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Dow Wynn, Port of Port Arthur

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Texas A&M University's Sea Grant College Program, administered by the Center for Marine Resources, is made possible through an institutional award from the National Oceanic and Atmospheric Administration, U. S. Department of Commerce. More than 40 individual marine resource development projects are carried out under the program involving 15 departments and divisions of the University.

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texas a&m sea grant 1973-74

Historically concerned with the varied and important resources of the Gulf of Mexico, Texas A&M University was named one of the nation's first Sea Grant Colleges on September 17, 1971. This followed three years of institutional support from the National Sea Grant Program, established by Congress in 1966. A&M's Sea Grant activities began in 1968, when the University received one of the first Sea Grant institutional awards. Originally part of the National Science Foundation, the Sea Grant Program is now administered by the National Oceanic and Atmospheric Administration (NOAA).

Texas A&M's Sea Grant Program is administered by the Center for Marine Resources, a university-wide unit established in the spring of 1971 to coordinate the institution's marine programs.

This special issue of **The University and the Sea** reports the accomplishments of A&M Sea Grant during the year ending August 31, 1974, in which support was provided for over 60 projects in six major program areas.

In 1973-74, activities were carried out in the Colleges of Agriculture, Business Administration, Engineering, Geosciences, Liberal Arts, Science and Veterinary Medicine, and in the Moody College of Marine Sciences and Maritime Resources, Texas Agricultural Extension Service, Texas Engineering Experiment Station (Industrial Economics Research Division, and Texas Transportation Institute. Also receiving Sea Grant support were projects at Baylor College of Medicine, Brazosport College, Region II Education Service Center, Lamar University and the University of Houston.

Expenditures for the 1973-74 academic year are shown in the accompanying chart. Approximately 49 percent was directed toward applied research; 29 per-

cent toward advisory services; over 5 percent toward education and training; and 15 percent toward program management and development, including public and technical information services.

As a Sea Grant College, Texas A&M is committed to identifying and serving the needs of Texas and cost sharing underscores this commitment. Recipients of Sea Grant support must match their federal funds on a one for two basis. This requires coordination with other programs and the active involvement of many people in the planning and operational processes, and is another of the unique aspects of Sea Grant which sets it apart from traditional university programs.

The Texas legislature has provided a portion of the matching funds for the past five years. This appears as a special item in the University's budget. Additionally, some state agencies plan their budgets in such a way that funds may be available to match Sea Grant work that is undertaken jointly. Other colleges and universities, associations and private firms also are sources of matching dollars.

Sea Grant in Texas has provided the opportunity and the stimulus needed to build a network which reaches virtually every coastal community and which contributes to progress in all phases of marine affairs.

For Texas, Sea Grant is important—to dozens of state agencies, legislative committees and industries and to thousands of individuals who have learned that the program is providing solutions to the problems of the coastal zone.

Texas A&M is committed to advancement of the Sea Grant concept through all of its marine programs and thereby to increased service to the people of Texas and the nation. ■

SEA GRANT PROGRAM EXPENDITURES 1973-74

Program Area	NOAA Funds	Matching Funds	Total
Marine Resources Development	\$ 262,089	\$126,522	\$ 388,611
Socio-Economic & Legal Studies	82,812	44,690	127,502
Marine Technology Research & Development	264,585	126,150	390,735
Marine Environmental Research	117,814	51,604	169,418
Marine Education & Training	91,920	30,787	122,707
Advisory Services	423,628	220,986	644,614
Program Management & Development	169,622	169,903	339,525
	<u>\$1,412,470</u>	<u>\$770,642</u>	<u>\$2,183,112</u>

advisory council offers guidance

Fourteen men representing a broad spectrum of private businesses, government agencies and educational institutions who share a common interest in marine affairs make up the Sea Grant Advisory Council for Texas, created in 1971. Meeting regularly with staff of the Texas A&M University Sea Grant College Program, the Council offers advice and direction to the program as it works to meet the needs of the state's diverse marine community.

Dr. Joseph Angelovic of Galveston is director of the Gulf Coast Center, National Marine Fisheries Service. Dr. Angelovic believes that the Advisory Council helps make the Texas A&M Sea Grant Program a cohesive one and assists in setting research priorities. His interests include marine fisheries, environmental research and aquaculture.

Commissioner of the General Land Office **Bob Armstrong**, Austin, has been interested in the marine environment since he was a member of the Texas House of Representatives, where he was the sponsor of two bills affecting beaches and the bill creating the Texas Conservation Foundation. As Land Commissioner, Armstrong created the first Environmental Planning Division within the office and serves as Texas' chief administrative officer for coastal zone management planning activities.

President of the Gulf Ports Association, **Al Cisneros** is general manager and port director of the Brownsville Navigation District. Cisneros views the Council as a body charged with communicating to the Sea Grant Program the real needs and problems of those who work, live and play in the Texas coastal zone. He is a past president of the Texas Ports Association and a past member of the House Interim Committee on Coastal and Marine Resources.

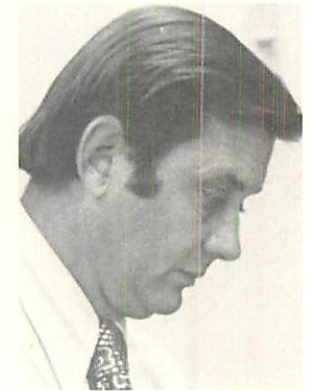
Myrven H. Cron of Houston has interests in both the chemical industry and marine recreation. He is president of Cron Chemical Corporation and Adventure Investment Corporation, owner of a marina-resort complex. Cron is vice president of the Marina Association of Texas.

Dr. William L. Fisher is director of the Bureau of Economic Geology at the University of Texas at Austin, where he has taught since 1969. He is a member of numerous state committees including the Governor's Interagency Council on Natural Resources and Environment and the Governor's Land Resources Management Committee. He is a member of the National Advisory Panel for the Coastal Zone Management program, National Oceanic and Atmospheric Administration.

Council member **Dr. Richard A. Geyer** of Bryan is head of the Texas A&M University Department of Oceanography. The author of several publications concerning the Gulf of Mexico, Dr. Geyer lists marine geophysics and acoustics among his interests. He was a member of the President's Commission on Marine



Angelovic



Armstrong



Cisneros



Cron



Fisher



Geyer

Science, Resources and Engineering and is on the Executive Committee of the Offshore Technology Society.

Vice Provost of Southern Methodist University, Dallas, **Dr. LeVan Griffis** is also a professor of civil engineering. In his view, the Advisory Council helps the Sea Grant program to set priorities and to evaluate present programs.

Terrance Leary of Austin, director of the shellfish program of the Texas Parks and Wildlife Department, feels that the Council provides an avenue of public input into the direction of the Texas Sea Grant Program. Leary is a past president of the World Mariculture Society and a member of the American Fisheries Society, National Shellfish Association, Gulf Estuarine Research Society, and Gulf and Caribbean Fisheries Institute.

Col. Don S. McCoy of Galveston is district engineer for the U. S. Corps of Engineers. As district engineer for the entire Texas coast, he is responsible for planning, design and construction of flood protection and navigation projects in the state.

Chairman of the Advisory Council is **William F. McIlhenny** of Freeport, associate scientist with the Texas Division of Dow Chemical Company. McIlhenny is interested in the chemistry of sea water and the recovery of industrial materials from the ocean. He is a member of the American Society of Oceanography, Marine Technology Society and the Texas Water Pollution Control Association.

John A. Mehos of Galveston is vice president of The Liberty Fish and Oyster Company, with which he has been associated since 1949. A past president of the Texas Shrimp Association, Mehos is a member of the Marine Fisheries Advisory Committee, U. S. Department of Commerce, and the Gulf States Marine Fisheries Commission.

President of Pace Fish Company, Inc. of Brownsville, **Pat L. Pace** is also president of the Texas Seafood Producers Association. He is a member of the Gulf Coast Council on Water Resources, Greater South Texas Cultural Basin Committee and the Board of Directors of the National Fisheries Institute. He is interested in all aspects of the fishing industry.

W. C. Price of Corpus Christi is a vice president of Central Power and Light Company. A past president of the Texas Industrial Development Council, he currently is a member of the Mid-Coast Water Development Council and the Texas Water Conservation Association. He was a member of the Industrial Advisory Group to the Interim Study Committee on Oceanography of the 62nd Texas Legislature.

General manager and port director of the Port of Port Arthur, **Dow Wynn** was charged with the design, planning, location, construction and management of the \$12 million public port facilities of Port Arthur in 1964. He is a past director of the American Association of Port Authorities, and is currently a director of the Gulf Ports Association and president of the Texas Port Association. ■



Griffis



Leary



McCoy



McIlhenny



Mehos



Pace



Price



Wynn

education-investment in tomorrow

The need to discover and develop the knowledge and skills necessary for exploration and utilization of the oceans is the motivating force behind the education and training programs sponsored by Sea Grant in several colleges of Texas A&M University and at Brazosport College.

Coordinated by **Dr. B. Dan Kamp** of the Center for Marine Resources, in 1973-74 the program included projects in A&M's Colleges of Veterinary Medicine, Business Administration, Engineering, Agriculture and Moody College of Marine Sciences and Maritime Resources (Galveston), and at Brazosport College near Freeport.

NEED FOR TRAINED WORK FORCE

The tremendous growth of marine technology and exploration has created a need for persons trained in vessel and equipment operations.

In response to this need, the Oceanic and Marine Technology program at Brazosport College was created with Sea Grant assistance in 1971, and graduated its first class in May 1973. The program, under the direction of **Capt. E. D. (Ned) Middleton**, has been cited by the U. S. Department of Health, Education and Welfare as "an outstanding program deserving special recognition in the field of oceanic and marine technology.

Its graduates have a consistently high employment rate—83 percent of the May 1973 graduates found jobs in marine fields, and the figure rose to 84 percent for the May 1974 class. Student employment with industry during the 1974 practicum was 100 percent.

