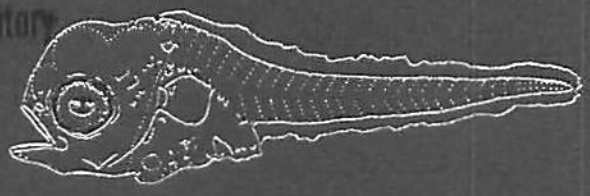

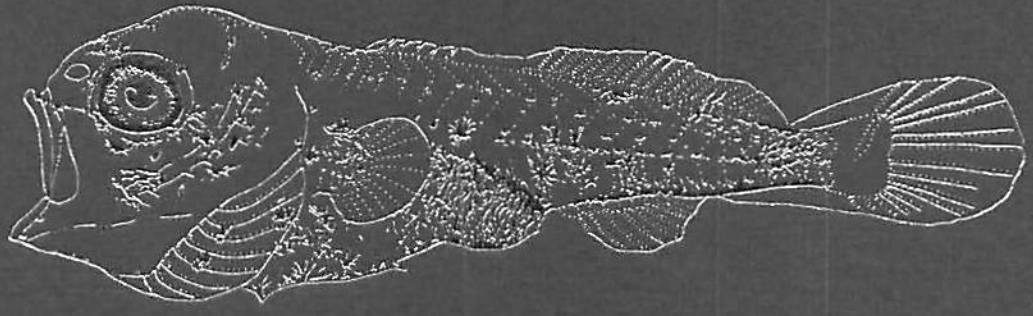

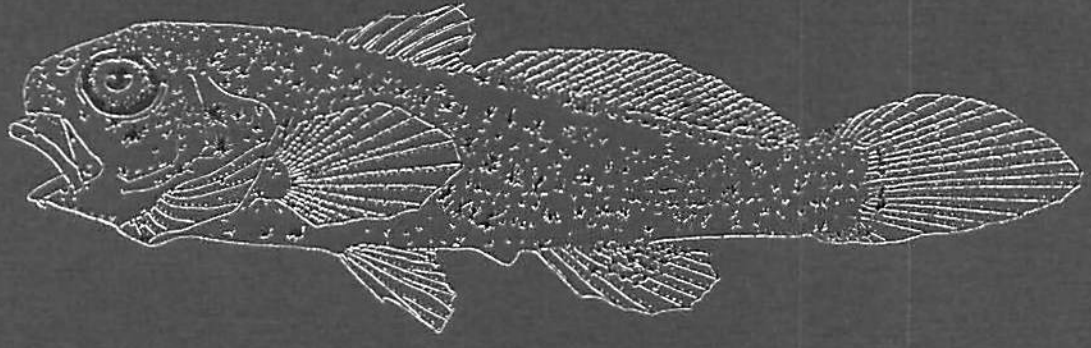

1981 ANNUAL REPORT

Mississippi-Alabama Sea Grant Consortium

January 1, 1981 to June 30, 1982

MASGP-82-020

Cover drawing by David Rupple, Gulf Coast Research Laboratory.

Members of the family Sciaenidae are among the most numerous and important fishes occurring in the northern Gulf of Mexico. Several species are sought by coastians for their recreational and commercial value. Among these are the Gulf whiting (Menticirrhus littoralis), which is common in the surf and other nearshore regions of our barrier islands.

Larvae of the Gulf whiting undergo a dramatic transformation from the time of hatching to the early juvenile stage, as illustrated here. These specimens, 2.8, 5.5, and 13.5 mm in length, show the early development of the Gulf whiting.

The actual sizes of the larvae are shown here.

Consortium Member Institutions

Auburn University
Auburn, Alabama

Gulf Coast Research Laboratory
Ocean Springs, Mississippi

Jackson State University
Jackson, Mississippi

Mississippi State University
Starkville, Mississippi

Tuskegee Institute
Tuskegee, Alabama

University of Alabama
Tuscaloosa, Alabama

University of Alabama in Birmingham
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University of Mississippi
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Mobile, Alabama

University of Southern Mississippi
Hattiesburg, Mississippi

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1981 Annual Report
Mississippi-Alabama Sea Grant Consortium

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Contents

Editor's Preface

This report covers the period from January 1, 1981 to June 30, 1982 and represents the combined efforts of the Mississippi-Alabama Sea Grant Consortium's ten member institutions.

The program presents a coherent group of projects oriented toward information analysis and problem solving. As in the previous year the program emphasis this year has continued on the marine and estuarine resources of the two state region while maintaining a balance in the program between research, education and advisory services.

Recognizing the development and maturation of the program the National Sea Grant Review Panel on June 9, 1982 recommended to the Department of Commerce that the Consortium be designated a Sea Grant College. On September 23, 1982 Secretary of Commerce Malcolm Baldrige elevated the Consortium to Sea Grant College status. The credit for this accomplishment belongs to the leadership provided by the Director and his staff, to those projects covered in this report and in a large measure to those researchers, educators and advisory service people of the past who have laid the foundation upon which the present program is built.

Max Flandorfer
Editor

Modern and Ancient Sedimentary Process and Response Within the Mississippi-Alabama Linear-Barrier-Coastal System

Frederick H. Manley, William R. Reynolds, Albert C. Staheli, and Ray L. Frederking
University of Mississippi

SUMMARY: The 1981 program concentrated its efforts on erosion and transport of upland materials into Mississippi Sound, the evolution of coastal geomorphic features, and depositional response patterns in surface and shallow sub-surface sediments in the central and western Sound and Lake Borgne.

By gaining a thorough understanding of the normal geologic processes in the formation of the Mississippi-Alabama coasts it will be possible to develop a predictive capability for the area. Normal and catastrophic geologic processes and man's intervention whether by dredging, filling or pollution can have profound and long lasting results. Knowing what past responses to different forces have been, one can best understand the ramifications of future processes and reduce if not eliminate harmful effects.

This year the second season of vibracore sediment sampling was completed. The Mississippi-Alabama Sea Grant Consortium comprehensive sampling program, operating with the principal investigators and students, obtained vibracores in the western portion of Mississippi Sound to the mouth of Lake Borgne.

The core locations were taken at seismic shot-points, along high resolution seismic survey lines previously acquired by other consortium researchers. These cores will aid in the interpretation and correlation of the lithologic and textural characteristics of the bottom sediments with the high-resolution seismic profiles. These high-resolution seismic profiles will aid in the assessment of the lithologic changes within the sediments of the Sound.

The vibracores, augmented by gravity cores taken with a project designed corer, bottom grabs and land based cores, were correlated with high resolution seismic profiles and satellite imagery to compile a substantial overall data base of the physical and chemical sedimentary processes in the Mississippi-Alabama coastal region.

Some important tasks that are or will be completed soon as master's theses include:

Particle size distribution, clay matrix composition, and the mineralogy of silt and clay fractions of central and western Mississippi Sound and Lake Borgne. These studies indicate that clay-mineral distributions are good indicators of sediment dispersal patterns through most of the Holocene layer.

A relict spit and barrier ridge located just north of Biloxi Bay, important to the overall sedimentary response study of the Sound, was examined. Sediment, sedimentary structure, map and aerial photo analysis indicate three subparallel relict coastal ridges north of Back Bay have been formed through the interactions of beach, dune, tidal channel and fluvial environments in response to coastal processes related to sea level changes.

Complementary studies to determine the sediment resources which produced the present and near present sedimentation patterns of the Sound and the delineation of heavy mineral provencis within the sediments of the Pearl River channel from central Mississippi to the coast have been completed. These studies indicate that earlier sediment dispersal patterns are similar to the present and that the Pearl River does not contribute a major portion of the bedload sediment east of the Lake Borgne-Mississippi Sound juncture. Three sources of bedload sediment at the mouth of the Pearl River are the river itself, longshore transport from the east, and erosion of the Mississippi Delta in the Lake Borgne area.

Publications

"Coring Mississippi Sound: An example of a geological engineering problem solved through interdisciplinary cooperation." 1981. Manley, F.H., Staheli, A.C., Fox, J.A., Feifarek, M.J., and Flandorfer, M., Geological Society of American Abstracts with Programs, 13(7):503.

"Sedimentologic modeling of Lake Borgne: An example of fluvio-marine deposition on the deltaic plain, north central Gulf of Mexico." 1981. Guidroz, W.S., Manley, F.H., and Staheli, A.C., Geological Society of American Abstracts with Programs, 13(7):465.

Pollutant Transport in Mississippi Sound

Thomas Lytle and Julia Lytle
Gulf Coast Reasearch Laboratory

SUMMARY: Results of the first three years of this continuing project show evidence of serious pollution in restricted areas of the Sound, particularly in the Escatawpa River industrial complex located in the Pascagoula River system. Sediment depth profiles showing widely divergent pollutant levels across the Sound have been completed. Environmental stress indices have been developed and assigned to indicate areas of special concern.

Development is taking place at an ever increasing rate in Mississippi Sound especially in endeavors other than the traditional area of seafood harvesting. One important problem that seems always to accompany development in general and industrial development in particular is pollution.

Before this project was begun in 1979, there was a real lack of scientific information on pollution in the Sound to answer serious environmental questions. With increasing polarization between developers and conservationists, there were no hard data upon which to base arguments pro or con and certainly no basis to reconcile differences of opinion.

This study was designed to characterize pollutant types, concentrations, and distribution across Mississippi Sound, clarify the effect these pollutants might have on the environment and suggest guidelines for responsible environmental decision making.

Because sediments preserve an integrated record of past pollution history, and because pollutants of more profound interest (e.g., pesticides, heavy metals, petroleum), tend to accumulate in sediments, this project focused its efforts on the sediments although the water column was also necessarily examined.

Thus far the project has described the fate of pollutants in the estuary, documented actual toxicity of polluted sediments and developed a toxicity index for sediment environments in the Sound that indicates the potential environmental problems that each may hold.

Sediment samples have so far been collected in the eastern Sound and the Pascagoula River system in 1979-1980, and in the central Sound and Biloxi Bay in 1981. Bay St. Louis and the western Sound will be sampled in 1982. The samples collected by the Consortium's coordinated sampling program included 10-foot cores using a specially designed vibracorer, numerous grab samples and routine chemistry. Sediment depth profiles showing pollutant-sediment type versus depth were developed for each location.

By using naturally occurring and industrially produced similar but

Collecting a vibracore in Mississippi Sound.

differentiable organic compounds as chemical tracers, it has been demonstrated that in the areas studied so far organic pollutants are transported only very short distances from their point of introduction. The majority of sediment samples that contain high levels of pollution contain petroleum hydrocarbons as the primary pollutant, especially in the eastern Sound.

Since the potential effects of pollutants in the sediment depend on more than simply their concentrations, an environmental stress index was developed to evaluate the potential hazard a particular area might pose to the environment. This index is based on toxicological bioassays, suspension stability, leachability and transport mechanisms, biota susceptibility and disturbance probability.

The environmental stress indices combined with the sediment depth profiles describe Mississippi Sound as a body with localized, polluted areas in the rivers and bays surrounded by the much larger body of the Sound with little pollution. The description also shows the necessity of careful, rigorous evaluation in the area prior to further development or disturbance.

As part of the effort to disseminate the information produced by this project, special posters and talks have been developed to present highlights of the research to scientific groups and the general public using radio, television, newspaper interviews and personal presentations. Project findings are also used as educational resource material in classes taught at Gulf Coast Research Laboratory.

State and federal government agencies that have requested information are the Mississippi Bureau of Pollution Control, Bureau of Marine Resources, and Highway Department, and the U.S. Army Corps of Engineers. The Corps has been particularly interested in being kept abreast of research findings and in exchange has shared a considerable amount of their own data with the project.

For the first time a solid base of chemical and geological characteristics of the bottom sediments of the eastern and central Sound is in place.

Planners and managers in the area now have understandable, usable guidelines to assist them in management decisions. The wide dissemination of project findings, cooperation with management-user agencies, and information exchange will help to prevent duplication of research efforts, strengthen the credibility of research programs in the area and bring the public to a better awareness of pollution in the Mississippi Sound.

Publications

"Interim Technical Report I: Pollutant Transport in Mississippi Sound," Thomas F. Lytle and Julia S. Lytle, Mississippi-Alabama Sea Grant Consortium. MASGP-79-032, 1981.

"Interim Technical Report II: Pollutant Transport in Mississippi Sound," Julia S. Lytle and Thomas F. Lytle, Mississippi-Alabama Sea Grant Consortium, MASGP-80-028, 1981.

Hydrodynamics of Mobile Bay and Mississippi Sound

Donald Raney
University of Alabama

SUMMARY: The application of mathematical models designed by this Sea Grant project to the solution of real problems in Mobile Bay and the development of a working cooperative agreement with the Mobile District Corps of Engineers for the mutual exchange of information were major accomplishments for this program year.

As greater pressures are brought to bear on Mobile Bay and Mississippi Sound by increasing industrialization and population growth, the need to assess potential hazards to the system and to rationally resolve the resulting conflicting demands on the limited resource of the region becomes increasingly important.

A relatively new tool available to engineers and scientists to characterize and predict interactions of water resource systems is the mathematical model. Using modern computers, models can provide problem solutions at greatly reduced cost and in much less time, permit greater manipulation of boundary conditions, and provide solutions to problems that would be exorbitantly expensive or impossible using the physical scale models of the past.

