filter their intake water at some point to approximately 0.5 mm size to avoid introduction of predators into the ponds, usually at the post-pump location. Screening techniques have not been designed, however, to minimize impact on fish eggs and larvae. This project, co-sponsored by the Texas General Land Office, is evaluating various water filtration systems for possible impacts. Various systems have been researched and evaluated, and a prototype has been built for further evaluation. Project results are now being analyzed.

Economic Feasibility of Offshore Net-pen Finfish Culture

Dr. Russell Miget .....*(512) 749-5207*
Marine Fisheries Specialist, P.O. Box 158, Port Aransas, Texas 78373

The declining natural populations of finfish compounded by increasing consumer demand present options of either continuing to import finfish or to raise commercially important species under culture conditions. A pilot project in cooperation with a major offshore oil and gas company is determining the commercial feasibility of cost sharing of resources and technology between the company's offshore operations and that of aquaculture. Two pilot scale net-pen structures have been built, deployed underneath an offshore gas platform and stocked with 10,000 redfish. These systems will be used to examine growth rates, food conversion and fouling in the offshore environment. A spar buoy-type net-pen has also been deployed adjacent to the platform and anchored to the ocean bottom, and 10,000 redfish fingerlings have been stocked in this pen. The critical aspect of this larger net-pen is to determine its ability to withstand winter currents and waves in the Gulf of Mexico. If these projects prove successful, such species as red snapper, yellowtail snapper, grouper, dolphin and pompano will be evaluated in similar net-pens.

Greenhousing Ponds to Assess the Feasibility of Overwintering and Headstarting Red Drum

Willie Younger .....*(409) 244-7650*
Matagorda County Marine Agent, Room 326 Courthouse, Bay City, Texas 77414

The primary obstacle to pond production of red drum large enough for the food market has been overwintering young fish to permit stocking larger fish into the ponds in the spring. Greenhouse applications in various aquaculture operations throughout the United States and other temperate weather countries have been proven to be successful in reducing and/or eliminating winter kill for certain species and, thus, extending the growth period. This has not, however, been fully tested for cultured red drum in Texas. Nursery-type greenhouses are used to cover quarter-acre ponds stocked with redfish fry or finger-

lings. Survival, growth rates, food conversion ratios and overall health will be evaluated and compared to non-covered, identically sized ponds during cold weather periods. This project is now in its second year; results will be available in 1991.

Summer Ocean Awareness Retreat

Willie Younger .....*(409) 244-7650*
Matagorda County Marine Agent, Room 326 Courthouse, Bay City, Texas 77414

For the past several years, Texas Marine Advisory Service agents and specialists have conducted a Summer Ocean Awareness Retreat (SOAR) on Matagorda Island each summer for area students. The project is co-sponsored by county 4-H clubs, Sea Grant and the Texas Agricultural Extension Service in conjunction with the U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department. Students spend approximately one week on Matagorda Island, where they are exposed to marsh ecology, marine biology, dune ecology, fish identification and conservation, and barrier island ecology. All classes are taught by MAS personnel. This program has been a highly successful educational marine retreat, and, as such, continues as an annual event.

Bay Shoreline Erosion Control through Smooth Cordgrass Plantings

Robert Nailon .....*(409) 267-3185*
Chambers and Harris Counties Marine Agent, Courthouse Annex, 1222 Main Street, P.O. Box 699, Anahuac, Texas 77514

This project began as a pilot effort in 1985 in Chambers County to add marshland along the shores of Galveston Bay, provide a buffer for eroding wave action, and enhance marsh habitat in the bay ecosystem. In a cooperative effort with the U.S. Soil Conservation Service, smooth cordgrass has been transplanted in an eroding shoreline area and stabilized by surplus parachutes that are slit and staked along the leading edge of the transplants. High school students are employed to assist with these efforts. Until recently, the project has been supported by Sea Grant, the Texas Agricultural Extension Service, U.S. Soil Conservation Service, Brown Foundation, Moody Foundation and the Texas General Land Office. More recently, the Environmental Protection Agency (EPA) has awarded a $75,000 grant through the Galveston Bay National Estuary Program to continue and expand this project over a two-year period. The results of this effort will then be transferred to other coastal areas of the United States as an EPA demonstration project.