Approximately 60 students enroll annually, and may choose from one- or two-year programs of study. The two-year course leads to an associate applied science degree and includes a summer internship, and the one-year student earns a certificate of completion.

Students are informed about career opportunities in marine industry by guest lecturers from industry, and in field trips and intensive training aboard "intermediate-sized" vessels, such as those used in the intra-coastal waterway system, fishing industry and offshore oil and mineral operations.

Certification may be earned in RADAR (radio detection and ranging), LORAN (long range navigation), Able Seaman/Lifeboatman, First Aid and basic SCUBA.

Regular technical courses are offered in a variety of subjects, including seamanship, navigation, oceanography, marine electronics, marine technology and marine economics.

LEARNING COASTAL MANAGEMENT

Recent concern for the resources of the Texas coastal zone has led to careful consideration of the



John Gunning teaches in the Oceanic and Marine Technology program at Brazosport College. Photo by Ken Walsh.

balance between development and the quality of the environment.

Graduate management students have had a unique opportunity to discuss the problems of coastal zone management with national, regional, state and local experts during coastal zone management seminars directed by **John L. Seymour** of the Department of Management.

During the spring 1974 semester, 23 students from 13 disciplines enrolled in the seminar, which was set up with Sea Grant support. Speakers included faculty from several departments on the A&M campus, as well as experts from business and industry.

Among them were **Dennis O'Connor**, University of Miami, School of Law; **Dick Leach**, general manager-administration, Port of Houston Authority; **Dr. Athelstan Spilhaus**, Texas A&M's first Visiting University Professor;

and **Bob Knecht**, Director of the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

Each presentation was videotaped for future use and as a pilot project to determine the feasibility of preparing a series of videotaped lectures for nationwide distribution to agencies and individuals involved in coastal management.

VET MEDICINE COURSES DEVELOPED

Dr. Donald H. Lewis of the College of Veterinary Medicine, with Sea Grant assistance, is directing the development of marine-related courses for veterinary medicine students. Research assistant **Mike Henley** works with him.

Presently, four courses are taught to graduate and senior veterinary medicine students, covering aquatic microbiology, diseases of commercial food fish, fish diseases and zoo and aquatic animal medicine and surgery. A laboratory manual developed by Dr. Lewis is used in the fish disease courses.

A series of marine-related veterinary mini-courses consisting of recorded lectures and slides also is being developed. Materials gathered for the mini-courses currently are used to supplement lecture and laboratory presentations. When completed, the mini-courses will be made available for individualized instruction and review.

OTHER NEW PROGRAMS

Sea Grant support has been instrumental in the development of other courses, at both the graduate and undergraduate levels.

Dr. Richard Noble of the Department of Wildlife and Fisheries Sciences, with his associates, **Drs. Mark E. Chittenden** and **John McEachran** designed courses to better prepare students in fisheries programs and related fields to solve fisheries problems and to undertake graduate studies.

Six new courses on ichthyology, fisheries, fish population and mariculture were taught at both the main campus and Moody College.

The undergraduate and graduate ocean engineering programs at the Galveston campus are directed by **Dr. Ernest L. Kistler**.

Two new courses on the dynamics of ships and semisubmersibles were introduced in 1974. Students

from this program will enter the offshore drilling industry trained in techniques of improving vehicle motion in severe seas for increased safety and drilling efficiency.

At A&M's main campus **Dr. John B. Herbich** has continued to coordinate the undergraduate program in ocean engineering, one of a few such programs in the country. Enrollment has grown to 90 students, and the first graduate received a B. S. in ocean engineering in December 1974.

Dr. Herbich also surveyed ocean engineering curricula at other universities and presented his findings in a paper, "Ocean Engineering Educational Program," at the Offshore Technology Conference in Houston in May 1974. ■

Dr. Donald Lewis has developed courses in marine animal medicine, taught in A&M's College of Veterinary Medicine. Photo by Austin Stockton.



advisory services—reaching out

Demonstrating a new net to a shrimper, advising a marina owner about insurance for his small business, helping marine-related industries cope with the energy crisis, showing a seafood processor how to maintain high product quality in his plant—these are a few of the people-to-people services provided to the diverse Texas marine community through the advisory services efforts of the Texas A&M University Sea Grant Program.

An essential part of Sea Grant, advisory services bring the expertise of university specialists in marketing, management, seafood quality, fisheries and engineering to bear on the problems of the wide spectrum of marine-related businesses and industries in the state.

Through advisory services, Sea Grant people located "in the field" in key areas of the state's coastal zone translate research into practical application for the everyday concerns of the marine community.

MARINE INDUSTRIES BENEFIT

Although individual contacts are the heart of advisory services, working with a group of people who share a common professional interest has proved an effective means of reaching several related problems through one effort.

Three trade associations were formed in Texas last year with the assistance of Sea Grant advisory specialists in the Industrial Economics Research Division. Through these new organizations, the Marina Association of Texas (MAT), the Marine Services Association of Texas (MSAT), and the Texas Shipyard Association (TSA), members and A&M advisors work to solve mutual problems. Workshops and seminars, as well as regular meetings, provide a forum for exchange of information for the benefit of all.

Instrumental in the organization and continued activities of the three associations are IERD advisory specialists **Kathryn Delaune** (MAT) and **Dewayne Hollin** (MSAT and TSA). They help arrange and conduct meetings, seminars, workshops and conferences.

Hollin, whose office is in Houston, organized six seminars examining topics of importance to marine- and offshore-related industries during the 1973-74 year. Five were co-sponsored, with Sea Grant, by professional or trade associations or educational institutions including: MSAT; TSA; Brazosport College, Lake Jackson; American Marketing Association, Houston chapter; the Texas Society of Certified Public Accountants, Corpus Christi chapter; and Texas A&M's Environmental Engineering Division.



Members of the Sea Grant fisheries advisory services team confer. Around the table from left to right are Charlie Moss, Dr. Ranzell Nickelson, Gary Graham, Dr. Wallace Klussmann, Dr. Bruce Cox, Joe Surovik, Carl Rasor and Melvin Russell. Photo courtesy Texas Agricultural Extension Service.

Three marine commerce advisory bulletins, discussing marine insurance, planning business expansion and marketing marine exports, were produced and distributed to the marine business community.

KEEPING CURRENT

Continuing education of engineers working in the coastal environment is the focus of Sea Grant-supported advisory service efforts of **Drs. John B. Herbich** and **Robert E. Schiller** of the Center for Dredging Studies, Texas Engineering Experiment Station, and the Civil Engineering Department.

Some 65 persons attended the Sixth Dredging Seminar held at A&M in January; and the Third Dredging Engineering Shortcourse in August attracted 85. Dredge operators and engineers, dredging equipment manufacturers, representatives of environmental regulatory agencies, Corps of Engineers personnel and others heard experts address a variety of dredging topics.

During the year, several inquiries about beach erosion problems were answered and advice was given on the placement of groins and seawalls to retard erosion at a development at Rockport.

PERSON TO PERSON

Working through the long-established network of the Texas Agricultural Extension Service, Sea Grant-supported marine agents are stationed in key coastal Texas counties. They are in daily contact with operators of marine-related businesses, 4-H club members and other young people, consumers and the general public, as well as people at all levels of the fishing industry—fishermen, boat owners, processors and packers.

Sea Grant's "men-on-the-scene" are: **Bruce Cox**, Cameron County; **Charles Moss**, Brazoria County; **Carl Rasor**, Matagorda County; **Melvin Russell**, Galveston County; and **Joe Surovik**, Calhoun County.

Through individual contacts, workshops, demonstrations, short courses and talks to civic, school and trade and professional groups these local representatives of Texas A&M answer a myriad of questions and give advice and assistance on such diverse topics as legislation affecting the marine community, quality control on fishing boats, income tax, business management, seafood preparation, net mending and diesel engine maintenance.

In the summer of 1974, Rasor's assistance was instrumental in the organization of a successful fishermen's cooperative in Palacios. Twenty member boats sell their catch to the cooperative and share in its profits.

A newsletter for the fishing industry, the TEXAS TRAWLER, is part of the fisheries advisory effort and provides timely information on laws and regulations, research and new equipment to almost 2,000 individuals. Another advisory publication, BOTTOM FISHING OBSTRUCTIONS, compiled by Sea Grant marine fisheries specialist Gary Graham, catalogs Gulf of Mexico bottom obstructions and pinpoints them on charts, helping shrimpers avoid damage to costly gear. This publication is being revised to include 1,000 new hang locations.

In each county served by a marine agent, a Sea Grant Committee composed of local leaders from the marine community advises the agents in the direction of the marine advisory effort in the area.

MAINTAINING SEAFOOD QUALITY

Dr. Ranzell Nickelson, seafood technology specialist in A&M's Animal Science Department, with support from Sea Grant and the Texas Agricultural Extension Service, maintains a Seafood Quality Control Advisory Laboratory which provides quality control testing, particularly for small seafood processing operations which cannot afford to maintain their own laboratories. For larger businesses, the lab serves as a reference facility, to verify procedures and results.

Some 200 seafood processing plant employees learned the basic causes of and methods of preventing in-plant spoilage during four two-day quality control workshops conducted in their respective processing plants. At another workshop, conducted at the new Texas A&M Agricultural Experiment Station and Extension Center at Corpus Christi, quality control personnel, laboratory technicians, public health officials and others learned to perform the five most common bacteriological tests of seafood quality.

ASSISTING THE RETAILER

The final stop for the seafood product before it arrives on the dinner table is the retail store. Marketing specialists **Drs. Sam Gillespie** and **Michael Houston**, with Sea Grant support, are using workshops, slide presentations, publications and personal visits to help retailers present their seafood products to consumers in a more attractive way.

To determine effective marketing techniques, the researchers used questionnaires to examine three questions: who buys seafood, why do they buy it, and what is the consumer's attitude toward purchasing and preparing the products. They found that seafood is eaten universally; no one group consumes more than another. Buyers consider seafood a good nutritional value for its price. However, the consumer's attitudes toward the taste of seafood and its ease of preparation were found to be key factors in the decision to buy seafood, they discovered.