This year in response to observations by another Sea Grant investigator (Brande, R/ER-6) of possible west to east spreading of dredge spoil banks from the charted locations in Mobile Bay, an investigation using modeling techniques of a possible net east to west current across Mobile Bay was completed. With additional dredging of the Mobile ship channel imminent and large quantities of dredge spoil planned for deposition on the existing banks, it becomes vital to know if the planned sites are ecologically secure or if alternate locations should be investigated.

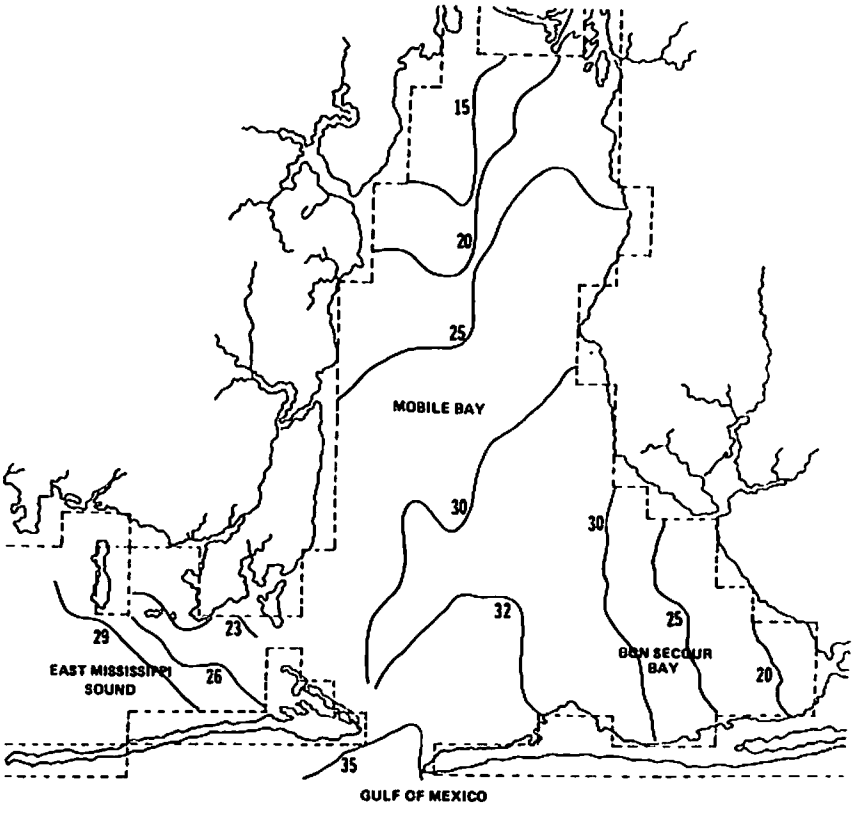
Work has begun on the preparation of a technical report on this study and publication is expected in early 1982.

Mobile Bay and Mississippi Sound are both restricted systems with contained water going out and Gulf water coming in through a small number of restricted passes between the offshore barrier islands. Any understanding of these systems must necessarily include the dynamics of exchange through these passes.

During 1981 two studies on pass exchange were essentially completed. The first, "Hydrodynamics of Mobile Bay and Mississippi Sound-Pass Exchanges," is a master's thesis published as a Sea Grant Technical Report in 1981. It describes the hydrodynamics in Pass aux Herons and Main Pass, the only exchanges between Mississippi Sound, the Gulf of Mexico and Mobile Bay. The second, "A Hydrodynamic and Salinity Model of Mobile Bay and East Mississippi Sound," is also a master's thesis and should be published in early 1982.

These models should greatly increase the predictive capabilities and understanding of the system by other investigators working on the system.

A significant development of this program year was the implementation of a cooperative agreement between the Mississippi-Alabama Sea Grant



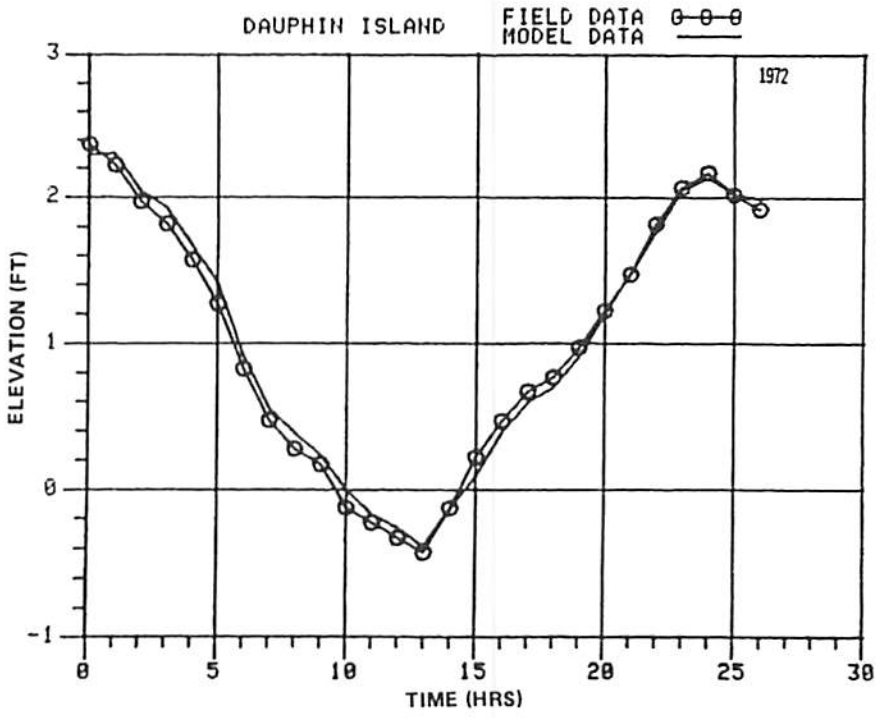
Sample salinity profile (tidal cycle averaged) for Mobile Bay and Mississippi Sound under low river inflow conditions, low wind conditions (salinity model exercised over 16 cycles).

Consortium (MASGC) and the Mobile District Corps of Engineers. This agreement allows the investigator access to Corps of Engineers prototype data (acquired by the Corps at great expense) necessary for MASGC modeling efforts.

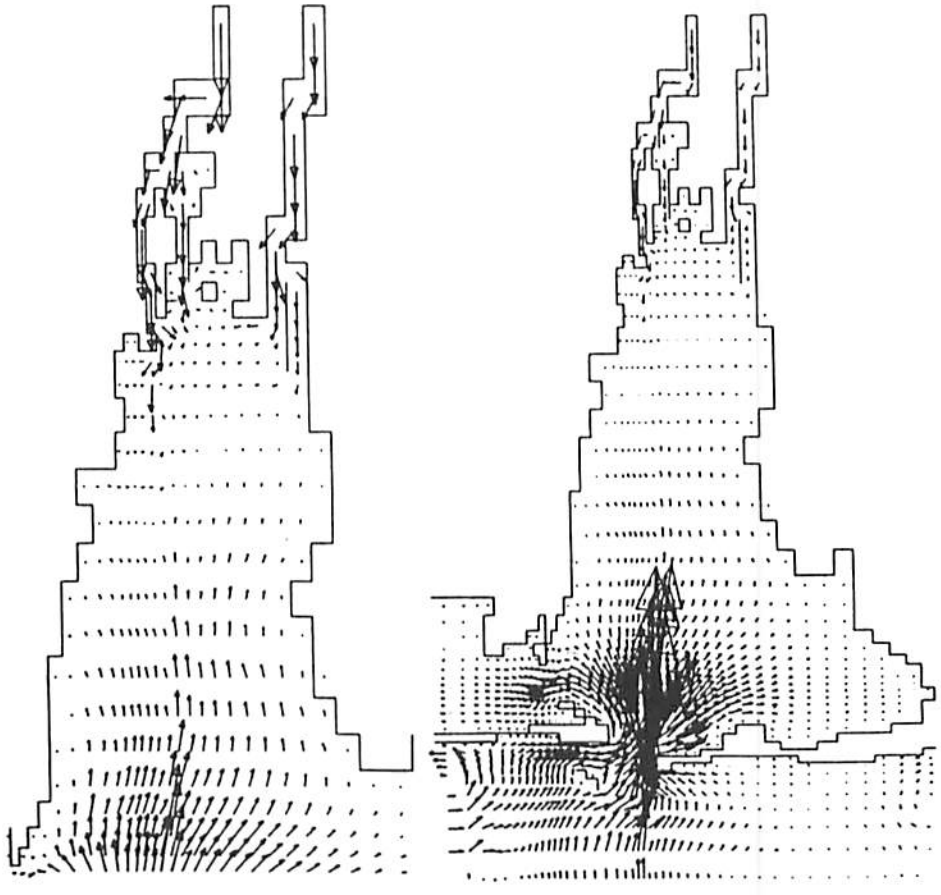
The exchange of some numerical models and the results from modeling applications, the facilitation of cooperation between MASGC and the Corps, and the possibility of future joint research efforts are further major benefits of the agreement.

A basic water quality model begun in 1980 has been developed and numerous experiments have been carried out. The 1982 program will continue to work on resolving problems associated with boundary conditions in the model.

Next year will be a significant period for this project and should see the establishment of MASGC as the center of numerical modeling for Mobile Bay and Mississippi Sound.



Comparison of model output with field data Dauphin Island.



Vector plot of water velocities during incoming tide.

Sedimentation, Dispersal and Partitioning of Trace Metals in Mobile Bay Bottom Sediments

Wayne Isphording
University of South Alabama

SUMMARY: This project has clearly shown that the assessment of the true environmental hazards of heavy metals in estuarine sediments must include the manner (and amount) by which a specific metal is held in the bottom sediments (site partitioning). The completion of contour maps of the concentration and distribution of eight metals in Mobile Bay will permit planning and regulatory bodies to better assess effects of future sediment disturbances.

Each year almost 80 million tons of sediment enter Mobile Bay. Because of the limited exits from the bay and the relatively low velocity of currents, most of it is deposited as sediments. These deposits, predominately clay with lesser amounts of silt and sand, act as sumps for heavy metals.

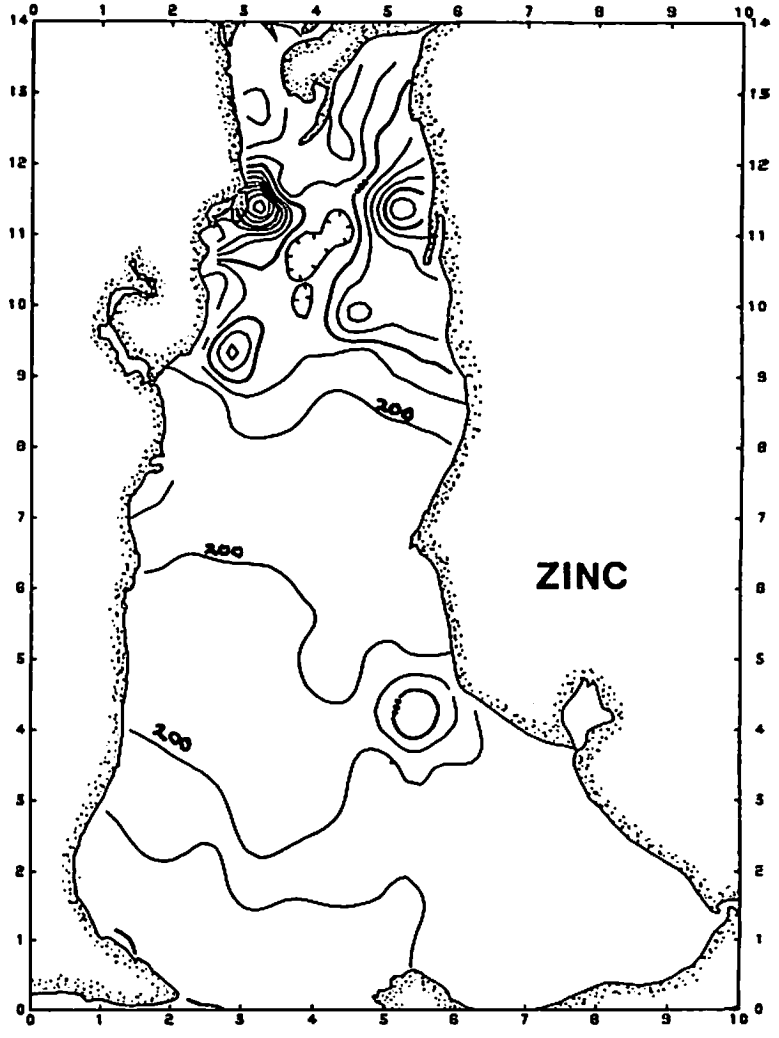
The objectives of this project are to determine the magnitude, areal distribution and manner in which the metals copper, zinc, iron, chromium, nickel, calcium, strontium and barium are incorporated into the bottom sediments of the Alabama-Mississippi estuarine environment (Mobile Bay, Perdido Bay, Wolf Bay and Mississippi Sound).

This study has provided the first detailed description of the actual site partitioning of metals in an estuarine environment. Previous studies have presented data only on total content of specific metals in sediments. This investigation has identified the actual manner by which the metals are held (partitioned) in the sediments and has determined the percentage held in each form.

How a metal is held or partitioned in the sediment determines the susceptibility of the metal to reintroduction into the water column by man or natural causes with the resulting potential for harm to the ecosystem.