Turtle Excluder Devices (TEDs)

Gary Graham .....*(409) 762-9800*
Marine Fisheries Specialist, Sea Grant College Program, Texas A&M University, P.O. Box 1675, Galveston, Texas 77553-1675

Examination, testing and demonstration of various TED devices continues. These efforts have resulted in numerous workshops and on-board demonstrations to aid in the refinement, acceptance and introduction of TEDs in the Texas shrimping industry. The most recent result is a Texas Marine Advisory Service fact sheet, *Solving Problems with TEDs*. The project coordinator also has received a $36,400 grant for "TED Technology Transfer in the Texas Shrimp Fishery," and a $96,500 grant for "Finfish Bycatch Reduction in the Texas Shrimp Fishery."

Telephone Directory

A

Ammerman, James ..... (409) 845-5105

B

Benner, Ronald ..... (512) 749-6772
Bright, Thomas J. ..... (409) 845-3854
Brooks, James M. ..... (409) 690-0095
Broussard, Amy ..... (409) 762-9800
Burton, Ronald S. ..... (713) 749-4778

C

Carlile, Debbie ..... (409) 845-7524
Casteel, Pamela ..... (409) 762-9800
Cifuentes, L. A. ..... (409) 845-3380

D

DeMichele, Leonard ..... (409) 845-5777
Dunton, Kenneth H. ..... (512) 749-6744

E

Emmert, Nathaniel ..... (409) 762-9800

F

Fisher, William S. ..... (409) 761-2133
Fuiman, Lee A. ..... (512) 749-6775

G

Gander, Rita M. ..... (214) 590-5408
Gatlin, Delbert M. ..... (409) 845-5777
Gold, John R. ..... (409) 845-5777
Graham, Gary ..... (409) 762-9800
Guseman, L. F., Jr. ..... (409-845-3631

H

Haby, Michael ..... (512) 749-5207
Haensley,William E. ..... (409) 845-3185
Harper, Donald E. ..... (409) 740-4540
Hegen, Annette Reddell ..... (512) 749-5207
Heming, T. A. ..... (409) 761-2436
(409) 761-3120
Hightower, Mike ..... (409) 845-7524
Hollin, Dewayne ..... (409) 845-3857
Holt, Scott A. ..... (512) 749-6715

J

Johnson, S. K. ..... (409) 845-5777

K

Keeley, Larry ..... (409) 845-9727
Kelly, Frank ..... (409) 845-3854

L

Landry, Andre M., Jr. ..... (409) 740-4448
Lee, Phillip ..... (409) 761-2133
Liles, Cindy ..... (409) 845-3854

M

MacKenzie, Duncan S. ..... (409) 845-7701
Martin, Allen ..... (409) 845-3855
Miget, Russell J. ..... (512) 749-5207
Morse, John ..... (409) 845-9630
Moss, Charles G. ..... (409) 849-5711, ext. 1564
(409) 265-4261 ext. 1564

N

Nailon, Robert ..... Anahuac (409) 267-3185
Houston (713) 855-5600

O

O'Neal, David R. ..... (409) 762-9800
Owens, David R. ..... ((409) 845-7783

P

Pagans, Ken ..... (512) 265-9203
Powell, Eric N. ..... (409) 845-3921
Presley, B.J. ..... (409) 845-5136

R

Reisinger,Tony ..... (512) 399-0125
Rowe, Gilbert T. ..... (40j9) 845-7211
Russell, Mel C. ..... (713) 534-3413
Houston (713) 337-2575 ext. 196
Galveston (409) 945-2581 ext. 196

S

Scogin, Malon ..... (409) 835-8461
Sigurdson, Chris ..... (409) 762-9800
Surovik, Joe T. ..... (512) 552-9747
Stoffa, P. L. ..... (512) 471-0464
Suttle, Curtis A. ..... (512) 749-6733

T

Thomas, Peter ..... (512) 749-6768
Tidwell, Jamey ..... (409) 762-9800
Tillman, Richard ..... (512) 758-5671
Tinnin, Richard K ..... (512) 749-6729
Treece, Granvil ..... (409) 845-7527

V

Vastano, Andrew C. ..... (409) 845-9826

W

Wager, Connie ..... (409) 845-3855
Ward, George H. ..... (512) 471-0114
Wardell, William J. ..... (409) 740-4540
Webb, James ..... (409) 740-4542
Weldon, Paul J. ..... (409) 845-7766
Whitledge, Terry E. ..... (512) 749-6769

Y

Younger, Willie ..... Bay City (409) 244-7650
Palacios (512) 972-5556

Single copies free
Sea Grant College Program
Texas A&M University
P.O. Box 1675
Galveston, Texas 77553-1675

TAMU-SG-91-601
2M October 1990
NA89AA-D-SG139
A/I-1