GENERAL ADVISORY SERVICES

Education is a major thrust of the overall Sea Grant effort and advisory services for educators is an important part of the program.

Through the facilities of the Region II Education Service Center at Corpus Christi, and under the direction of **Dr. Thomas Tope**, project leader, and **Gordon Garwood**, marine consultant, elementary and secondary teachers are offered a variety of services.

Marine-related and environmental education materials packets are available to teachers to supplement existing curriculum units or form the basis for new units. Dr. Tope and Garwood also assist the teacher in updating marine science materials, and on request, speak to classes on marine topics and careers, and demonstrate new marine education materials to teachers' groups.



Advisory specialists assist seafood processing plant personnel with better quality control methods. Photo courtesy Texas Agricultural Extension Service.

A unique educational game is being studied by **Dr. Albert Schaeffer**, Department of Sociology and Anthropology, to determine its effectiveness in teaching decision making regarding environmental problems. In the game, WALRUS I (Water and Land Resources Utilization Simulation), players assume the roles of city officials and other groups faced with a fictitious environmental problem. It is designed to make the participants aware of some of the conflicts in resources management encountered in real-life situations. Participants in Dr. Schaeffer's study were city and county government employees in Corpus Christi, and A&M undergraduate students.

Additional Sea Grant advisory service projects address a variety of marine-related interests. An investigation by **John Seymour**, Management Department, analyzes the jurisdictions of coastal area local governments and the extent to which they are exercising their powers in the area of coastal zone management.

Sea Grant advisory efforts at A&M's Moody College of Marine Sciences and Maritime Resources are coordinated by **Dr. James McCloy**. During the 1973-74 year, the College maintained a Marine Education Center open to the public. Moody College, with Sea Grant support, annually conducts SEA DAY, which offers high school students and counselors a chance to explore marine-related careers.

Two directories compiled and updated by **Norman Whitehorn**, Industrial Economics Research Division, DIRECTORY OF PERSONNEL IN EDUCATIONAL INSTITUTIONS, and DIRECTORY OF PERSONNEL IN GOVERNMENT AGENCIES, provide information on Texas marine resources capabilities. The directories are used by industry, government and educational institutions in identifying ongoing activities throughout the state. ■

toward imparting information

All who are involved in the Sea Grant Program are involved in communications, for the development and transfer of useful information is an implicit requirement of the National Sea Grant College and Program Act.

To aid in fulfilling the need to communicate, Texas A&M maintains a marine-oriented information services unit to provide a professional communications link between project personnel and the various audiences they serve.

Writers, editors and artists in the Department of Marine Resources Information assist in the preparation of technical reports, advisory bulletins, news and feature articles for mass media, and provide a variety of other information services, including art and graphics support, photography, library support, and assistance with conferences, seminars and special programs.

PUBLICATIONS

Regular publications of the Department include **The University and the Sea**, a bi-monthly magazine containing news and features about Sea Grant activities and other marine-related programs of the University. It is written for a lay audience and goes to 6,000 persons.

The **Texas Trawler** is a popular newsletter distributed to 1,200 fishermen, seafood processors, researchers and others concerned with the state's commercial fishing industry.

A clipsheet, **Coastscripts**, is prepared to keep Sea Grant personnel and others informed about items of marine-related topics covered by the state's coastal newspapers.

Prompt reproduction and accurate distribution of materials is an important part of any information program. At present the department maintains an in-house offset printing press and computerized mailing lists of more than 15,000 names in 30 categories.

The Department also maintains a small library of Sea Grant publications and other marine documents for ready access by project personnel, students and others.

Photographic, audiovisual and graphic arts services are available to support routine activities and for special assistance to researchers and advisory services personnel.

SPECIAL EVENTS

A&M's interest in development of the nationwide Sea Grant Program is fostered through the department by support for special programs and through publications.

In 1974, this activity included the preparation and staffing of a Sea Grant Exhibit at the Offshore Technology Conference and the presentation, in cooperation with Virginia Institute of Marine Science, of a Sea Grant Film Festival at Fish Expo, the national commercial fishing exposition at Norfolk, Va.

Department staff also worked, in cooperation with Sea Grant information personnel at the University of Wisconsin, on presentation of the national marine communications workshop at Madison. The department prepared promotional materials, notebooks for the participants and a summary report of the meeting, which was the first in which Sea Grant communicators met as a group, and which led to preparation of a detailed proposal for a national Sea Grant communications program.

In addition, the department provides distribution and abstracting support for **Sea Grant 70's**, a monthly review of national activities funded by a separate grant from the National Sea Grant Office. ■

fisheries vital to texas economy

A single four-hour shrimp trawl in the fertile Gulf of Mexico off Texas can yield a ton or more of catch, but less than 10 percent of an average haul is shrimp. The remainder is a wide variety of finfish species, economically useless to the shrimper. Virtually all of these fish are thrown overboard after the shrimp have been sorted out.

These so-called "trash fish," a tremendous untapped protein source, in reality include such delicacies as sea trout, flounder and bass. This waste of valuable fish has attracted the attention of Sea Grant researchers at Texas A&M, who are identifying the problems that must be resolved before these underutilized species can become a profitable commodity for producers, processors and retailers.

The problems are numerous and basic. For example, shrimp vessels are not designed to transport these tons of finfish economically, let alone preserve their quality. Nor do producers have the needed technology for processing and packaging the many and often unusual species hauled in with the shrimp. Finally, no major market exists for the underutilized species.

IN THE NET

To determine the makeup of the catch on a typical shrimp trawler, Sea Grant researchers **Drs. Mark Chittenden** and **John McEachran** of the Wildlife and Fisheries Science Department spent 40 days at sea on four cruises. Their catch statistics show that for every pound of heads-off shrimp caught, over 11 pounds of finfish were caught and discarded.

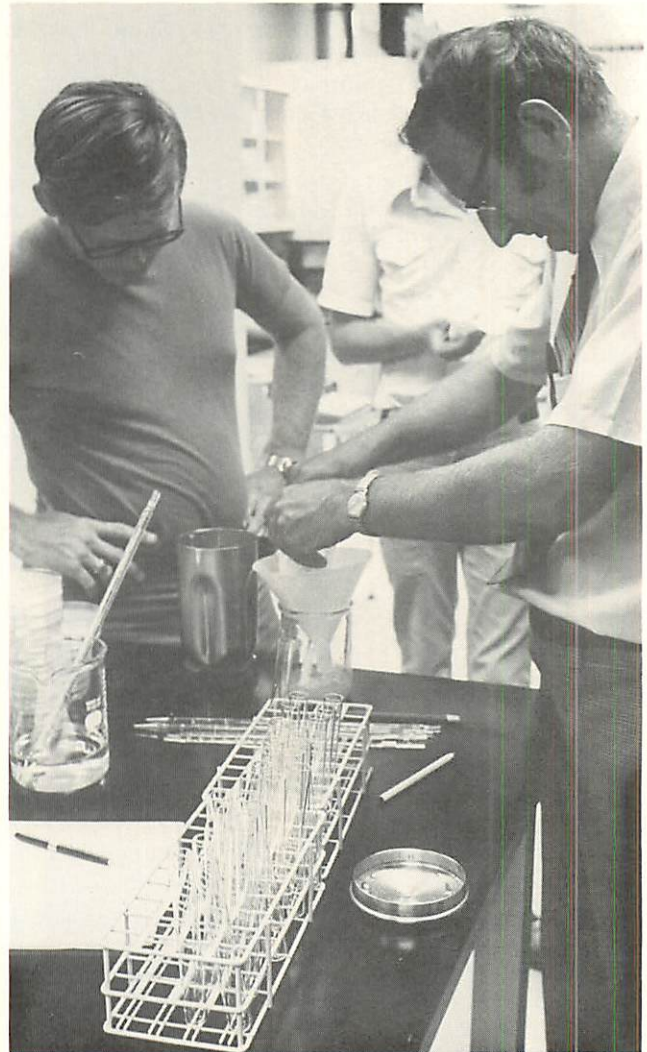
The researchers report that, according to National Marine Fisheries Service statistics for 1973, Texas-based boats discarded over 890 million pounds of fish every year. In comparison, the approximate annual total Texas shrimp landings for 1973 were over 80 million pounds.

STORING SEAFOOD

The shelf-life of fish and shrimp stored on ice is one problem studied in a project headed by **Dr. Bryant Cobb** of the Animal Science Department. Dr. Cobb and **Drs. Thayne Dutson** and **Zerle Carpenter**, also of Animal Science, devised a system reproducing the conditions in a trawler's ice-cooled hold; the effects of on-board temperatures and handling procedures on the shelf-life of fish were assessed.

They found that most commercial species maintained acceptable quality for 12-15 days when stored on ice at three to five degrees centigrade. Baseline data on shelf life and storage conditions for fish, both whole and eviscerated (gutted), caught incidental to shrimping also was determined.

The team continues its work on the production of a basic "protein substance" made from the minced



Dr. Bryant Cobb (right) conducts seafood quality studies in new facilities at the Texas A&M Agricultural Experiment Station and Extension Center at Corpus Christi. Photo by Laura Colunga.

flesh of underutilized fish species. Various additives, including sodium chloride (table salt), calcium biphosphate, sugar, egg albumin and starch are tested to produce a substance with suitable taste and texture for use as a protein supplement with other food products.

"The use of calcium biphosphate instead of table salt would help overcome a potential calcium deficiency due to the excessive use of phosphates in the American diet," Dr. Cobb said. The U. S. Food and Drug Administration and others are interested in the results of the project, he said.

In conjunction with Dr. Cobb's research on product quality, **Dr. Carl Vanderzant** of Animal Science is studying the microbial and biochemical factors that cause quality deterioration of shrimp stored on ice. Using simulated conditions of an ice-cooled trawler hold, changes in bacterial flora and nitrogenous components (amino acids, ammonia and trimethylamine) are measured, so that storage procedures can be improved.