Of the ways metals may be absorbed into sediments, the following four permit easy reintroduction into the water column by disturbances such as dredging or storms:

1. In inter-layer exchangeable sites in the clay mineral lattice.
2. Trapped in the pore water of the sediment during burial.
3. Associated with iron and manganese oxides and sulfides (the reducible phase).



Zinc content variability in Mobile Bay bottom sediments. (Contour interval 100 ppm)

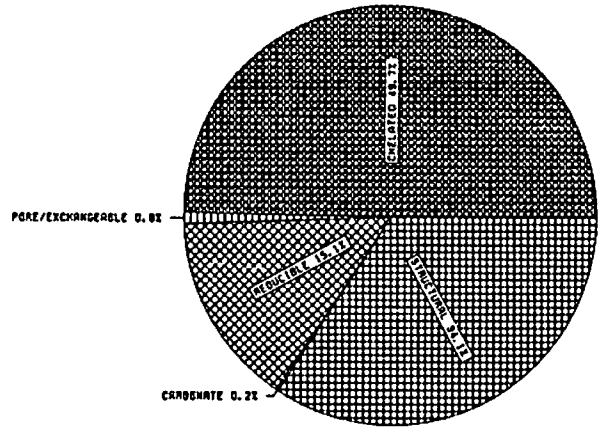
4. In the form of organo-metallic chelated compounds adhering to the clay mineral platelet surfaces.

In only one combination structurally coordinated ionic bonds hold the metal strongly enough to prevent release upon disturbance.

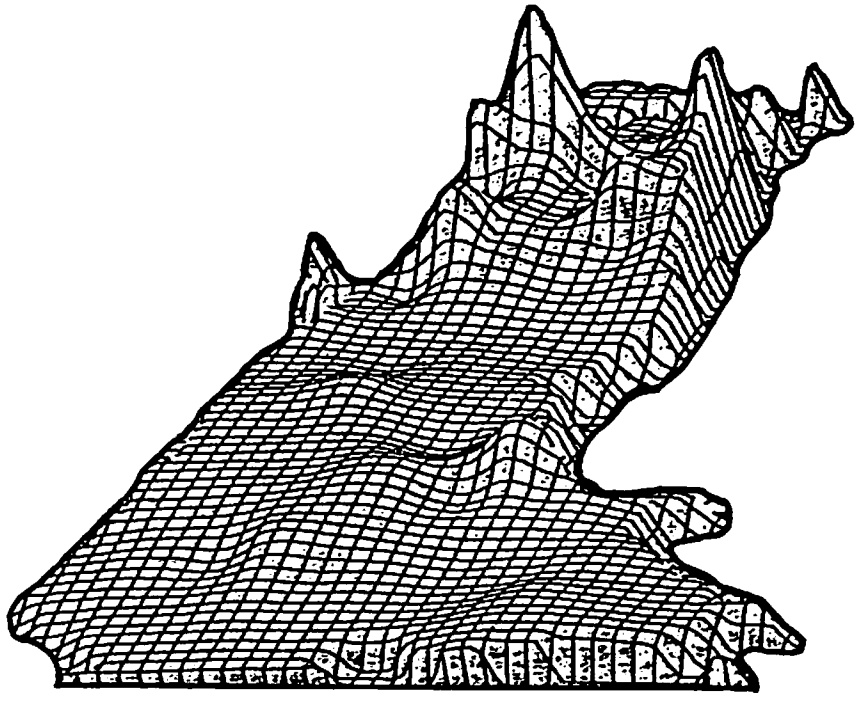
So far 92 cores have been collected and analyzed from Mobile Bay. The completion of contour maps for the selected metals and three-dimensional transect-views of the contour data were major accomplishments of this year. Diagrams such as these will ultimately be produced for each selected metal for the entire Alabama-Mississippi estuarine region. By identifying sites of anamalous concentration, regulatory agencies may better plan for future development and ensure that hazardous levels of specific metals are not released by man-caused activities.

In a practical application of the information and techniques developed by this project, it was shown that an alleged unreported spill of barium containing drilling mud in Mobile Bay apparently did not occur. This allegation if not refuted could have placed the development of a major gas field in jeopardy and caused at least partial forfeiture of a $55 million environmental protection bond.

The collection of additional cores from Wolf Bay and Perdido Bay is scheduled for 1982 with final completion of the project scheduled for 1983 with the collection and analysis of cores from Mississippi Sound.



Ion site partitioning data, Mobile Bay bottom sediments, percent zinc in phases.



Three dimensional computer representation of zinc concentration in Mobile Bay bottom sediments.

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Isphording, W.C. 1981. Utilization of partial digestion analysis in the geo-chemical investigation of estuarine sediments. Abstract. Southeastern Section Meeting, Geological Society of America, Hattiesburg, MS. p. 10.

Isphording, W.C. 1982. Mis-interpretation of environmental monitoring data — a plague on mankind! Accepted for presentation and publication, Gulf Coast Assn. Geological Societies annual meeting (Houston, TX). Transactions Vol. 31.

The Role of Mississippi Sound in Recruitment to Sport and Commercial Fish Stocks

Sally Richardson and Joanne Laroche
Gulf Coast Research Laboratory

SUMMARY: In the second year of this three year study of the relationship of Mississippi Sound to the larvae and spawning activities of important fish stocks, three 36-hour time studies at two locations were taken to complement the year long sampling program completed last year. The reference file of identified fish larvae begun last year was significantly enlarged and several preliminary observations of potential importance in local fishery management were made on the little known early life history of spotted and sand sea trout.

In complement to the year long monthly studies completed last year the investigators this year carried out a series of three, 36-hour replicated surface and bottom ichthyoplankton samplings. The samplings were taken at two stations, one north the other just south of Dog Keys Pass, a major entrance into Mississippi Sound.

The samples were taken (using the same one meter, 335-micron mesh net used in last year's monthly survey) on 18-20 January, 20-22 May and 16-18 November, 1981. The planned frequency of sampling was eight samples every three hours. The actual number of samples taken varied with processing time which depended on plankton composition and volume.

Along with the plankton sampling, hydrographic data collected included surface to bottom dissolved oxygen profiles, salinity, temperature and secchi disk readings. Current meters were positioned to measure current speed and direction every 15 minutes at the surface, midwater and bottom at West Point, Horn Island. A tide gauge was used to measure tidal amplitude, and standard meteorological data were also collected. These data will be analyzed to provide needed information on what environmental factors influence the movement of fish larvae into Mississippi Sound through a major pass.

Over 200,000 fish larvae have been removed from 520 of 528 samples collected in last year's year long survey.

Among the more than 150,000 fish larvae identified from Mississippi Sound thus far, over 130 different taxa have been recognized, 67 taxa in 42 families have been identified to species, 24 have been identified to genus, and most of the rest have been identified to family level.

Preliminary analyses on this enormous quantity of data have provided some interesting new information on the reproduction and early life history of spotted seatrout *(Cynoscian nebulosus)* and sand seatrout *(Cynoscian arenarius)*. Although these two species are of considerable importance to Mssissippi's sport and commercial fishery, very little is know of their early life history in area waters.

Spotted seatrout larvae first occurred in May samples and remained in relatively constant abundance through July. The larvae occurred more frequently and in greater abundance in

Photo Mississippi Press

A stringer of fish taken in Mississippi Sound. Much still needs to be learned about these and other fishes lifestyles.

the western region of the Sound and were more abundant at inshore and island pass stations. Spotted seatrout apparently spawn later in the season and in shallower water than do sand seatrout. Spawning may be concentrated in the vicinity of Louisiana marshes and Chandeleur Sound.

Sand seatrout larvae in comparison first appeared in February samples and increased in abundance to a maximum in May then decreased. The center of abundance of the larvae occurred in the central region of the Sound and they were more abundant at passes and offshore stations. Sand seatrout spawn earlier in the season and in deeper water than do spotted seatrout and spawning is most intense immediately south of the barrier islands.

Information such as this will provide the vital data to those agencies formulating management policies for these and other economically important and intensely fished species such as menhaden, croaker and redfish.

Differences in hydrological properties in the sound such as temperature, salinity and dissolved oxygen, may have significant effects on the survival of fish larvae and their growth into adult stocks. Important progress was made this year in the analysis of the hydrological data taken during the sampling efforts and correlating it with the larval data. During the next year of this project this correlation will be continued along with the final compilation and analysis of the larval fish data.

Seismic Survey and Deep Core Stratigraphy of Mobile Bay Region

Scott Brande
University of Alabama in Birmingham

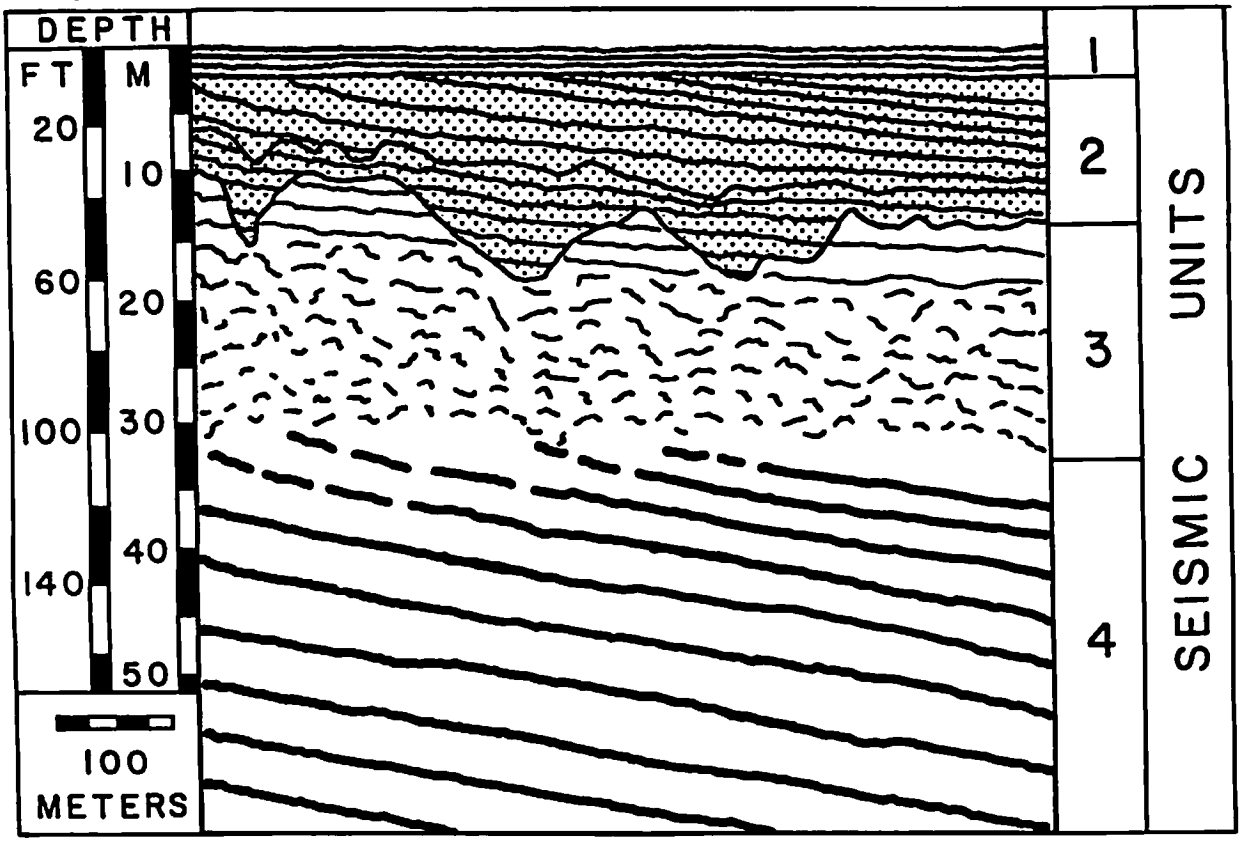
SUMMARY: The characterization of the geologic properties of shallow sub-bottom structures in Mobile Bay indicated in last year's seismic survey was the primary goal of this project year. Vibracores located on the seismic lines were collected and partially analyzed to provide correlation between the seismic record and the actual sediment record.

With ever-increasing levels of environmental modification and disturbance, both man-caused and natural, the establishment of a baseline of the normal sedimentary processes within Mobile Bay is essential for future research and management of the system.

Last year an extensive seismic reflection survey of Mobile Bay and Mississippi Sound was completed. The major goal of this project year was the characterization of the shallow sub-bottom units found in that survey. An important accomplishment this year was the acquisition of 30-foot vibracores at 10 stations located on the seismic lines in Mobile Bay. These cores will provide the correlation between the seismic record and the sediment record. All the cores have been x-radiographed through the cooperation of the University of Alabama in Birmingham hospital radiology department. These x-radiographs revealed detailed sedimentary structures and textures in the cores before they were opened and possibly disturbed.

Initial conclusions indicate that a strong correlation exists between the seismic record and the sedimentologic properties of the cores.

This correlation of cores widely distributed over Mobile Bay and the seismic record enables the extension of seismic interpretation to areas of the bay that have not been cored.