Dr. Vanderzant has continued his evaluation and improvement of techniques for the isolation of **Vibrio parahaemolyticus** from seafoods. **Vibrio**, a bacteria found almost exclusively in seafoods and marine environments, is responsible for most human gastroenteritis related to seafood consumption. Dr. Vanderzant's accomplishments were reported in September 1973 at the International Symposium on **Vibrio parahaemolyticus** in Tokyo.

The researchers also found that different types of **Vibrio** species exist in pond-reared seafoods than in those from non-confined marine environments. According to Dr. Vanderzant, this factor has a pronounced effect on the microorganisms causing spoilage and alters the resulting spoilage pattern.

BETTER PACKAGING

Drs. Cobb and Vanderzant, assisted by **Jodie M. Phillips**, research associate, also are working to improve seafood packaging. Most of the experimentation in this project has been conducted at the Seafoods Laboratory in the Texas A&M Agricultural Research and Extension Center at Corpus Christi, with support from the marketing section of the Texas Parks and Wildlife Department. The study compared the shelf-life of "vacuum packaged" and "overwrapped" fish.

Research indicated that vacuum packaging, in which excess air is removed from the wrapper containing the fish, is a much more efficient means of preserving quality of Gulf fishes than the widely-used overwrapping (wrapping the fish and a shallow tray in clear plastic wrap).

The shelf-life of the vacuum packed product was eight to ten days, approximately double that of the overwrapped fish (three to five days). Although "drip," the loss of natural fluids from the fish, is a problem in vacuum packaging, it is reduced by careful blotting prior to packing, the researchers said.

They also plan to study an alternative procedure of vacuum packaging, freezing and then thawing the product for the fresh fish market. If their tests show this to be a superior procedure, the retailer could thaw enough fish for one day's sales, eliminating much of the waste often encountered in marketing fresh fish.

The results of Dr. Cobb's and Dr. Vanderzant's work are passed on to seafood retailers by Sea Grant advisory services personnel and staff of the Texas Parks and Wildlife Department.

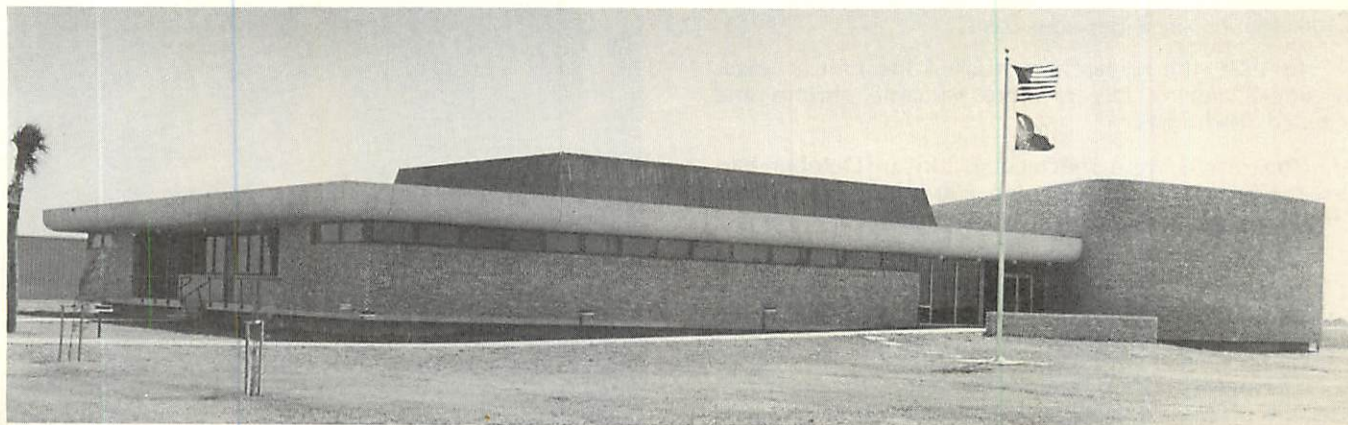
MARKETING FISH

Agricultural economists **Dr. John Nichols** and **Melvin Cross**, in a Sea Grant project begun in 1972, evaluated the potential market for fish caught in the western Gulf of Mexico incidental to shrimp trawling. The researchers concluded that, currently, there are no economically feasible systems for utilizing the available fish.

"This is not a problem of lack of markets at the consumer level," said Dr. Nichols, "but rather can be traced to the cost of saving, handling and delivering the incidental catch, combined with institutional constraints such as traditional work patterns and poor market channels."

Their study of price-quantity relationships in major potential markets revealed that most fish caught incidental to shrimping could be sold without a significant adverse impact on prices in present markets.

The economists also developed a basic format for evaluating existing and future systems of utilizing incidental catch. The results of Dr. Nichols' and Cross' efforts have led to the initiation of a new Sea Grant project involving market development studies, research on market structure and case studies of selected fish supply systems. ■



The Texas A&M Agricultural Experiment Station and Extension Center at Corpus Christi houses a Seafoods Laboratory as well as entomology and soils labs and an auditorium for meetings and shortcourses. Photo by Laura Colunga.

shrimp - a new coastal crop

The prospect of man-reared shrimp for the nation's dinner tables comes increasingly closer to reality as Sea Grant mariculturists at Texas A&M University continue their experiments with raising the succulent shellfish in captivity.

Underway since 1969, A&M's shrimp farming experiments have produced much information that is needed before commercial shrimp mariculture can be developed.

"We have made dramatic progress," says **Dr. Jack C. Parker**, program manager for Sea Grant mariculture and fisheries research.

"We're still in the experimental stage," Parker says, "but commercial shrimp culture is becoming more and more feasible."

"It can become a new industry that will reduce the need for seafood imports and create new jobs and new uses for the state's coastal land areas," he adds.

Mariculture demonstration units are located at Angleton, Texas, and at Flour Bluff, near Corpus Christi.

The Corpus Christi facilities are adjacent to Central Power and Light Company's Barney M. Davis Power Station and include a unique tri-level pond system, operational since 1972, and 18 new quarter-acre ponds completed in 1974.

Warm water from the power plant's 1,100-acre cooling lake will enable the shrimp growers to experiment with year-round production.

The tri-level unit includes an eighth-acre nursery pond, a quarter-acre intermediate pond, and a half-acre grow-out pond, through which the shrimp are rotated as they grow.

The mariculturists achieved record volume in their 1973 experiments, with one harvest yielding more than 4,500 pounds on a per-acre basis.

In 1974, the researchers stocked the unit at lower densities, seeking larger, more valuable shrimp and reduced feed costs.

The results were spectacular. In an October harvest the grow-out pond yielded 750 pounds of six-inch shrimp weighing almost an ounce each.

The premium shrimp measured 18 shrimp or 28 tails per pound, according to **Fred Conte**, the Texas Agricultural Extension Service mariculture specialist who supervises the Corpus Christi operation.

The mariculture program exemplifies the Sea Grant concept of cooperative participation by industry, government agencies and educational institutions.

Ralston-Purina Company, for example, provides seed stock, rations and technical assistance. Since the

project began, feed costs have been reduced significantly by lowering the protein content of the ration from an initial 45 percent to as low as 20 percent.

Other participants in the program include Dow Chemical Company, Booth Fisheries, Texaco, ParTex Construction Company, National Marine Fisheries Service, Phipps Sand and Gravel Company, and the Brazoria County Commissioners' Court and Mosquito Control District.



Fred Conte shows off some of the six-inch shrimp harvested from the Corpus Christi mariculture ponds in October of 1974. Photo by Bob Bunting.

IMPROVED POND DESIGN

Drs. Charlie G. Coble and **Donald R. Reddell**, associate professors of agricultural engineering at Texas A&M, have worked on the design of efficient, economical and environmentally sound production units.

The researchers studied various means of sealing the ponds against water loss and reported that compacted clay appears to be the most economical material for most applications.

Since environmental protection will be one of the many concerns of commercial shrimp producers, the researchers analyzed samples of inlet water, discharged effluent, surface water and bottom water taken weekly from the Corpus Christi demonstration unit.

The samples were analyzed for pH, conductivity, chlorides, total solids, total fixed solids, volatile solids, ammonia, nitrogen, nitrates, magnesium, potassium, sodium, copper, zinc and mercury. There appeared to be no significant buildup of the compounds between inlet and outlet.

WATER QUALITY VITAL

The importance of maintaining water quality became apparent during 1973-74 at the Angleton unit, where a previously unreported problem involving pH was encountered.

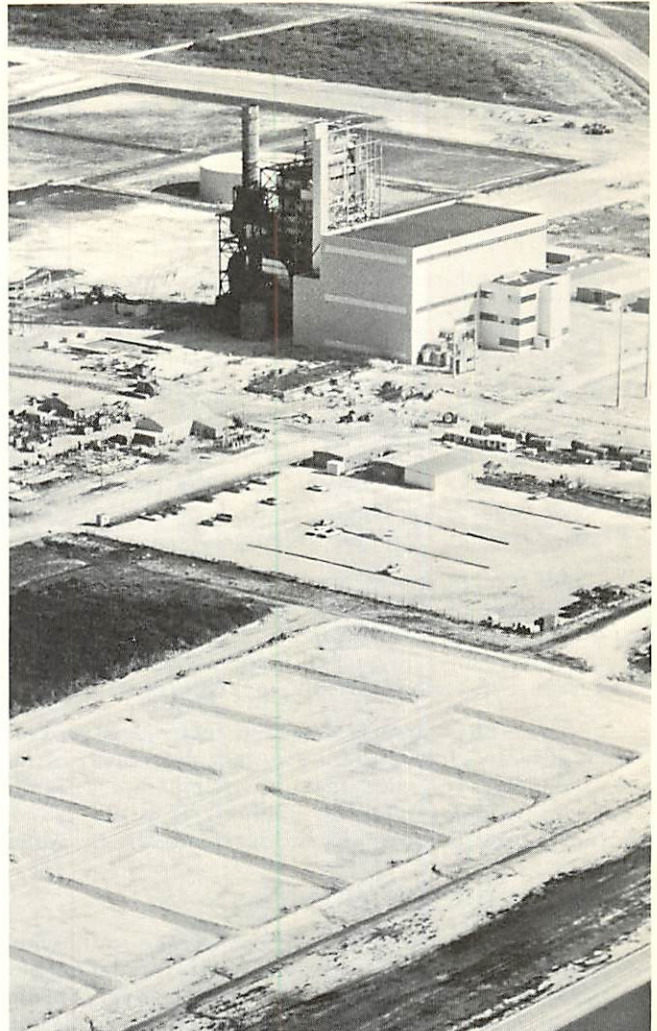
Searching for reasons for the poor growth rates of the two species of white shrimp being cultured, researchers noted abnormal pH levels in the pond waters and found that declining pH values corresponded almost directly to the declining growth of the shrimp. Then they noticed that all 20 ponds had a well established and growing population of the marine clam, *Rangia cuneata*.

Clams utilize calcium and bicarbonates from the water to build their shells and when present in large numbers can significantly reduce the buffering capacity of the water. When the buffering capacity is exceptionally low, production of a weak acid such as carbonic acid from excessive carbon dioxide produced by clams and shrimp is sufficient to reduce pH. Measurements of alkalinity confirmed that the buffering capacity of the water in the Angleton ponds was exceptionally low and it was concluded that the live clams probably were responsible.

Subsequently, this hypothesis was confirmed in tests conducted in ponds with and without clams. In every instance where living clams remained or where a clam population returned, pH and alkalinity declined as before, but in ponds without clams the levels of pH and alkalinity were maintained. Having identified the source of the problem, methods are now being sought to remove these molluscs both before and after shrimp are stocked.

HEALTHY SHRIMP

Important support for development of shrimp mariculture has been provided through a project, **DIAGNOSIS AND TREATMENT OF SHRIMP DISEASES IN PONDS**, conducted by **Dr. S. K. Johnson**, an Extension Fish Disease Specialist in A&M's Department of Wildlife and Fisheries.



The 18 new experimental mariculture ponds near Corpus Christi are located adjacent to Central Power and Light Company's Barney M. Davis Power Station.

The project is concerned with evaluating shrimp health management techniques, identifying potential or actual agents of shrimp disease, and with providing laboratory support for investigation of specific disease problems.

Information from Johnson's work has been widely distributed to mariculturists through professional papers, technical reports and through a special **HANDBOOK OF SHRIMP DISEASES (TAMU-SG-75-603)**. ■

the environment-keeping it clean

Water pollutants, oil and chemical spills, viruses and bacteria in the water—these are some of the problems of today's industrialized world examined in Sea Grant supported environmental quality studies at Texas A&M and at Lamar University in Beaumont.

A new technique to determine the relative spill dilution capacity of inland and intracoastal waterways was the result of one project. **Dr. Roy Hann**, head of the Civil Engineering Department's Environmental Engineering Division, was the investigator.

Spill modeling was applied to a collection of hydraulic information on waterways, and from this data, a rating system was developed. It shows, among other things, the relative impact of a theoretical spill in one area versus the identical spill in a different area.

The rating system is designed to be used in conjunction with a toxicity rating system developed earlier in the study. Together, the two systems are a significant improvement over past methods of assessing risks in the transportation of hazardous materials by water.

ODORS IN THE SHIP CHANNEL

Unpleasant odors and dead fish are the result when oxygen in an estuary is consumed by assimilating biodegradable materials. Aeration—adding oxygen to the water—is one way to improve water quality in heavily polluted areas.

For several years, Sea Grant researchers have been studying aeration in the Houston Ship Channel. Dr. Hann and **Dr. Tom D. Reynolds** selected the Houston channel for two reasons—first, a great deal of information about the Houston Ship Channel already exists, and second, the ship channel exhibits the most severe water pollution in Texas.

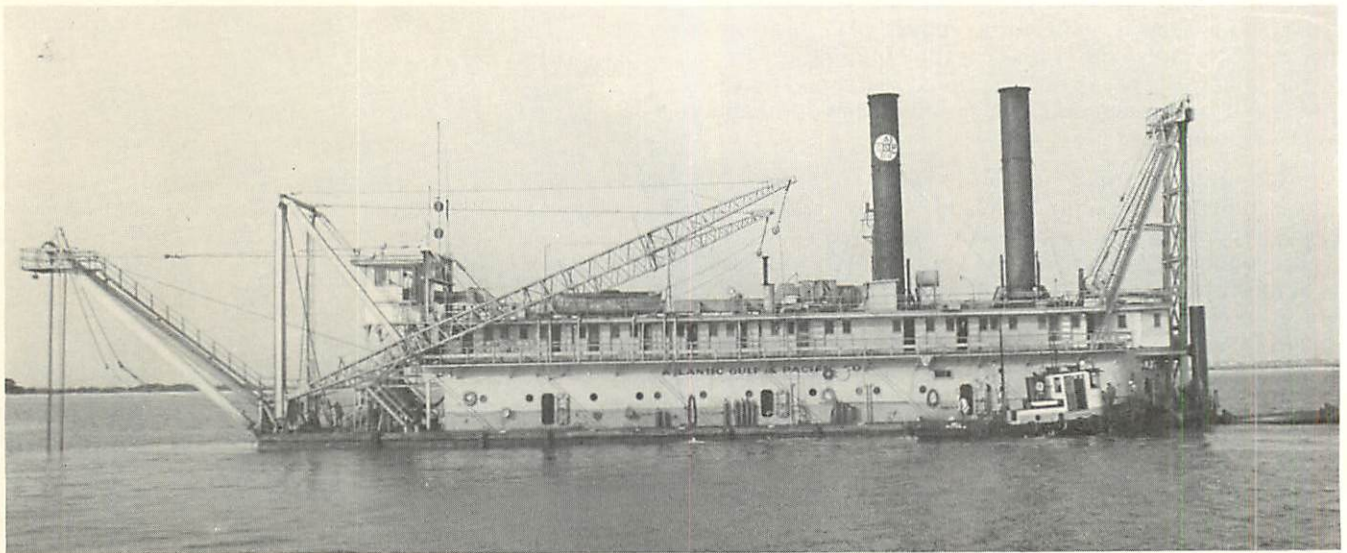
All existing systems of aeration were evaluated to determine which were the most technically and economically feasible. Three systems best fit the researchers' criteria: compressed air re-aeration, in which compressed air is fed directly into the water; mechanical re-aeration, in which streams of water are shot into the air; and sidestream re-aeration, which uses pure oxygen.

The latter method, in which liquid oxygen is added to water directed from the channel into side stations, proved to be the best alternative for the Houston Ship Channel.

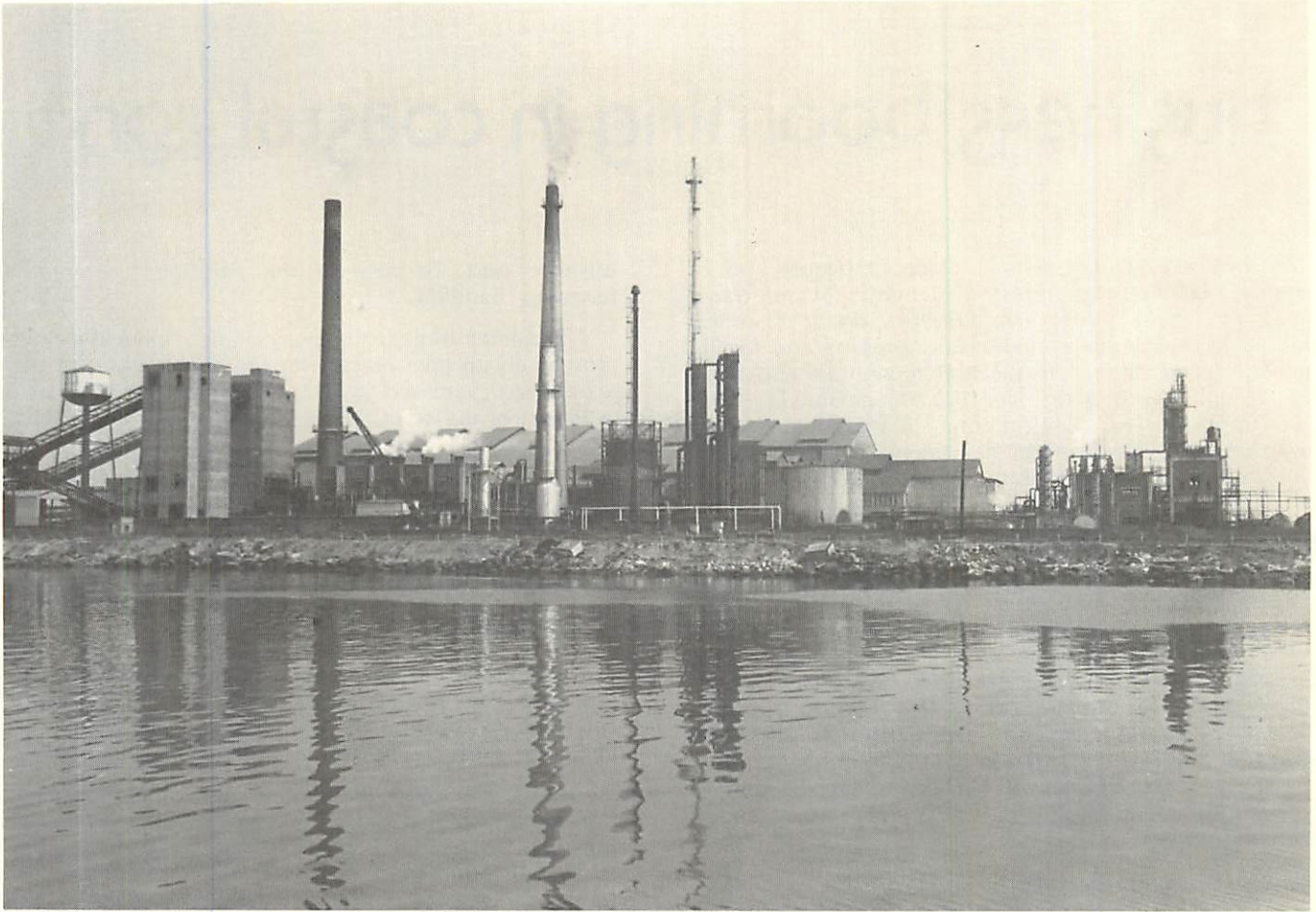
Dr. Reynolds predicts that aeration will be used widely within the next ten years. Presently, he estimates, there are approximately a dozen sites throughout the world where it is in use.