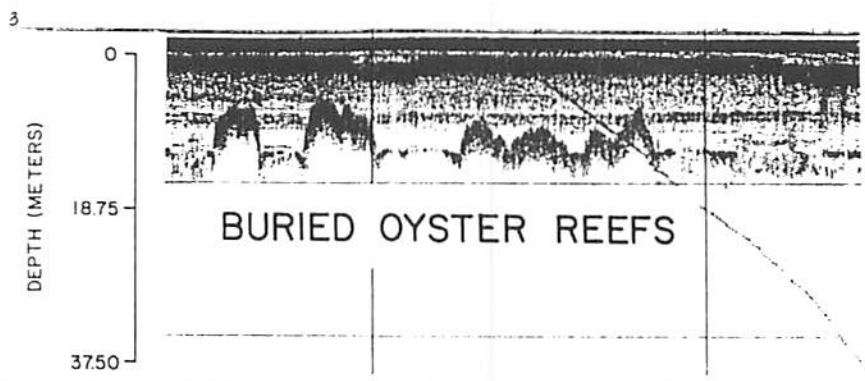


General seismic stratigraphy, Mobile Bay, Alabama.

A generalized structure section of Mobile Bay exhibits two near surface geologic units overlying a highly incised underlying unit.

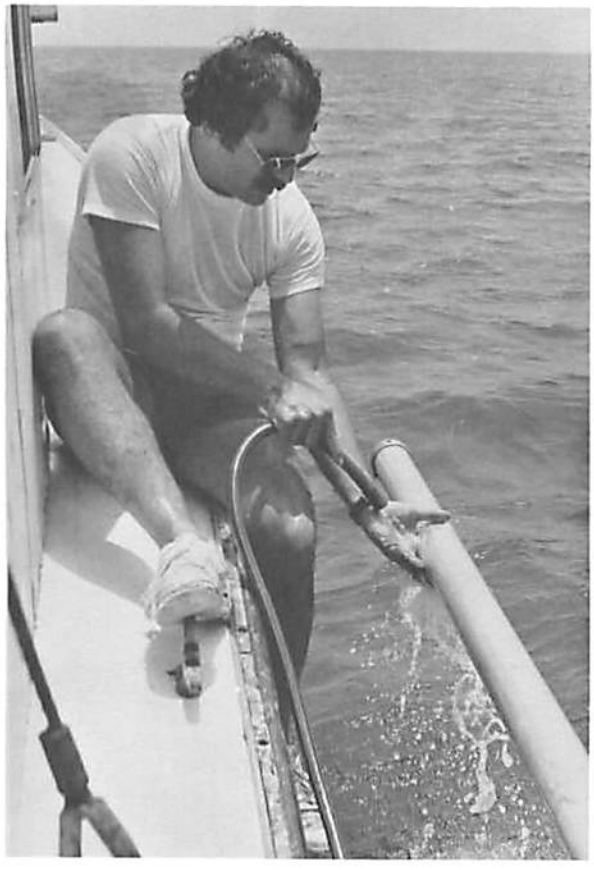
The results thus far from the project have developed considerable local and regional interest. The Mobile District Army Corps of Engineers has expressed particular interest and has received copies of project progress reports.

With further analysis of the data and development of the sedimentologic characterization of Mobile Bay, this work will greatly increase our knowledge of an important geo-system.



Part of the record of the seismic survey of Mobile Bay. The surface of the bottom is indicated by 0.

Photo Debbie Breland Mobile Press Register



Dr. Brande washing a core pipe after recovering a sediment core.

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Brande, Scott, Dinger, J.S., Miller, R. and Kindinger, J. 1981. Pleistocene-Holocene boundary in Mobile Bay, Alabama, and Mississippi Sound, Mississippi detected from seismic reflection profiles. (Abstract). *Abstracts with Programs* 13(1):3, Geological Society of America.

Brande, Scott, McAnnally, C.W., Dinger, J.S., Miller, R., and J. Kindinger. 1981. Seismic profiles correlated to lithologic horizons in Mississippi Sound, Mississippi and Mobile Bay, Alabama. *Abstracts with Programs 1981.* 13(7):415-416, Geological Society of America, Boulder, Colorado.

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Study of Organic Pollutant Levels in Oysters of Mobile Bay

Ken Marion and Robert Settine
University of Alabama in Birmingham

SUMMARY: With increasing industrial activity in and around Mobile Bay it is very likely that the ecosystem will be subjected to increasing levels of pollution. This project is using oysters as a concentrator-indicator organism to assess the chronic pollution loading in Mobile Bay by identifying and quantifying the major organic pollutants in oyster tissues.

Mobile Bay, one of the major estuarine nursery grounds in the United States and a producer of large quantities of shrimp, oysters and fish, is caught between the conflicting needs of a healthy productive estuary and industrialization.

Waters reaching Mobile Bay have already been the recipients of a wide variety of discharges from industry, agriculture and urban areas. The Bay itself is undergoing rapid industrial expansion with large chemical operations, Theodore Industrial Park and petroleum production already in place.

With further petroleum production imminent, the deepening and expansion of the State docks and ship channel, and the completion of the Tennessee-Tombigbee waterway, the Bay will be subjected to increasing contamination by bacteria, heavy metals and, particularly, organic pollutants. Many of these organic pollutants are known to be detrimental to public health and many are on the U.S. Environmental Protection Agency's (EPA) list of priority pollutants.

An assessment of the pollutants in Mobile Bay is necessary to evaluate their possible effect on economically-important seafood resources and their potential as human health hazards. Such baseline information is essential for current and future decision-making involving resources and industrial development in the Bay area.

Because bivalves are filter feeders and have the ability to greatly concentrate some pollutants in their tissues, the American oyster (*Crassostrea virginica*)

Photo Marion-Settine

Oystering in Mobile Bay. A valuable resource that needs to be preserved.

was selected to be used as a biological monitor of the environmental condition of the bay by identifying and quantifying the major organic pollutants found in its tissues.

The major objectives for the first year of this project were to develop an efficient methodology for the extraction and quality control of the organic compounds from the oyster tissues and to establish baseline data as a guide for pollutant surveys in other areas of the Bay.

Several chromatographic methods were screened for the separation of the organic compounds from the oyster tissue. Gel permeation chromotography was found to be the most efficient with better than 90+percent recovery. The isolated organics are identified and quantified using a Hewlet-Packard Model 5985 gas chromatograph/mass spectrometer (GC/MS) and library spectra compiled by EPA/NIH.

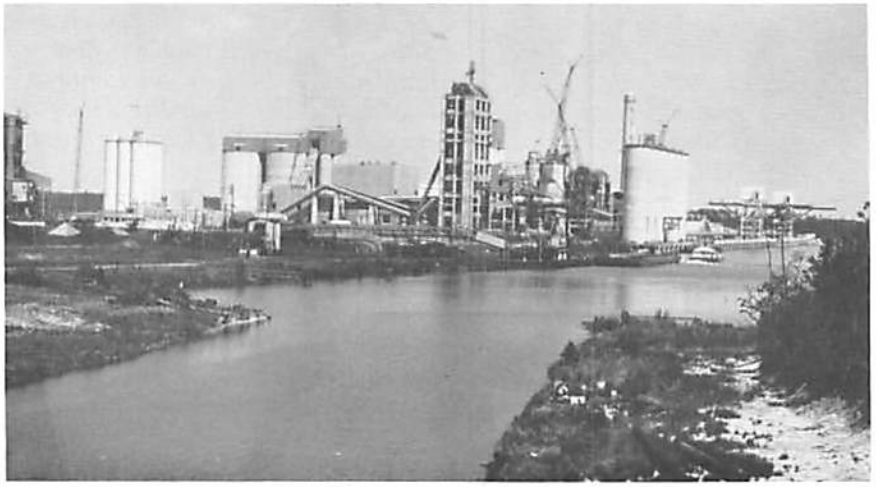
A large number of organic compounds with a wide range of molecular weights have been found in the tissue of oysters collected in Mobile Bay. Many of these compounds are priority pollutants. Some are polycyclic aromatics and many are typical of effluents of petroleum-based industries. Pesticides and their metabolites, presumably of agricultural origin, have also been detected.

Of interest is the surprisingly high concentrations of DDT and its derivatives in light of the prohibition by the EPA of its use.

There is marked seasonal and intersite variability in the types and concentrations of compounds found. The results from the control site at Cedar Key, Florida (a site relatively remote from industrial sources), show significant differences from Mobile Bay in the types and quantities of pollutants found. The Cedar Key compounds are more of low molecular weight, indicative of motor boat traffic, with only trace amounts of high molecular weight compounds. Also, no pesticides were detectable during the spring sampling period at Cedar Key.

Results so far indicate that the site and time of year affect the amount and nature of the organic compounds stored in oyster tissues. It also seems that the level of these compounds stored in the oysters is not very high. Measurements over time will be necessary to confirm this.

The future data base will be expanded to include sites closer to pollution sources and to include bivalves other than oysters to broaden the study into areas not inhabited by oysters.



Theodore, Alabama. Industrialization can place heavy strains on the ecosystem.

Photo Marion-Settine

Photo Marion-Settine

Pristine estuarine areas such as this are vital for many important commercial and recreational fisheries.

Publications

Settine, R.L., Graves, R.J. and Marion, K.R. 1982. Bivalves as indicators of environmental pollution. *J. Alabama Academy of Science* 53(3): 49. (Abstract)

Utilization of Chitin to Control Pesticide Mobility

Charles McCormick
University of Southern Mississippi

SUMMARY: By chemically attaching small mobile herbicide molecules to larger polymer molecules such as chitin, the resulting macromolecular combination becomes much less mobile and the system can be used to control the release of the herbicide into the environment. This can have real dollar benefits to agriculture by reducing the quantities of herbicide necessary for an application and to the environment by reducing herbicide runoff into the ecosystem.

Major efforts of the fourth year of this five-year project centered on improving methods for dissolving the chitin, modifying methods of attaching the herbicide to the polymer molecule, using Carbon-13 nuclear magnetic resonance spectroscopy (NMR) in the characterization of compounds under study and the use of high pressure liquid chromotography (HPLC) for evaluating herbicide release.

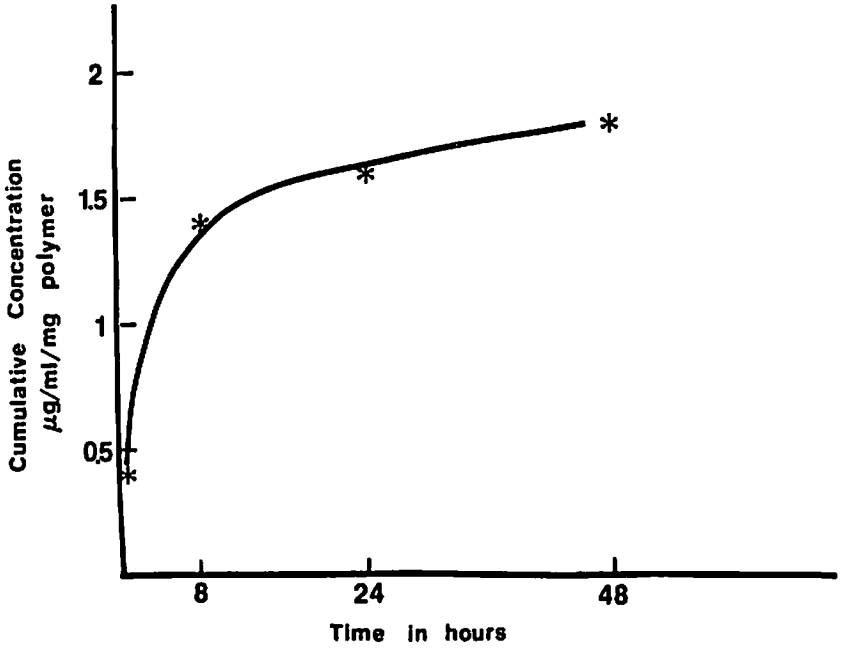
Concern over adverse effects of agricultural pesticides on the marine environment has prompted efforts to find more efficient methods of applying pesticides, so that migration from the application areas into nontarget areas such as rivers and bays is reduced. This project is focused on utilizing chitin and other polysaccharides in chemical combinations with herbicides to reduce the pesticide mobility and to produce controlled release (CR) pesticide systems.

In this approach the small mobile herbicide molecule is chemically attached to the large chitin molecule, and becomes much less mobile due to the size of the resulting macromolecular combination. The advantage of using chitin is that chitin is a biodegradable, renewable marine resource which is presently a waste product in the marine industry. Since the herbicide is released by slow environmental breakdown of the chemical bond which links it to the polymer, continuous release of small amounts of the herbicide is provided. This process gives larger periods of pest control, allows smaller amounts to be used per application, and requires fewer applications. Work during previous years of this project has demonstrated the feasibility of these systems. Studies during this year have improved the methods of preparation, characterization and evaluation of these systems.

An improved method for dissolving chitin has been found which permits higher chitin concentration and more dissolution. It was found that by pretreatment of the chitin with water and an alcohol the polymer may be dissolved in dimethylacetamide/lithium chloride without heating as was necessary in the past. This is significant because heating causes degradation of the polymer. Higher concentrations are now possible which improves the economics of potential large-scale operations.

In order to attach the herbicide metribuzin (a common agricultural herbicide) to a polymer, it is necessary to first prepare a reactive derivative of the metribuzin. The isocynate and chloroformamide derivatives were investigated with the chloroformamide chosen as the most productive. This derivative can be produced with higher yield and gives greater amounts of herbicide-polymer linkages than earlier systems. CR polymers have been produced with a 60 percent (by weight) herbicide content. This is a substantial increase in the efficiency of these systems.

Important progress has been made in utilizing Carbon-13 nuclear magnetic resonance spectroscopy to



Cumulative concentration in water of metribuzin released from chitin/metribuzin chemical combination as a function of time.

characterize these products. This technique gives needed information and molecular structure such as sites and quantity of pesticide attachment. High pressure liquid chromotography has been developed as an important tool in the evaluation of pesticide release mechanisms by providing the differentiation between released herbicide and degradation products vital to accurate determination of herbicide concentrations.

Among the objectives for the final 1982 project year are greenhouse evaluations of CR polymers with higher herbicide content, preparation of optimized CR systems and completion of data and conclusions on the technology for transfer to interested industry.

Publications

"Polysaccharide Models for controlled Release of Pendent Herbicides." McCormick, C.L., Anderson, K.W., Hutchinson, B.H. 1981. *Organic Coatings and Plastics Chemistry.* 44:27.

"Polymers Containing Pendently Attached Metribuzin as Potential Controlled-Release Herbicides." McCormick, C.L. and Anderson, K.W. 1981. *Proceedings of the Eighth International Symposium on Controlled Release of Bioactive Materials.* Published by the Controlled Release Society, Inc., p. 255.

Presentations

"Polysaccharide Models for Controlled Release of Pendent Herbicides" by C.L. McCormick at the 1981 National Meeting of the American Chemical Society in Atlanta, Georgia, March 30, 1981.

"Preparation and Evaluation of Polysaccharides Having Pendently Attached Metribuzin as Controlled-Release Herbicide Systems" by K.W. Anderson at the 1981 Mississippi Academy of Sciences Meeting in Jackson, March 5, 1981.

"Polymers Containing Pendently Attached Metribuzin as Potential Controlled-Release Herbicides" by K.W. Anderson at the Eighth International Symposium on Controlled Release of Bioactive Materials in Ft. Lauderdale, Florida, July 28, 1981.

Cooperating Industry

Hopkins Agricultural Chemical Company, Madison, Wisconsin.

Enteroviruses in Prohibited Oyster and Marine Sediments

R.D. Ellender and David Cook
University of Southern Mississippi
Gulf Coast Research Laboratory

SUMMARY: Many viruses of human origin are widely distributed in estuarine and coastal areas and have been isolated from seawater, marine sediments and shellfish samples. To what extent viral disease is transmitted by such vectors is not well understood, but evidence indicates that bacterial indicators are not true measures of the presence of viruses in polluted samples. This project examined comparative and noncomparative analyses of enteric bacteria and enteric virus groups in water, shellfish and sediment samples.

Mississippi, as well as the other Gulf Coast states, has experienced a tremendous increase in population growth in recent years. Along with this growth there has come an increase in fecal contamination in the estuary and coastal systems from point and nonpoint sources of both human and animal origin.

This fecal pollution has long been a concern of those responsible for managing the oyster fishery and protecting public health. Whether or not shellfish is fit for human consumption is currently measured by an indicator of fecal pollution, the fecal coliform index. The fecal coliform index is designed to protect the public primarily from hepatitus virus and the typhoid bacillus which, though rare, are disease agents associated with the consumption of raw shellfish. There is serious concern, however, that bacterial indicators may not reflect the presence or concentration of viruses. It is evident also that viruses are able to survive for considerable periods in sediments and that by doing so they are able to affect the overlying water and the organisms therein.

This project was initiated to correlate and identify the relationships between viruses and fecal coliforms in sediments and oysters from prohibited areas.

It became evident early in this project that the state of the art for examining viruses in sediments collected in this geographic area were inadequate for the study at hand. It was necessary for the investigators to devise and refine a method of extracting viruses from various sediment types and in a reproducible manner. Major efforts of this project year were the selection and examination of four representative, 25-kilogram-sediment lots of varying sand, silt, and clay proportions and their evaluation using different virus extraction procedures and eluent mixtures.

Nineteen different methods were tried before a satisfactory procedure using beef extract with lecithin was found to produce a satisfactory recovery rate. Further work defining this method needs to be done, however. The four sediment samples (divided into 500-g subsamples) provide a standard control for the evaluation of future studies to evaluate natural samples.

Results demonstrated that viruses were preferentially adsorbed to sediments containing a larger percentage of clay while sandy sediments conversely allowed greater virus recovery. Similarly, viruses suspended in the water column could survive longer (greater than seven days) when attached to suspended sediments than when in the water column. Studies were also conducted to determine how long specific viruses remained viable in the differing sediment types and in oyster feces.

Parallel with the virus studies in this project was the examination of enteric bacteria survival in estuarine sediments and in oyster feces. Major findings showed that the survival rate of *E. coli*, coliforms or fecal coliforms are not appreciably affected by composition or past pollution history of the sediment. Lowering the temperature from 25°C to 15°C significantly increased survival rates. Indicator bacteria survived longer in oyster feces than in sediments. One important recommendation of this research was that in the interest of public health, shellfish harvesting areas be quarantined for two weeks following exposure to polluted flood waters or after receiving shellfish relayed from contaminated areas. This will allow sufficient time for enteric bacteria concentrations to fall below hazardous levels.

Publications

Tsai, S.C., Ellender, R.D., Johnson, R.A. and Howell, F.G. 1983. Elution of Viruses from Coastal Sediments. *Appl. Environ. Microbiol.* (Submitted, Jan. 1983).

Johnson, R.A. and Ellender, R.D. 1983. Enteric Virus Elution from Estuarine Sediments. Abstracts of the 83rd Annual Meeting of the American Society for Microbiology, New Orleans, p.96.

Marine Algae in Production of Fermentation Alcohol and in Wastewater Recovery

Charles Rhyne
Jackson State University

SUMMARY: The blue-green alga Spirulina major, *grown in wastewater-seawater mixtures, is being studied for its practical application as a reusable aquatic biomass resource for production of ethanol feedstocks and for tertiary treatment of wastewater. This project, started this year with discretionary funds, has found that* S. major *meets certain basic criteria for a successful photosynthetic wastewater bioconversion system.*

Wastewater discharges with high levels of nitrogenous and phosphoric compounds have been shown to be directly responsible for algae blooms that lead to low oxygen levels in estuaries and coastal waters. This condition often leads to fish and other animal kills as well as reduced aesthetic appeal for the area. A reduction in total wastewater output or enhanced treatment of the wastes at point sources, seem the only plausible ways of maintaining the environmental quality of coastal regions.

Studies around the world are showing that using controlled eutrophication in mariculture methods that combine wastewater treatment and biomass production holds great promise for alleviating coastal pollution as well as contributing to energy and animal feed resources.

The aim of this project is to develop a photosynthetic wastewater bioconversion system that uses marine algae as the basis for production of a usable feedstock (algae starch or other appropriate food reserve).

Laboratory studies by the investigator of numerous marine plankton and attached marine algae have led to the selection of the blue-green filamentous marine alga *Spirulina major* based on certain critical requirements: it adapts well to wastewater-seawater mixtures producing up to 140 mg dry weight/L/day; the carbohydrate food reserve, glycogen, can be manipulated upward from 11.9 percent to 36 percent; it resists foreign algae contamination for up to five months; it grows attached to a substrate allowing easy harvest; and it reduces phosphate levels by 58 percent; nitrate levels by 73 percent, and ammonium levels by 90 percent.

Additionally *Spirulina* lacks the bulky cellulosic wall that makes up a considerable portion of the carbohydrate component of many green algae cells.

Two completely unrelated findings have permitted the investigator to increase the laboratory yield of *Spirulina:* first is the addition of Ferrous chloride (0.5 to 1.0 mg/L) to the growing medium and second is the use of polyethylene mesh as a substrate for algae attachment.

Results obtained in this start up year have been promising enough to warrant scaling the operation up to a greenhouse setting for the 1982-83 program year.

Publications

Crump, L. and Rhyne, C. Marine Algae in the Production of Fuel/Chemical Feedstocks and in Wastewater Recovery. Abstract *Mississippi Academy of Science Journal.* 1982, 27:36.

Ms. Lois Crump, the graduate student working on this study, has recently been notified by the National Sea Grant Association that she has received honorable mention in the Student Abstract Competition for her abstract entry "Marine Algae in the Production of Fuel/Chemical Feedstocks and in Wastewater Renovation."

Secondary School Minority, Underprivileged and Handicapped Student Exposure to Marine Education

Della McCaughan and Bobby Irby
Biloxi High School
University of Southern Mississippi

SUMMARY: In four years this education program has made remarkable gains in increasing the involvement of minority students and minority teachers in marine activities by using a diversified program of workshops, inservice training, practical marine education materials, field trips, and student involvement.

Biloxi High School was the first secondary school in Mississippi to introduce marine education into its curriculum. When first introduced only a few minority students (0 to 3 percent) enrolled in marine science courses. Since the initiation of the Sea Grant sponsored program in 1977, great advances have been made in attracting and encouraging blacks and other minority students not only to enroll in marine education classes but to seriously consider pursuing careers in various fields of marine science. The total enrollment in the program has risen to 225 to 300 students each year with 20 to 39 percent minority participation. Furthermore, beyond involving secondary school students, marked success has been achieved in attracting minority educators to marine education. As high as 40 percent of workshop participants are now minority teachers.

Through a continuing program of teacher workshops and other training aids sufficient interest has been generated in marine education by the teachers of Mississippi that virtually every secondary school now offers some marine education elements in their curricula, and most of the coastal schools have full-fledged programs. This teacher workshop effort is now a continuing program under the auspices of the University of Southern Mississippi with no further Sea Grant funds required.

Throughout the state teachers are using marine education materials in the form of study guides, books, pamphlets, videotapes, and drawings that were developed by students, workshop participants and teachers working in the program.

The program has initiated an intensive counseling program designed to encourage minority and underprivileged students to attend college and to consider marine science as a career. In the next two to four years there should be 20+ minority students graduating from college that have expressed an interest in pursuing a marine related career field.

Approximately 1,400 Vietnamese have recently settled in the Biloxi area and are employed primarily in the seafood and fishing industries. Because they have close ties to marine industry, Vietnamese students have been encouraged to participate in the program. These students have served as student instructors, translators and artists and their continuing integration into marine education seems assured.

The program will continue to remove obstacles from the path of students who in the past have felt excluded from what was perceived as an "elite" field of study and will continue to encourage marine awareness to the benefit of the region and the state.

Photo by John E. Ware, New Orleans States Item

Biloxi High School students on a field trip to the barrier islands.

Man and the Gulf of Mexico

Bobby N. Irby
University of Southern Mississippi

SUMMARY: The main focus for this project's third year was the evaluation of the Man and the Gulf of Mexico (MGM) curriculum materials developed in previous years. Another important area of emphasis was the dissemination of MGM materials to marine educators and to other groups interested in marine education in the two-state area.

As a means of developing viable marine science programs in the school systems of Mississippi and Alabama, this project concentrated on using teacher education and curriculum implementation as a way to establish the program in the classroom.

So far four topics have been developed in the marine education curriculum:

Marine and Estuarine Ecology,
Marine Habitats,
Diversity of Marine Animals, and
Diversity of Marine Plants.

This year the emphasis has been on the evaluation of these developed materials. Specifically the investigators examined:

How well did the student learn the material?

What were student attitudes toward the material and to the marine environment?

How did the students evaluate the material?

Field testing begun in 1980 and continuing into 1981 included 11 schools in both coastal and inland areas of Mississippi and Alabama.

Preliminary observations indicate that MGM curricula are equally appropriate for both inland and coastal area students. An interesting side light of the field test data analysis showed that coastal area students scored significantly higher on the Marine and Estuarine Ecology and Marine Habitats sections, while inland students scored significantly higher on the Diversity of Marine Animals section.

Included in the rationale for the development of the MGM curriculum is the premise that to realize the maximum potential of the materials, MGM must cooperate with other agencies operating marine science programs. In keeping with this philosophy, a strong working relationship has been established with the Marine Environmental Science Consortium (MESC) in Alabama. This association has increased cooperation between the two groups, fostered the dissemination of the MGM material in Alabama and increased the familiarization of teachers with MGM material.

By increasing the utilization of marine education materials in the public schools the MGM materials will engender an increased awareness of marine science studies in students, teachers and the public.

Man and the Gulf of Mexico evaluation program, 1981 Mississippi and Alabama test center sites.

Talladega College Marine Sciences Fellowship and Development Program

Arthur Bacon
Talladega College

SUMMARY: The Talladega College marine science program, now in its third year, has used fellowships, field trips, marine science courses and seminars to encourage minorities to pursue careers in marine science.

Talladega is a small, predominantly black college located in the hinterland of Alabama. With a student body of only approximately 600 it nevertheless produces a large percentage of students who go on to advanced degrees. (Out of the 100 top colleges in the nation for rate of students obtaining advanced degrees, Talladega ranked 18th for M.D.'s and 55th for science doctorates.)

In an effort to create an awareness of the opportunities in marine sciences for minority students, the program has used a variety of methods to catch the interest and foster eventual involvement of its students in marine sciences.

Three of the participants in the Fellowship program have graduated and at least one has indicated his intention of going on to graduate studies in marine science.

Field experiences for students in the program have included trips to National Marine Fisheries Service (NMFS) Laboratories at Panama City, St. Petersburg and Sarasota, Florida; collecting-study trips to Florida and Alabama; and participation by selected students in the summer program at Dauphin Island Sea Laboratory. The impact of these students' field experiences is brought back to the student body at Talladega via student seminars.