DISPOSING OF TANK CLEANING WASTES

Until recently, efforts toward industrial waste control have centered on major industries like petroleum



Dredging, though vital to the maintenance of the Gulf Intracoastal Waterway, can affect environmental quality. Photo by Charlotte Mould.



Industry lines the Houston Ship Channel, the single most polluted body of water in Texas. Photo by Charlotte Mould.

refining, food processing and paper manufacturing, rather than smaller support activities such as barge cleaning.

A project conducted by **Dr. John E. Ball** and **Ted Sparr** of the Environmental Engineering Division combined field study and laboratory work to develop a management plan for treating and disposing of wastes from cleaning of barge tanks.

With publication of the study results, "Management of Tank Washings in Marine and Coastal Commerce," barge cleaning companies will have the technical information to determine various treatment alternatives, construct a workable system at minimum cost and meet state standards. The report will be distributed through the barge cleaning trade association.

SABINE LAKE STUDIES

Trace metal concentrations in Sabine Lake oysters, and viral and bacterial concentrations in the lake itself were the subjects of a project coordinated by **Dr. Charles P. Turco** of Lamar University. Carrying out the research were **Drs. Ernest L. Estes** and **R. J. Scudato** of Lamar and **Dr. Mark Sobsey** of Baylor College of Medicine.

The project established baseline information on Sabine Lake viral and bacterial levels, and demonstrated

that oysters are able to purge copper and zinc to background levels after 48 days in an aquarium environment.

Information gained from this study will be used by aquaculturists concerned with metal-contaminated shellfish, and by public health officials and municipal planners in assessing the oyster fishing potential and water quality of the Sabine estuary, the researchers say.

EFFECTS OF DREDGING

The environmental impact of dredging in industrial waterways has become a concern. The environmental quality of sediments—nutrients, oil, grease and toxic metal content and oxygen demand—was determined in a project directed by **Dr. J. Frank Slowey** of A&M's Environmental Engineering Division.

Using these measurements, baseline data on the environmental quality of sediments in five Texas industrial waterways subject to dredging was obtained and provided to the Texas Water Quality Board, Environmental Protection Agency and several navigation districts.

These agencies combine this information with other data to evaluate the condition of sediments to be dredged as well as the environmental impact of dredging operations at several locations along the Texas coast. ■

business booming in coastal zone

The Texas Gulf coast—a place of beauty and of intense business and industrial activity. Water transportation, giant ports, a multibillion-dollar chemical and petroleum industry, valuable shrimping and fishing activities, and an ocean-oriented recreation and tourism complex employing over 100,000 persons—all this goes on in the Texas coastal zone. Sea Grant-supported researchers at Texas A&M are taking a close look at this important section of the state.

LOAD THAT BARGE . . .

An interdisciplinary team headed by **John Miloy** of the Industrial Economics Research Division (IERD) has completed an intensive one-year study of the Gulf Intracoastal Waterway in Texas. Participating were **Dr. Robert B. Ditton** and **Ronald L. Schmied**, Department of Recreation and Parks; **Dr. John B. Herbich**, Ocean Engineering Program; **Dr. Carlton E. Ruch** and **Christian Phillips**, IERD; **Dr. Wayne E. Etter**, Department of Finance; **Dr. Charles A. Nickerson**, Department of Accounting; and **John L. Seymour**, Management Department.

In the summary report, ANALYSIS OF THE ROLE OF THE GULF INTRACOASTAL WATERWAY IN TEXAS (TAMU-SG-75-203), the team examines the environmental, engineering, sociological, economic and legal aspects of the 426-mile Waterway. Miloy says the report stresses the statewide economic impact of this low-cost transportation route and points out the environmental and legal problems which threaten its continued use.

PORTS ARE BUSY

The economic and environmental impacts of an onshore deepwater port at Galveston have been examined by **Dan Bragg** of IERD and **Dr. Wesley P. James**, Environmental Engineering Division. The results of their study appear in a two-volume Sea Grant Report, A SURVEY OF THE ECONOMIC AND ENVIRONMENTAL ASPECTS OF AN ONSHORE DEEPWATER PORT AT GALVESTON, TEXAS.

In Part I, "Potential Economic Effects," Bragg concludes that the western Gulf will experience sizable growth in both import and export of liquid and dry commodities, that the size of liquid and dry bulk ocean carriers will continue to grow, and that the United States will, in the near- to mid-term future, face a port crisis involving multi-cargo ports, similar to the present problem of liquid cargo ports.

The researcher also advises that planning for dry-cargo superports should begin now, even though the need for them will not become critical for some 10 to 15 years. Bragg declares that if imports of foreign crude oil pass through an onshore port, the economic impact of such a port will be much greater than that of an

offshore port, because of the additional commodity tonnages handled.

Projected biological, physical and chemical changes most likely to take place with the construction of such a port are examined by Dr. James and **Dr. Roy Hann** in Part II of the study, "Environmental Considerations."

They conclude that the environmental impact will be significant, but that with proper scientific planning environmental degradation can be minimized.

"In view of the economic benefits to the region, state and nation, there is no reason for environmental degradation to be the only deterrent to the project," they conclude.

The impact of Texas deepwater terminals on existing ports was assessed by a team from the Industrial Economics Research Division, headed by Bragg, and including **Perry J. Shepard** and **James R. Bradley**.

Ports, and other elements of the water transportation system in the state, are coming under increasing pressures to handle a growing volume of waterborne trade with often obsolete and inadequate facilities, the researchers found. Due to the current economic situation, improvements to ports are becoming more difficult to fund.

The proposed new deepwater terminals should provide some relief to existing ports, the team reported, but port directors and others should consider the potential impacts of these terminals in planning the future of their ports.

A forthcoming report of the study should prove valuable to port administrators and planners, legislative and regulatory agencies and shippers.

SHRIMP LANDINGS WORTH \$\$\$

Commercial shrimp landings in Texas in 1971 were worth almost \$64 million, Sea Grant researchers in the Agricultural Economics Department report in their study, IMPACT OF COMMERCIAL SHRIMP LANDINGS ON THE ECONOMY OF TEXAS AND COASTAL REGIONS.

Using a computer program to estimate the total value and state and regional economic impact of Texas commercial shrimp landings, a team headed by **Dr. Wade L. Griffin** found that the Brownsville to Aransas area led the state in 1971 with \$37.6 million worth of shrimp landings.

Others conducting the study, all of the Agricultural Economics Department, were **Drs. John Nichols, John Adams** and **Lonnie Jones**. They found that some 6,083 persons were employed in some phase of the shrimping industry, which provided \$56.8 million in personal income.

The economists feel that their findings will be useful to local, state and federal government groups in planning for wise management of the coastal zone and its resources.

FUN AND PROFIT

The state's fourth leading employer, an industry that generated an economic impact of over \$3 billion in the Texas coastal zone in 1973—recreation and tourism—was the subject of a two-year study by **Dr. Billie I. Ingram** of A&M's Industrial Economics Research Division.

In her investigation of the economic impact of the recreation and tourism industry on Texas, and particularly the coastal area, Dr. Ingram found that over 316,000 jobs were produced by the industry in 1973. In the report **ECONOMIC IMPACT OF RECREATION AND TOURISM WITHIN THE TEXAS COASTAL ZONE (TAMU-SG-74-215)**, she calls the Texas coast "the state's most valuable resource" and potentially "the nation's greatest public year-round recreation and tourism area." The Texas coast makes up one-half of the total coastline available for recreational purposes in the 48 contiguous states.

Research by **Dr. Wayne E. Etter**, Department of Finance, reveals that many private recreational land development projects have been initiated without adequate financial analysis. In his one-year Sea Grant-sponsored study Dr. Etter interviewed recreational land developers and financial institutions to discover the type of planning and analysis that had preceded the commencement of each project.

Many successful recreational land developments were preceded by little, if any, financial analysis, he found, but many developers feel that the continuation of this practice could lead to unprofitable developments

in the future. Based on a literature review and the interviews, Dr. Etter developed an approach to investment analysis for recreational land development, which he presented at a Recreational Land Use Conference held at A&M in November 1974.

A team of four industrial engineers at Lamar University in Beaumont, coordinated by **Dr. Charles P. Turco**, director of research and development there, is assisting regional planners in coastal Southeast Texas. The group, made up of **Drs. Ali M. Ali, Carl Carruth** and **James J. Brennan** and **Charles F. Hawkins**, studied the effectiveness of a typical city park system.

Selecting Beaumont, the city with the largest park system in the Southeast Texas area, the researchers decided that the measure of a park's effectiveness would be the degree to which the residents of the surrounding neighborhood used it, and interviewed residents of a random sample of homes in a 10-square-block area around each park to determine this. Results of the study are being tabulated and will be published for use by regional and city planners.

COASTAL MANAGEMENT

In an effort to assess the impact of the federal Coastal Zone Management Act of 1972, **Dr. Gerald Swanson** of the Political Science Department studied the politics, policies and management processes regarding coastal management in Texas, Florida, California and New York. The purpose of his work was to establish baselines for each state's performance prior to the implementation of the Coastal Zone Management Act.