As an instance of the popularity of and interest in marine science that has been generated on campus, the annual Marine Sciences Career Day drew more than 50 students to hear visiting scientists discuss opportunities in their respective career fields.

The marine science program at this small but productive minority college will continue to engender awareness and interest in opportunities in marine science in students who, in many cases, have never even seen the ocean much less considered making a career of its study.

An Experimental Program to Intensify Marine Science at Jackson State University

Vernon Archer and Joy Morrill
Jackson State University

SUMMARY: This project, begun in 1980, has been very successful in introducing students to career opportunities in the marine sciences. Using a variety of methods such as field experiences and visiting lecturers, this project has already encouraged a number of students to pursue marine science as a career field.

Jackson State University is a predominantly black minority institution located in inland Mississippi, and contact with the marine environment or marine science was not among most of the student's experiences. This program was begun to increase the awareness and interest of the students in marine studies and to raise their perception of the career opportunities available from training in various marine science fields.

The continuing goal of the program is to provide qualified undergraduate and graduate students, particularly minority students, an opportunity to engage in various marine and coastal activities in anticipation of eventual careers in marine and environmental science fields not well supplied at this time with minority scientists.

Some of the techniques that have been used to expose the students to marine studies and increase their interest in pursuing careers in those fields are fellowships, scholarships, field trips, visiting lecturers (by established marine scientists), working cruises aboard research ships, field courses and research projects. Students are also encouraged to supplement campus studies with courses and research projects at noted marine science institutions. Jackson State students have taken courses and/or undertaken research projects at Texas A&M, Duke University Marine Laboratory, Gulf Coast Research Laboratory, and Woods Hole Oceanographic Institution.

Currently nine undergraduate students (eight male, one female) and fourteen graduate students (seven male, seven female) are involved in the program. So far, ten students have received the B.S. degree under the program. Of these one is now at the University of Massachusetts, one is at the University of Colorado, two attended summer sessions at Duke University Marine Laboratory (one of whom went on to Indiana University) and three are working on their M.S. degrees at Jackson State.

It is anticipated that by the end of 1982, seven students that have received support from the program will have received the M.S. degree at Jackson State.

With the help of the Mississippi-Alabama Sea Grant Consortium this program has developed to the point where it now enjoys the additional support of the National Marine Fisheries Service and the Naval Oceanographic Research and Development Activity. Additionally, cooperative agreements have been established with Duke University Marine Laboratory and the University of Rhode Island Graduate School of Oceanography. Such arrangements will help to broaden vistas already opened by this successful program.

Dr. Jones, MASGC Director, and Dr. Joy Morrill instruct Jackson State students on a field trip.

Macroinvertebrate Fauna of Mississippi and Alabama Coasts: Food Content of Six Commercial Fishes From Mississippi Sound

Richard W. Heard and Robin M. Overstreet
Gulf Coast Research Laboratory

SUMMARY: Data acquired partially from previous Sea Grant work and used to assess the invertebrates of marine habitats in Mississippi and Alabama have been used in this project to assess food contents of six commercial fishes and identify the fauna associated with sediments in a pollutant transport study.

Most fish in Mississippi Sound act as opportunistic feeders. The food contents of spotted seatrout, sand seatrout, silver seatrout, black drum, sheepshead, and southern flounder show this feeding behavior, but variations in diet occur among species, season, size of fish, and location. A total of 875 fish were examined, and 663 of these contained a total of about 200 different food items, usually identified to species. The seatrouts and flounder had eaten primarily crustaceans and fish. The black drum contained mostly crustaceans, pelecypods, and polychaetes, whereas the sheepshead ate over 113 different items. That fish with its sharp incisor teeth fed on benthic and infaunal organisms, grazed on encrusted animals, and seemed to serve as an exceptional collecting device. The contents of the sheepshead appeared to provide good representative data on prevalence and abundance of numerous local invertebrates by season and specific habitat.

Benthic and infaunal invertebrates associated with samples gathered for a pollution transport study in coastal Mississippi were identified, and the biology of those animals was related to the corresponding sediments and habi- the corresponding sediments and habitats. Those species occuring in most forms which have adapted to low dissolved oxygen concentrations. In some collections, no or only a few infaunal species occurred, supporting the view that pollutants at those localities are toxic in nature.

Publications

Overstreet, Robin M. and Richard W. Heard. 1982. Food Contents of Six Commercial Fishes from Mississippi Sound. *Gulf Research Reports* 7(2):137-149. MASGP-81-023.

Marine Educational Materials System Program Support

Judy P. Stout
University of South Alabama

The resources available within the Marine Educational Materials System (MEMS) have received wide recognition and publicity during 1981. This is the first twelve-month period of operation of a MEMS Depository at the Dauphin Island Sea Laboratory (DISL). Though a portable microfiche reader is still provided in Mobile, administration, holdings, and other equipment were handled through the Dauphin Island facility with the joint support of the Mississippi-Alabama Sea Grant Consortium (MASGC) and the Marine Environmental Sciences Consortium (MESC).

A microfiche reader-printer provided last year by MASGC has filled over 200 requests for reference material. Requests have been received from as far away as Georgia and Tennessee in addition to Alabama. Recent purchase of 700 new titles has brought total title holdings to 1,500.

In addition to instructors, middle and high school science students have found the system to be a valuable resource for development of science fair projects. Students involved in Discovery Hall Project of MESC have used MEMS materials much more extensively than other library sources.

Graduate students from MESC Colleges of Education have also used MEMS to develop subject blocks for incorporation into existing science and social studies curricula.

The Gulf Coast has attractive but fragile areas for relaxation.

Marine Resources Law

William Hooper, Jr. and Michael Gibbs
University of Mississippi Law Center

SUMMARY: The Marine Resources Law Program has developed a reputation as the center for ocean and coastal law expertise in Mississippi and is now receiving broad support and use from within the state. The 1981 program was involved in problems of both regional and national importance.

Over the past 12 years the Marine Resources Law Program at the University of Mississippi Law Center has developed a reputation as the center for ocean and coastal law expertise in the State of Mississippi. It enjoys broad support from members of industry, state, regional and local government entities, academia, and the general public for the expertise it has brought to bear on timely coastal legal issues. In 1981, the program was involved in several projects of importance to local, state and federal officials, local industry, other Sea Grant principal investigators and the general public. These projects included the following:

1. At the request of the Sea Grant Advisory Service, and in cooperation with the Alabama Marine Law Program, legal workshops were conducted in Mobile, Alabama, and Biloxi, Mississippi, for owners and operators of recreational boat leasing businesses. A handbook, *Recreational Boat Leasing on the Mississippi and Alabama Coasts: A Review of Boat Owners' Legal Responsibilities*, was published and distributed to participants of the workshops and other interested parties. The purpose of the workshops and handbook was to inform those involved in recreational boat leasing businesses about the importance of maintaining safe boats and equipment and of complying with all applicable rules and regulations. Representatives of the Mississippi Boating and Water Safety Commission and the U.S. Coast Guard Water Safety Office participated in both workshops.

2. The program began publishing its quarterly newsletter, *The Water Log*, in 1981. It includes reports, critical analyses, case reviews, and editorials on legal issues affecting the Mississippi and Alabama coasts. *The Water Log* is mailed to approximately 450 persons nationwide, including state and federal legislators, local, state and federal governmental agencies, coastal industries and businesses, the nationwide Sea Grant network and academic institutions. Issues discussed in the newsletter included federal and state coastal management laws, fisheries management in the Gulf of Mexico and port regulation.

One issue consisted of edited versions of four student papers that were written by students enrolled in the "Law of the Coastal Zone," a course offered to upper level law students at the University of Mississippi Law School. Response to the newsletter has been excellent.

3. The "Law of the Coastal Zone" course was re-introduced into the curriculum of the University of Mississippi Law School. The seminar, taught by the principal investigator, focused on legal issues and problems unique to coastal areas. Each student enrolled in the seminar produced a paper on a particular coastal law issue. Some of these papers have been published in *The Water Log*.

4. Responding to a request from the Sea Grant Advisory Service the program prepared a legal memorandum on the question of termination of oyster leases upon the death of the lessee.

5. The program completed a study of the federal government's policy toward barrier islands. An article length paper entitled *Barrier Islands: A Proposal for an Effective Federal Policy* was produced as a result of the study.

6. The program prepared a brochure describing the Sea Grant Legal Program, its objectives and its activities. The brochure, distributed throughout the law school and at various meetings, is designed primarily to increase law student interest in the Sea Grant Program at the University of Mississippi School of Law.

An integral part of the Marine Resources Law Program is the contribution made by student research associates. Through the program, specially selected upper level law students are given the opportunity to supplement their general legal education with practical training and experience handling ocean and coastal legal problems. Under the supervision of the principal investigator, students contributed articles to *The Water Log* and conducted law research for issues involved in the program's other projects.

The program has developed an extensive collection of reference materials on marine and coastal law and policy and marine science and technology. Several books were added to the marine law library in 1981. The library is available to faculty, staff and students at the University of Mississippi Law Center, to state and federal officials, and to the general public.

Publications

The Water Log. Mississippi-Alabama Sea Grant Consortium Newsletter. 4 issues: March, June, September, December 1981. Michael Gibbs, Editor.

Jarman, C., Gibbs, M. and Farnell, S. *Recreational Boat Leasing on the Mississippi and Alabama Coasts: A Review of Boat Owners' Legal Responsibilities;* September 1981. MASGP-81-014.

Gibbs, M. The Mississippi Coastal Program: Managing Mississippi's Coastal Resources. October 1981. Paper presented at the Proceedings of the Seventh Annual Meeting of the Coastal Society, Galveston, Texas.

Is construction permitted here? – Questions that the Law Program helps to answer.

Alabama Marine Law Program

Robert McCurley and Sarah K. Farnell
University of Alabama

SUMMARY: The Alabama Marine Law Program has used research, advisory services, and educational components to examine aspects of coastal and marine law of importance to local, state, and national interests.

The Alabama Marine Law Program was designed to respond to the needs of marine resources users by providing for the analysis and study of legal problems confronting the coastal area. By using the three-fold approach of education, research, and advisory services, the program has provided needed answers to local, state and federal agencies, the general public and regional industries. The following specific projects of particular interest were completed in 1981:

The Alabama Marine Law Program in cooperation with the Mississippi Marine Resource Law Program and the Sea Grant Advisory Service expanded work on a project published last year entitled *A Survey of Wetlands Law*, MASGP-79-008-3. This expanded effort involved analysis of the future of Mississippi and Alabama wetlands and the legal aspects of wetlands use. The project is especially important in light of a federal court action in Louisiana prohibiting owners of wetlands from using the property for agriculture or forestry. The Louisiana State University Sea Grant Legal Program has requested that it also cooperate in this project.

Revision of a high demand monograph *Submerged Lands* MASGP-79-008-1. Recent oil and gas discoveries off the Alabama and Mississippi coasts have brought increased concern with the laws dealing with submerged land ownership. The revised publication *State and Federal Claims to Submerged Lands in the Mississippi Sound* MASGP-81-0010-(2) includes an updated analysis of current litigation.

Research was completed on and an article published in *Sea Grant Today* January 1982 on the methods states use to tax offshore resources. A similar but more specific article on Alabama laws, "Regulation of Alabama's offshore Resources", was published in *The Alabama Lawyer*, April 1982 issue.

A paper "Legal Options for Wetlands Management" was presented at the annual conference of the Coastal Society.

In response to legislation regulating the use of motor vehicles on sand dunes in Alabama, a publication analyzing the laws affecting motor vehicle use in dune areas entitled *Beaches and Dunes vs Off Road Vehicles* was published.

In an effort to help examine the barriers to forms of natural gas not currently being heavily utilized, several projects were completed including: "Legal Constraints on Methane Gas Development" (MASGP-81-010) [the Alabama Department of Energy cooperated with a $1,000 grant to defray part of publication costs] and "Methane Gas Ownership," to be published in the *Alabama Law Review* in 1982.

A joint project with the Mississippi law program studied charter boat owner liability in Mississippi and Alabama. The purpose of the project was to inform those involved in recreational boat leasing about the importance of maintaining safe boats and equipment and of complying with all applicable rules and regulations.

The Alabama and Mississippi law programs cooperatively presented a workshop on Marine Law and Policy to Mississippi-Alabama Sea Grant Consortium investigators at a pre-site visit meeting. A publication, *Issues in Ocean and Coastal Law and Policy* MASGP-81-010 was distributed at the workshop.

A course, Introduction to Marine and Environmental Law, was presented at Dauphin Island Sea Laboratory. Two papers presented by students Freda Dennis and Prince Collins in satisfaction of the course were published by MASGC.

The Program sponsored a workshop on minerals leasing in the coastal area in cooperation with the Escambia County Bar Association and presented a workshop on "Energy and the Law" to high, junior, and middle school teachers at the University of Alabama's summer institute *Teaching About Energy and the Environment*.

A conference on the important and controversial issue of the Tennessee Tombigbee Waterway presented in early 1982 brought together speakers from the University of Alabama, the University of Mississippi,

Mississippi State University and federal, state and local agencies to discuss impacts of the waterway on the local area.

As part of its continuing effort to disseminate the results and information generated by this program, six issues of a newsletter *Energy and Environmental Law Update* were published and distributed to 350 groups and individuals throughout the Southeast.

Publications

Legal Options in Wetlands Management. *Proceedings of the Seventh Annual Convention of the Coastal Society.* October, 1981. In Press.

State and Federal Regulation of Alabama's Offshore Lands. *The Alabama Lawyer.* April, 1982, p. 340. MASGP-81-025.

State and Local Taxation of Offshore Resources. *Sea Grant Today.* Vol. 12, No. 1, 1982, p. 10.

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State and Federal Interactive Relationships on Water Pollution Regulatory Systems. Prince Collins Chukobasih, Student paper published by MASGC, 1981.

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Socio-Ecologic Study of the Bayou La Batre Community, Alabama

Nelson Reid and Paul Starr
Auburn University

SUMMARY: Bayou la Batre, Alabama, is a small, long-established fishing community in coastal Alabama. This project examined the community social and economic structures and the changes occurring in those structures through the pressures of industrialization, tourism, and changing social structures brought by outside organizations and capital.

What was once a small and relatively autonomous fishing community has in recent years become a prominent center for the production of trawlers and work boats (20 ship yards now in production), an important seafood landing and processing site (consistently ranks in the top ten in U.S. seafood landings), and since 1980 the primary landing site for petroleum exploration/development in Mobile Bay. These combined activities contribute an estimated $1 billion to the region's economy.

Historical transformation has been examined via interviews and historical documents reflecting increased industrialization in the area through the introduction of new technologies and the integration of commercial enterprises into the larger national and international economy.

Given the limited nature of the resources involved, particular attention has been given to matters of accommodation among the varied interest groups participating in the area's development.

Whether Bayou La Batre will gain or lose as a result of increased industrialization, limited resources, the introduction of outside corporate investment, and important social changes, only the future can tell. This investigation only seeks to trace the elements of the situation, examine their meaning for the community, and explore how those concerned with community development and planning might better understand the processes of change and accommodation.

Advisory Services

The Advisory Services in Mississippi and Alabama are physically and administratively distinct. Nevertheless there is a great deal of coordination, interaction and cooperation involved in the planning and implementation of the respective programs.

Cooperative activities exist in areas such as waste disposal, seafood processing, recreational boating, commercial and sport fishing and youth development activities.

Each program is administratively responsible to the Cooperative Extension Service in its own state thereby linking the Sea Grant and Land Grant Systems.

Program priorities are established by interaction between advisory personnel and their clientele with important contributions from an Advisory Committee and the public at large.

Mississippi Sea Grant Advisory Services Program

C. David Veal and John Kelly
Mississippi Sea Grant Advisory Service

SUMMARY: The Mississippi Sea Grant Advisory Service continued important work on fuel consumption patterns in the Gulf shrimp fleet, transferred preliminary information to area fishermen and made inroads in seafood waste disposal problems. Some important contributions were made in providing start up support for area seafood marketers. A wide range of educational-informational projects involving sport and commercial fishing, the scientific community, youth groups and government agencies was completed.

The Mississippi Sea Grant Advisory Service has worked with Mississippi food retail outlets to establish a market for the wide variety of presently unutilized finfish that are available locally. Early in the year a major Mississippi food chain contacted Mississippi Sea Grant Advisory Service with a request to provide training and guidance in the selection, preparation, display, merchandising, and marketing of fresh and frozen seafood products in its 70 retail stores.

On a smaller scale, a request was made to provide design criteria for a major new seafood outlet on the Gulf Coast. The market being planned by a local seafood processor will feature not only locally caught seafood and shellfish but a broad range of seafood from the North Atlantic and Pacific Oceans as well—a real innovation locally.

The Advisory Service in conjunction with Mississippi State University Food Technology Department has begun preliminary investigation on the utilization of locally caught shark as a food fish. Although work has been done in this subject in other institutions very little has been done in this area.

For the second year in a row the advisory service sponsored Coast Week. This program is aimed at providing junior and senior high school students and the general public with an overview of the coastal environment, its opportunities and its problems. More than 300 students from around the state participated in lectures, demonstrations and field trips by marine scientists, educators and representatives of 16 local and federal agencies. Subjects covered ranged from water currents and estuaries to marine careers and oyster shucking.

A highlight of the program was the visit to the Gulf Coast by the replica of a 19th century Baltimore clipper, the *Pride of Baltimore*. The tall ship's visit was arranged by the advisory service to point up the association between the cities of Baltimore and Biloxi in the early days of seafood processing. Baltimore supplied the know how and seasonal labor to establish the first seafood canneries in Biloxi.

Mississippi Sea Grant Advisory Service personnel made numerous presentations to area school groups on topics ranging from the activities of the Sea Grant Consortium and the Advisory Service to scientific topics. Youth-directed activities, particularly the encouragement of interest in marine areas, continue to be of major concern to the Mississippi Sea Grant Advisory Service. Programs under development include marine 4-H programs in cooperation with the Southeast and Southwest districts of the Cooperative Extension Service, and with Gulf Coast Research Laboratory Marine Education Center.

The advisory service presented a five-part sport fishing workshop sponsored by Mississippi Power Company. Workshops were held in Gulfport, Pascagoula, Hattiesburg, Laurel and Meridian, Mississippi. The attendance at these well-received workshops exceeded 225.

Work is continuing on an energy consumption project dealing with the commercial shrimp fishing fleet. The project, funded equally by Mississippi-Alabama Sea Grant Consortium, the National Marine Fisheries Service and the Gulf and South Atlantic Fisheries Development Foundation Inc., is using ship-mounted, fuel-monitoring computers, on-board observers and interview techniques to establish fuel-use patterns as a means of reducing the burden of increasing fuel costs. In addition, one boat in the study sample has had her bottom coated with a special compound, purported to reduce hull friction by 15 to 25 percent.

In order to transfer some of the preliminary information to the fishing community as soon as possible, two symposia were held in 1981, one in Biloxi, Mississippi, and one in Bayou La Batre, Alabama. Additionally two workshops were conducted for training advisory agents from other Sea Grant programs. The workshops held in Houston, Texas, and Orlando, Florida, brought agents from North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas.

Shrimp processors have had a long-standing problem of solid waste disposal. The shrimp heads and shells quickly spoil in Biloxi's warm climate and give off noxious odors and cause frequent local complaints. This has forced processors to resort to frequent and expensive removal to sanitary land fills. A recent innovation is the use of special compactors to remove most of the moisture from the waste thus reducing spoilage and bulk. This

practice has sharply reduced an important local problem.

Liquid waste continues to be a major problem for the seafood processing industry. The advisory service at the request of industry representatives has brought the problem to Mississippi's university system to find a solution.

Work continues on the effort to reconcile differences between sport and commercial fishermen. Recent fishing law changes have essentially eliminated the possibility of the development of a large scale sardine fishery in this area.

There is also continued conflict between charter boat captains and net fishermen. Although little progress has been made in this particular area, the advisory service has worked with both groups to help resolve the problem.

A serious concern of the recreational boating industry is that of legal liability. The advisory service at the request of local groups worked with the Sea Grant legal program to produce a workshop on the legal aspects of leasing waterborne equipment to the general public. Cooperating in presentations at the workshops were representatives of Mississippi Bureau of Marine Resources, U.S. Coast Guard, Mississippi Sea Grant Advisory Services, and the Mississippi Sea Grant Legal Program. Because of its significance, and importance and enthusiastic reception, the workshop should be equally applicable to Alabama.

The advisory service, at the request of the Corps of Engineers, has been instrumental in providing important dialog between the Corps and fishing and environmental interests on the effects dredging and dredge spoil disposal can have on the marine environment. The advisory services role is only to open lines of communication not to assume an advocacy role for either side.

In order to facilitate the exchange of information between scientists working in Mississippi Sound and between the scientists and the public, Mississippi Sea Grant Advisory Service and the Consortium sponsored a Symposium on Mississippi Sound in Biloxi, Mississippi, in June 1981. Scientists were brought together from Sea Grant, the universities, federal and state agencies and the private sector to explain the state of the art in their research field and planned future research. This symposium will not only facilitate information exchange but help eliminate unnecessary duplication of research.

Publications

MASGP-81-001, Starting and Maintaining a Marine Aquarium.

MASGP-81-002, Mississippi Marine Resources — Pilot Manual.

MASGP-81-003, Mississippi Charter Boat Directory.

MASGP-81-007, Symposium on Mississippi Sound, June 25-26, 1981.

MASGP-81-008, Recreation and Climate Guide For Coastal Mississippi.

MASGP-81-009, 1982 Mississippi Tide Tables.

MASGP-81-021, Gulf Coast Fisherman Newsletter.

Alabama Sea Grant Advisory Services Program

Warren McCord, Mac V. Rawson, William Hosking, and Wallace Calhoun
Alabama Cooperative Extension Service

SUMMARY: The Alabama Sea Grant Advisory Service played important roles in helping area commercial fishermen acquire medical insurance, continued a fishing vessel fuel conservation study, worked cooperatively with federal, state and local government agencies on local issues and maintained public contact via workshops, publications, personal contact and the media.

Significant changes in both personnel and structure occurred in 1981 and has occasioned a major shift in program focus to two main areas: fisheries development and coastal resource awareness and development.

Fisheries Development

In a combined project begun in 1980, the Alabama and Mississippi Sea Grant Advisory Services are examining fuel consumption patterns in the shrimp fleets of the two states. This project funded equally by the Consortium, the Gulf and South Atlantic Fisheries Development Foundation Inc., and National Marine Fisheries Service is using fuel flow computers mounted on selected boats, on-board observers, and interview techniques to gather data that can be used to reduce very high fuel cost/catch ratios of the Gulf shrimp fleet.

At the same time that the shrimp fleet was facing escalating fuel and other operating costs, the U.S. Public Health Service (PHS) on October 1, 1981, closed its clinics and hospitals. Commercial fishermen who had been eligible to receive free medical care from PHS facilities found themselves in the position of having no source of medical insurance and unable to participate in any organized group plans to obtain such insurance. The Advisory Services first informed the fishermen that their medical coverage was being terminated, many of whom were unaware of the pending loss of coverage and worked with the Alabama Fisherman's Association to identify insurance companies willing to deal with the commercial fishing community. A medical insurance provider was selected and a policy should be in place in early 1982. Other commercial fishing industry efforts included workshops on soft-shell crab production, a brochure on shrimp and marine public affairs and meetings for the scientific community and the general public.

With an additional member of the advisory service team available, increased participation in a number of projects was possible, including work on industrial/municipal pollution of oyster reefs, unauthorized disposal of Dauphin Island bridge debris, and multiple/alternate use of fishing vessels. The additional advisory service specialist has also permitted expanded day-to-day contact with commercial and sports fishermen an essential component of advisory service.

In other efforts advisory personnel have provided material to local communities for publication in conjunction with local seafood festivals.

Coastal Resources

A continuing problem in Alabama is that of dredge spoil disposal. Where dredge spoil should be placed and the best techniques for disposal are questions of profound environmental consequence. Improper or hasty decisions can have lasting and far reaching consequences.

The advisory service, taking care not to assume an advocacy role, encouraged input during planning stages from commercial fishermen, sport fishermen, scientists, industrial and environmental interests and the general public in the formulation of long term plans for spoil disposal in Mobile Bay and the Sound by the Corps of Engineers.

The cooperative extension service has provided the services of a Marine Public Affairs Agent for the second year in a row to work with these varied groups and to provide assistance in other areas of resource awareness.

An important charge of the Sea Grant Program is the exchange of information both within the scientific community and from the scientific community to the public. In February 1982 the Alabama Sea Grant Advisory Service and the Consortium sponsored a Mobile Bay-Mississippi Sound Research Review that brought together in Mobile, Alabama, scientists from Sea Grant, universities, federal and state agencies and the private sector for just such an exchange. Scientists explained the current state of knowledge and planned research in their area of study. This research review will be held on an annual basis to facilitate the continued interchange of information and to eliminate duplicative research efforts.

Since the advisory service is the major point of contact between Sea Grant and the public, it is important that a high level of visibility, credibility and acceptance be maintained. A Cooperative Extension Service team for information services representing special skills in printed media, visuals and television cooperated with the Advisory Service in evaluating and improving information transfer methods. Their positive recommendations have increased the capability of the advisory services to carry its message to the people.

The Marine 4-H Program was formed to provide information and stimulate interest in coastal affairs among the youth of the entire state. Although much of the routine functions

have been transferred to the Auburn based 4-H Specialist, Alabama Sea Grant Advisory Service continues to lend the program its enthusiastic support.

The annual Marine 4-H Conference was again held at Camp Tempoochee, Niceville, Florida. This cooperative effort of the University of Florida, Auburn University, the Alabama Marine Environmental Sciences Consortium and the Alabama Sea Grant Advisory Service has proven effective in increasing coastal awareness of 4-H members throughout Alabama.