The results of Dr. Swanson's study will be presented at the April 1975 meeting of the American Society for Public Administration, and also will be made available to federal officials and officials in the states studied. ■



Barge traffic continues to increase on the Gulf Intracoastal Waterway, a transportation route vital to the economy of the state. Photo by Charlotte Mould.

the ever-changing texas coast

What physical processes are at work on the state's shoreline and what happens there as a result of human activities are being closely examined by Sea Grant researchers at Texas A&M. They are seeking solutions to the practical problems of the coast—hurricanes and storms, dredged material disposal, offshore pipeline failures, erosion, deposition and silting.

PLANNING FOR THE WORST

Builders, city planners and government agencies all need information on the adequacy of building codes in areas subject to hurricanes and severe storms. To compare building codes in Texas with model codes and national standards concerning hurricane requirements,



Dr. John Herbich of A&M's Civil Engineering Program uses a wave tank model to study scour around pipelines such as those used in the offshore industry. Photo by Austin Stockton.

Dr. James R. Gardner, Urban Planning Department, studied the coastal zone cities of Galveston, Brownsville, Corpus Christi, Freeport, Port Lavaca, Port O'Conner and Port Arthur. The cities' building codes also were examined to see if they met insurance requirements. Dr. Gardner has now developed a checklist that will enable a city to determine if its building code is adequate.

CONTAINING DREDGED MATERIAL

Increased traffic by huge transport vessels in Gulf coast shipping lanes demands dredging of new and existing lanes; at the same time, higher water quality standards have restricted dredged material disposal methods, calling for efficient design and operation of diked or confined disposal areas.

From a field study of an unconfined area in Galveston Bay, researchers in the Civil Engineering Department found that future maintenance costs of disposal areas could be reduced by using dikes, making dredging unnecessary. **Dr. David R. Basco** and research assistants **Robert Male** and **David E. Bassi** studied unconfined material deposited in the Bay; they found that over 40 percent of the material left the designated area immediately and, acting as a heavier-than-water fluid, spread out over the Bay floor. Eventually, it covered an area about three times as large as the original deposit area.

Using a model of a diked disposal area constructed in a wave tank in A&M's hydromechanics laboratory, the team found that a single short dike placed directly in front of an inlet pipe worked best in confining the material. Also, deep water aided settling.

Results of the studies appear in two Sea Grant publications—FIELD STUDY OF AN UNCONFINED SPOIL AREA OF THE GULF INTRACOASTAL WATERWAY IN GALVESTON BAY, TEXAS and A DISPERSION CURVE STUDY OF MODEL DREDGE SPOIL BASINS. Dr. Basco also presented the findings at a United Nations-sponsored dredging shortcourse in Poona, India, in January 1975.

The U. S. Army Corps of Engineers is utilizing the team's study in its planning, and in preparing for the National Dredged Material Research Program. Information also was sent to the Texas General Land Office, for use in coastal management planning decisions.

WHY DO PIPELINES FAIL?

Offshore pipelines are used extensively in the oil and gas industry for such things as transporting oil and gas produced offshore to onshore storage. With the advent of superports and supertankers, pipelines will undoubtedly come into even more use in unloading and servicing the giant ships.



"Breaks" such as this one in the protective dune wall on Padre Island allow sand to be carried by wind into the Laguna Madre and the Gulf Intracoastal Waterway that runs through it. Photo by Dr. C. C. Mathewson.

As the use of pipelines grows, more failures are reported, and industry demands accurate information on the reasons for these failures.

Dr. John B. Herbich of Civil Engineering and research assistant **Khandaker M. A. Rahman** are examining scour around pipelines and pipeline stability to determine the nature of pipeline failures. In addition to evaluating information on failures due to scour caused by wave action during storms and hurricanes, they also determined the pattern and depth of scour around pipelines.

From this information, an analytical approach will be developed to predict the behavior of pipe and sediment when subjected to waves and currents interacting with bottom sediments.

LOSING LAND

The effects of water on the shoreline, erosion and deposition, also are of interest to investigators. Valuable real estate has been lost to the sea in some areas.

Dr. Wayne Ahr of the Geology Department has set up a model of Matagorda Bay shoreline change which will help predict changes that might occur there under varying weather and ocean conditions. Another model explains historical shoreline changes in the bay that have been mapped. Also, a method of objectively analyzing the effect of channels and spoil islands on erosion and deposits was devised.

The results of this numerical modeling have been put on maps, and the findings, according to Dr. Ahr, are not surprising; man-made channels have focused tidal-current scours on the west side of the bay and during northers, the strong north wind almost totally offsets tidal action.

It was noticed that the channelized tidal currents in man-made "flumes" figuratively "rub shoulders" with mounds of dredged material. Dr. Ahr believes

these mounds frequently are incorrectly placed, in areas where they are subject to the most vigorous water agitation.

His work was done with cooperation from the Texas General Land Office, Bureau of Economic Geology at the University of Texas, and the Texas Water Development Board. These agencies and others will make use of Dr. Ahr's study in coastal management decisions.

WIND AND WAVES

Water and wind are the two forces that are carrying sand off the beaches of Padre Island and into the Laguna Madre, which separates the 100-mile long barrier island from the Texas mainland. **Dr. C. C. Mathewson**, Geology Department, determined and defined the two mechanisms responsible for moving sediment into the portion of the Gulf Intracoastal Waterway passing through the Laguna.

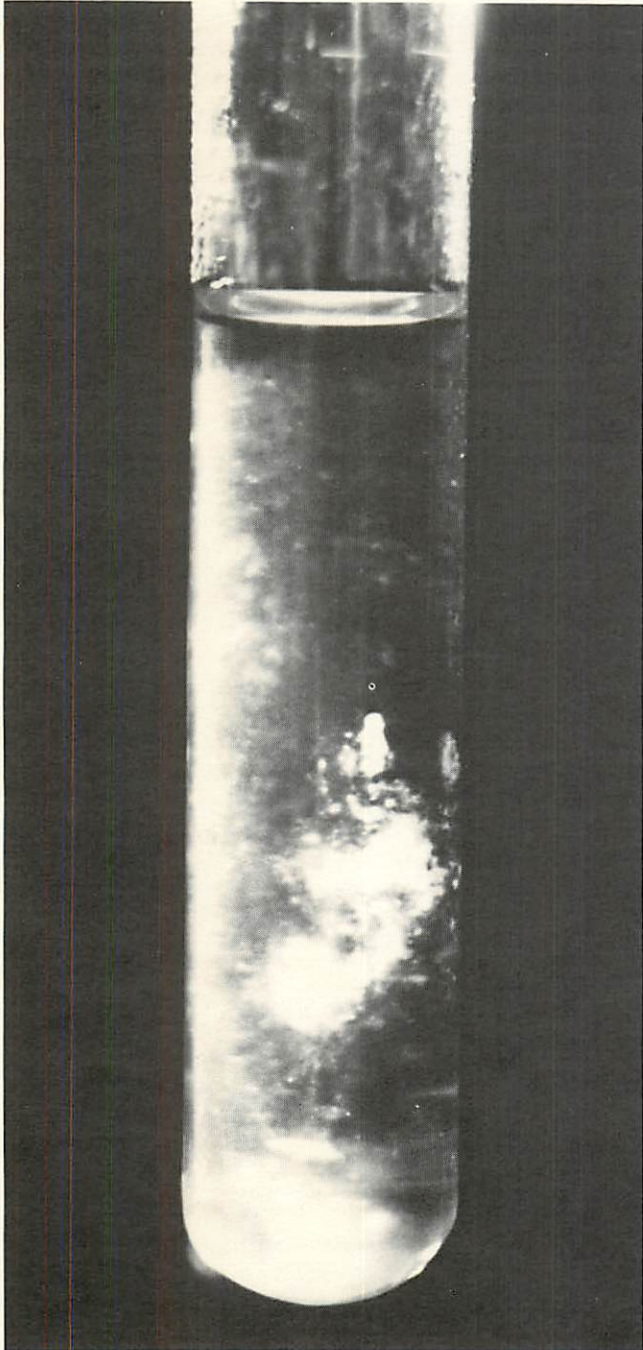
Members of a graduate field geology course assisted in field studies for the project, conducted at Padre Island National Seashore. The investigators found that the natural dune wall, sometimes over 30 feet tall, stretching the entire length of the island, significantly controls sand transport by wind.

Breaks in the dune wall caused by storms allow sand to be moved across the island toward the mainland. Once in the Laguna Madre, the sand is transported by water current.

Dr. Mathewson found that in shallow areas (less than three feet), storm activity controls sand movement, while in deeper water prevailing wind conditions are the controlling factor.

As commercial development of Padre Island increases rapidly, entities concerned with planning the wise use and protection of this valuable barrier island will find Dr. Mathewson's findings an important aid in land-use planning. ■

improved health and safety a goal



This anaerobic bacterium associated with meningitis in redfish was isolated from fish examined after a massive fish kill near Orange in 1973. Photo courtesy Dr. D. H. Lewis.

Sea Grant researchers at several institutions are working to solve health-related problems of the marine environment. This two-year-old Sea Grant program is composed of projects in A&M's College of Veterinary Medicine and Moody College of Marine Sciences and Maritime Resources in Galveston, and at Baylor College of Medicine and the University of Houston.

The health-related studies include developing safer decompression procedures for diving, detecting viruses in estuarine waters and oysters, identifying antibiotics for shrimp diseases, and diagnosing microbial diseases of marine organisms.

MAKING DIVING SAFER

Safer decompression procedures to allow extended saturation dives are the goal of **Dr. Edward L. Beckman** of Moody College. In saturation dives, divers, after one day underwater at any pressure, and saturated with a nitrogen-oxygen breathing mixture, can remain at that pressure for an indefinite period. During the first year of the project, Dr. Beckman and **Jim Moore**, systems analyst with A&M's Data Processing Center, devised a standard computer model to calculate decompression tables. A test dive successfully validated the calculations.