Publications

Sea Harvest News Series

MASGP-80-003-6. February, 1981. Fuel Conservation Study Begins. Medical Care. Survey Form
MASGP-80-003-7. February, 1981. Groundfish Management Plan Hearing
MASGP-80-003-8. May, 1981. Texas Closure Announced. PHS Contract Physicians' Services End
MASGP-80-003-9. July, 1981. Hearings Scheduled on Shrimp Management Plan. Income Tax Management. Restricted Areas at LOOP
MASGP-81-013-1. August, 1981. Fishery Management Councils
MASGP-81-013-2. October, 1981. Health Care Changes. New Louisiana Fishing Laws
MASGP-81-013-3. January, 1982. Underwater Obstructions. Tax Guide for Commercial Fishermen. Measures to Improve Your Fishing Efficiency
MASGP-81-013-4. March, 1982. Alabama Shrimpers Overcharged for Louisiana Licenses. Texas Closure of Shrimp Grounds Will be Continued. New Hull Coatings Can Increase Fuel Savings. New Study on Crab Pots Shows How to Increase Catch
MASGP-81-013-5. March 16, 1982. Energy Management Workshop. Health Insurance for Commercial Fishermen
MASGP-81-013-6. April 1, 1982. Energy Management Workshop Reminder

Timely Information Publications

MASGP-80-006-4. Beaches and Dunes vs. Off Road Vehicles

4-H Marine Science Publications

MASGP-80-011-1. 4-H Marine Science Simulation Game. Member's Guide. Land Use for Marsh Beach
MASGP-80-011-2. 4-H Marine Science Simulation Game. Agent's Supplement. Land Use for Marsh Beach
MASGP-80-011-3. 4-H Marine Science Member's Guide. Activity I. A Beach and Dune Community
MASGP-80-011-4. 4-H Marine Science Member's Guide. Activity II. The Nomadic Beach
MASGP-80-011-5. 4-H Marine Science Member's Guide. Activity III. Building A Dune
MASGP-80-011-6. 4-H Marine Science Member's Guide. Harvesting From the Sea

Other Publications

MASGP-80-017. Tips on Promoting a Tourist Attraction
MASGP-81-011. First Aid for Damaged Beaches and Dunes
MASGP-81-016. Sea Grant
MASGP-81-017. Buying and Preparing Shrimp
MASGP-81-018. Fish & Shellfish Handbook
MASGP-81-026. Synoposis of the Mobile Bay-Mississippi Sound Research Review

Other Media

Sea Grant columns published in five weekly newspapers in Mobile and Baldwin counties.
Six news and feature articles published in the *Mobile Press-Register* and weekly newspapers.
Four television news interviews and ten other television appearances.

An Evaluation for Energy Consumption, Problems and Potential Solutions in the Mississippi and Alabama Shrimp Fleets

C. David Veal, Mac V. Rawson and William Hosking
Mississippi Cooperative Extension Service
Alabama Cooperative Extension Service

SUMMARY: The Alabama and Mississippi Sea Grant Advisory Services joined forces in a project funded jointly by the Consortium, the National Marine Fisheries Service, and the Gulf and South Atlantic Fisheries Development Foundation Inc., to determine energy consumption patterns of Gulf shrimp and to make recommendations for fuel savings.

The most valuable fishery product in the United States is shrimp. In 1979, of the $472 million total value of the U.S. shrimp fleet, the Gulf of Mexico fishery accounted for 80 percent of the value and 60 percent of the volume.

For Gulf shrimp boats over 50 feet, 40 to 54 percent of total operating costs go for fuel and oil. Recent trends have been to even larger vessels with greater fuel consumption. Of vessels built since 1970, 62 percent are larger than 55 feet compared to 18 percent built prior to 1960.

With the rapid increase in fuel prices in recent years and level or even lower ex-vessel shrimp prices, the shrimp industry finds itself in an untenable economic position. It has been estimated that when diesel fuel sold at $0.90/gal. a vessel operator was operating at a loss of $0.01/lb. Fuel prices in mid-1981 ranged from $1.14 to $1.26.

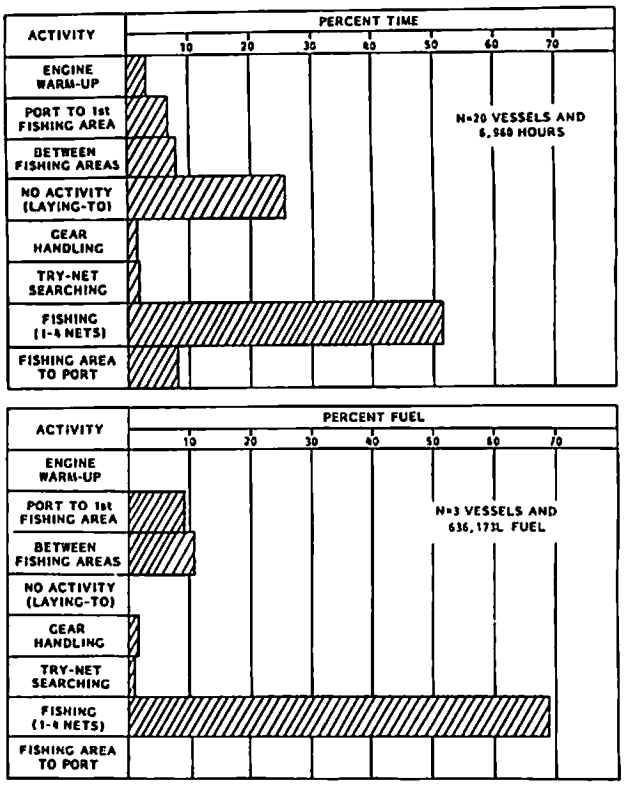
The objectives of this project included:

1. Defining the character of the shrimp fleet in Mississippi and Alabama using questionnaires, and computer analysis of Documentation Office data.
2. Defining a time budget for a typical vessel using a system of on-board observers.
3. Defining a fuel budget through the use of vessel-mounted fuel monitoring computers and on-board observers.

Data so far examined indicate that 51 percent of a vessel's time is spent fishing and, that time, accounts for approximately 70 percent of the total fuel consumed.

It seems apparent that any efforts aimed at reducing fuel consumption must, in the short run, concentrate on improving fishing gear and fishing techniques. In the long run, gains might be possible by improving vessel design and more efficient propulsion systems, all expensive alternatives.

As a means of getting the project's results and recommendations to the fishing community as soon as possible, two symposia were held in 1981, one in Biloxi, Mississippi, and one in Bayou La Batre, Alabama. In addition, two workshops were conducted for the training of advisory agents from other Sea Grant Programs. The workshops held in Houston, Texas, and Orlando, Florida, included agents from North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas.



Time and fuel budgets for selected Gulf of Mexico shrimp trawlers.

Development of Recreation and Climate Guide for the Mississippi Coastal Area

C. David Veal
Mississippi Cooperative Extension Service

The Mississippi Sea Grant Advisory Service, cooperating with the National Oceanographic Data Center (Environmental Data and Information Service), produced a full color brochure that will promote interest in the Gulf Coast as a desirable vacation area.

The 19-page publication describes the range of leisure opportunities available in the area. Attractive color photographs illustrate most of the activities. Historical sites, fishing, boating, golf courses and local festivals are a few of the wide range of leisure activities covered. A series of tabular climate and weather guides depicting the monthly and seasonal possibilities for separate activities such as fishing, sightseeing and sunbathing are included along with a topical narrative for each major activity.

Publications

Veal, C. David and Richard DeAngelis. 1981. Recreation and Climate Guide for Coastal Mississippi. Mississippi-Alabama Sea Grant Consortium, Ocean Springs, MS. MASGP-81-008.

Sailing and sunbathing, two of many things to do on the Gulf Coast.

Literature Review, Data Set Identification and Compilation of Data of the Ground Fishery in the South Atlantic and the Gulf of Mexico

Edward J. Harrison and Teresa C. Heaton
Mississippi State University

SUMMARY: A bibliography on nine groundfish species was assembled in computerized format. A brief summary and key word identifiers are included in each citation. Holders of existing research data and the general nature of the data were identified. The compilation covered American waters from the Chesapeake Bay southward to the Texas/ Mexico border, with some information from other areas also included.

In April 1981 the initial phase of a three-year program to locate and compile existing information on nine species of groundfish was begun. The project was funded through the Mississippi-Alabama Sea Grant Consortium (MASGC) with Saltonstall-Kennedy monies appropriated by the Pascagoula Laboratory of the National Marine Fisheries Service (NMFS).

The project was designed to assist fishery managers and researchers by producing two major products: (1) an annotated bibliography, with keyword identifiers, containing citations to all relevant publications, theses, reports, etc., on the target species, and (2) a data base representing a compilation of existing field data on these species collected by university, governmental and private researchers with data rearranged into a common format to facilitate computer analyses. Both items were to be delivered in computer-ready form on punch cards or magnetic tape.

The minimum goals for the first year were to produce the portion of the bibliography covering literature for the coastal areas of Alabama, Mississippi, and Louisiana, and to locate sources of existing data in this same area. Federal budget restrictions have made the second and third phases (years) of the project impossible, but accomplishments for the first phase exceeded expectations. The resulting annotated bibliography cites literature on the Atlantic coast from Chesapeake Bay southward to Florida and the entire Gulf of Mexico coast of the United States. A few exceptional publications from other areas are also included.The search for existing research data covered the same geographic area that is represented in the bibliography. The Groundfish Bibliography and keyword identifier list now on file at MASGC and NMFS will be incorporated into the computerized Coastal Information System now under development at MASGC.

Groundfish Species Included In The Bibliography

Scientific Names	Common Name
Arius felis	Sea catfish
Cynoscion arenarius	Sand seatrout
Cynoscion nothus	Silver seatrout
Leostomus xanthurus	Spot
Micropogonias undulatus	Atlantic croaker
Peprilus burti	(Gulf) Butterfish
Peprilus triancanthus	Butterfish
Stenotomus caprinus	Longspine Porgy
Trichiurus lepturus	Atlantic cutlassfish

Activity Budget Sheet

	NOAA Grant Funds	Matching Funds
RESEARCH		
MARINE RESOURCES DEVELOPMENT		
Aquaculture	$ 12,000	$ 5,756
Living Resources	86,874	38,849
Mineral Resources	73,395	84,056
SOCIO-ECONOMIC & LEGAL STUDIES		
Ocean Law	44,275	83,101
Socio-Political Studies	1,100	-0-
MARINE TECHNOLOGY RESEARCH & DEVELOPMENT		
Resources Recovery & Utilization	52,546	24,804
MARINE ENVIRONMENTAL RESEARCH		
Environmental Models	17,997	9,306
Applied Oceanography	63,300	38,086
Total Research	351,487	283,958
EDUCATION		
MARINE EDUCATION AND TRAINING		
College Level	15,000	6,166
Other Education	69,289	40,778
Total Education	84,289	46,944
ADVISORY SERVICES		
ADVISORY SERVICES		
Other Advisory Services	172,667	61,403
PROGRAM MANAGEMENT		
PROGRAM MANAGEMENT		
Program Administration	307,928	55,072
TOTALS	$916,371	$447,377

This summary is approximate. The official financial report will be submitted to NOAA's Office of Sea Grant Programs in accordance with federal grant requirements.

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Program Summary

Project No.	Project Title	Principal Investigator	1981
	MARINE ENVIRONMENTAL RESEARCH		
R/ER-1	Modern and Ancient Sedimentary Process and Response Within the Mississippi-Alabama Linear-Barrier-Coastal System	Manley	C
R/ER-2	Pollutant Transport in Mississippi Sound	Lytle	C
R/ER-3	Hydrodynamics of Mobile Bay and Mississippi Sound	Raney	C/R
R/ER-4	Sedimentation, Dispersal and Partitioning of Trace Metals in Mobile Bay Bottom Sediments	Isphording	C
R/ER-5	The Role of Mississippi Sound in Recruitment to Sport and Commercial Fish Stocks	Richardson	C
R/ER-6	Seismic Survey and Deep Core Stratigraphy of Mobile Bay Region	Brande	C
R/ER-8	Study of Organic Pollutant Levels in Oysters of Mobile Bay	Marion	N
	MARINE TECHNOLOGY		
R/MT-1	Utilization of Chitin to Control Pesticide Mobility	McCormick	C
R/MT-3	Enteroviruses in Prohibited Oysters and Marine Sediments	Ellender	C/E
R/MT-4	Marine Algae in Production of Fermentation Alcohol and in Wastewater Recovery	Rhyne	N
	EDUCATION AND TRAINING		
E/O-1	Secondary School Minority, Underprivileged and Handicapped Student Exposure to Marine Education	McCaughan	C
E/O-2	Man and the Gulf of Mexico	Irby	C
E/O-3	Talladega College Marine Sciences Fellowship and Development Program	Bacon	C/E
E/O-4	An Experimental Program to Intensify Marine Science at Jackson State University	Archer	C
E/O-7	Macroinvertebrate Fauna of Mississippi and Alabama Coasts	Overstreet	C/R/E
E/O-8	MEMS Program Support	Stout	C
	SOCIO-ECONOMIC AND LEGAL STUDIES		
R/SL-1	Marine Resources Law	Hooper	C
R/SL-2	Alabama Marine Law Program	McCurley	C
R/SL-3	Socio-Ecologic Study of Bayou La Batre Community, Alabama	Reid	

Project No.	Project Title	Principal Investigator	
	ADVISORY AND PUBLIC SERVICE		
A/O-3	Mississippi Sea Grant Advisory Services Program	Veal	C
A/O-4	Alabama Sea Grant Advisory Services Program	McCord	C
A/O-7	An Evaluation for Energy Consumption, Problems and Potential Solutions in the Mississippi and Alabama Shrimp Fleets	Veal	N
A/O-8	Development of Recreation and Climate Guide for the Mississippi Coastal Area	Veal	E
	RESOURCES DEVELOPMENT		
R/RD-1	Literature Review, Data Set Identification Compilation Data of the Groundfish Fishery in the South Atlantic and the Gulf of Mexico	Harrison	N/E

Legend

E - Project completed or terminated.
C - Project continued
R - Project redirected
N - Project initiated

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Editor