In 1973-74, they added an oxygen toxicity index which predicts the approach of oxygen poisoning effects. They also are working on a model which considers the basic physical aspects of gas expansion in body tissues during decompression. None of the presently popular models for calculating decompression tables consider this aspect of bubble formation in the production of decompression sickness, Dr. Beckman says.

Working with **Dr. David Yount** of the University of Hawaii physics department, Dr. Beckman is striving for a decompression table calculation based on these physical factors.

VIRAL CONTAMINATION

Sea Grant researchers at Baylor College of Medicine are working toward the day when health agencies and the shellfish industry will have reliable methods of assessing the dangers of viral contamination of coastal waters and shellfish.

Dr. Joseph L. Melnick, **Professor Craig Wallis** and **Dr. Mark D. Sobsey** developed an improved method for detection of viruses in oysters and modified the portable virus concentrator invented by Dr. Melnick and Professor Wallis.

The improved procedure for detecting enteric viruses was tested in experimentally contaminated pools containing oysters, with an average virus recovery efficiency of about 63 percent. The methods were then

used in a study to determine the extent of enteric virus contamination of oysters and their surrounding water in Sabine Lake.

The Sabine Lake work was done in collaboration with Sea Grant researcher **Dr. Ernest Estes** of Lamar University. Enteric virus data now are being correlated with bacteriological and chemical data on the water and shellfish collected by the Lamar research team.

In improving the portable virus concentrator for field use, the use of clarifying filters to remove particles has been eliminated, preventing the possible losses of viruses associated with particular matter. The researchers say the modification improves the concentrator's efficiency and ease of operation.

HEALTHIER SHRIMP

Antibiotics to treat shrimp diseases due to pathogenic bacteria now are available, due to the efforts of **Dr. Addison Lawrence**, University of Houston biologist.

In Sea Grant-supported research, Dr. Lawrence determined that oleandomycin and oxytetracycline can be used safely to treat diseases of shrimp in the laboratory or in mariculture ponds. In experiments, the antibiotics did not affect the *Penaeus aztecus* larvae and post larvae, but killed more than 99 percent of the bacteria present.

The Ralston Purina Company, the Environmental Research Laboratory at the University of Arizona, Texas A&M, the Texas Parks and Wildlife Department and others will combine this information with research from their own programs to improve treatment of shrimp diseases due to bacteria.

DISEASE DIAGNOSIS

Refined techniques for diagnosing disease in marine animals is one goal of a team of Sea Grant researchers in A&M's College of Veterinary Medicine, headed by **Dr. D. H. Lewis** of the Veterinary Microbiology Department.

Dr. Lewis and **Drs. L. C. Grumbles** and **Stewart McConnell**, also of microbiology, are determining how diseased marine organisms respond to various treatments and how pathogenic agents cause diseases.

Two fish kills that attracted state-wide attention were studied by the scientists. One kill of several hundred redfish of all ages and sizes occurred in the fall of 1973 near Orange, in which the afflicted fish were observed to swim erratically in small circles near the surface prior to death. The team recovered an aerobic bacteria from the brains of several specimens, and the disease syndrome was reproduced in the laboratory.

A second kill involving larger mullet occurred near Port Aransas in April 1974. The scientists determined that the kill was caused by a parasite, and cooperative studies of its taxonomy, life cycle and host range were initiated with the Department of Parasitology.

Routine experiments also were a part of activities during 1973-74—some 350 bacteria specimens submitted by various federal, state and industrial sources were processed. Also, Dr. Lewis was chairman of the Fish Disease Committee, Southern Division, American Fisheries Society, and participated in the Society's first Fish Health Workshop in Denver, Colorado. A draft manuscript, "Methods for the Diagnosis of Certain Bacterial Fish Diseases" was developed in the workshop. ■



Scientists in A&M's College of Veterinary Medicine identified a *Vibrio* species as responsible for this "black gill" condition associated with shrimp mortality in mariculture ponds. Photo courtesy Dr. D. H. Lewis.

off the press

FISHERIES AND SEAFOOD TECHNOLOGY

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program summary

Program Area—Year Beginning September	'71	'72	'73	'74	Program Area—Year Beginning September	'71	'72	'73	'74
PROGRAM ADMINISTRATION					Mariculture Engineering Design, Coble			N	*
					Development, Reproduction, & Nutrition of Shrimp Biology and Mariculture, Clark			N	C
Program Administration, Calhoun	C	C	C	C	Shrimp Culture Research, McIlhenny	T			
Coastal Zone Laboratory System, Clayton	N	T			AQUATIC ANIMAL HEALTH AND SEAFOOD QUALITY				
Moody Marine Institute, Calhoun	N-T				Storage & Utilization of Fishery Products, Cobb	R	R	C	T
EDUCATION AND TRAINING					Seafood—Safety & Wholesomeness, Vanderzant, Cobb		N	C	C
					Packaging of Fish, Cobb		N	C	T
					Shrimp Diseases in Ponds, Johnson			N	T
Oceanic & Marine Technology, Middleton	C	C	C	C	Microbial & Parasitic Diseases of Marine Organisms, Lewis	C	R	C	C
Teaching & Course Development in Fisheries, Noble		N	C	C	Temperature Tolerance, Aldrich	C	R-T		
Development & Presentation of Courses Related to Fish Health, Lewis		N	C	C	The Effect of Antibiotics on Shrimp Larval Culture, Lawrence			N	C
Undergraduate & Graduate Ocean Engineering Programs, Herbich, Kistler		N	C	C	Shrimp Biology and Mariculture, Lawrence			N	T
Institutional Seminar Series in Coastal Zone Management, Phillips, Seymour			N	C	Quality of Pond-Reared Shrimp, Vanderzant	R	T		
Teacher Certification in the Marine Sciences, Treadwell				N	Parasites in Ocean Food Fish, Haensley	T			
MARINE ADVISORY SERVICES					Histologic Study of Marine Fish, Faries	T			
					FISHERIES ASSESSMENT				
Directory Services, Whitehorn	C	C	C	T	Population Characteristics of Mackerel in the Western Gulf, Chittenden, McEachran		N	C	C
Retail Seafood Workshop, Gillespie	N	C	C	T	Acoustical Detection, Marine Organisms, Bright	T			
Environmental Quality Short Course, Ball		N	C	T	Photo Assessment of Marine Species, Pequegnat	T			
Marine Fisheries and General Extension, Klusmann	R	R	C	C	SEAFOOD MARKETING AND ECONOMIC SYSTEMS				
Advisory Services for Marine Business Management, Shepard	C	C	C	C	Marketing Fish Caught Incidental to Shrimping, Nichols	C	C	C	T
Advisory Services for Marine Processes & Engineering, Clark				N	Prototype Marketing Facility, Gillespie		N-T		
Coastal Zone Problems Education Program, Tope	C	R	C	C	Development of Finfish Marketing Systems, Nichols, Gillespie				N
MARINE RESOURCES INFORMATION					Production Costs and Returns for the Texas Shrimp Industry, Griffin			N	C
					COASTAL ZONE STUDIES GROUP				
Dept. of Marine Resources Information, Bunting	C	C	C	C	MARINE RESOURCES MANAGEMENT				
Building Marine Awareness Through Electronic Media, Chastain				N	Organizational Structures for Coastal Zone Management, Seymour, Swanson				N
RESEARCH					Recreational Expenditure Habits in Sabine Estuaries, Turco				N
					The Potential for Onshore Deepwater Ports in Texas, Bragg				N
FISHERIES-MARICULTURE GROUP					Analysis of Shipping on Texas Gulf Intracoastal Waterway, Phillips				N
SHRIMP MARICULTURE SYSTEM					Transportation of Hazardous Materials, Richards		N	C	T
Shrimp Mariculture System, Parker	C	C	C	C					

Program Area—Year Beginning September	'71	'72	'73	'74	Program Area—Year Beginning September	'71	'72	'73	'74
Impact of Deepwater Terminals, Bragg			N	T	Treatment of Sediments, Slowey		N	C	T
Impact of Recreation, Ingram		N	C	T	Metal Cleansing, Turco	N	R	C	T
Financing Recreation, Etter			N	T	Environmental Simulation, Schiller	R	R	C	T
Funding Alternatives / GIWW, Nickerson			N	T	Management of Tank Washings, Ball			N	T
Implementing the CZM Act, Swanson			N	T	Waste Management Program, Hann	N-T			
Indirect Economic Stimuli / GIWW, Phillips			N	T	Microbial Human Health Hazards, Lewis		N-T		
Role of GIWW, Miloy			N	T	SHORELINE PROCESSES AND MARINE TECHNOLOGY				
Recreation Expenditure Habits, Turco			N	T	Offshore Pipelines, Herbich, Dominguez		N	C	C
Impact of Shrimp Landings, Griffin			N	T	Diked Dredge-Spoil Areas, Basco		N	C	T
Deepwater Port Galveston, Bragg			N	T	Matagorda Bay Processes, Ahr		N	C	T
GIWW, Miloy		N-T			Silting Mechanisms in the Texas GIWW, Mathewson			N	C
Marine Industry Analysis, Whitehorn		N-T			Building Codes on Coast, Gardner			N	T
Offshore Port Study, Bradley	C	T			Physical Factors Affecting Shoaling Rates in the Texas GIWW, Basco				N
Financial Planning, Bridges	C	T			Upper Texas Coast Shoreline Processes, Ahr				N
Coastal Resources Management, Bradley	N-T				Seabed Stability, Bryant	R	R-T		
Evaluation of Seacoasts, Gunn	T				Sediment Deposition, Sorenson	C	R-T		
Investment-Financial Analysis, Wilson	T				Hydrocarbon Seepage, Geyer	C	T		
Port & Harbor Development System, Stogsdill	T				Fogg Research Base, Pequegnat	N-T			
Land Use Analysis, Miloy	T				Acoustic Communications, Riter	T			
ENVIRONMENTAL QUALITY					Acoustic Nonlinearity, Caruthers	T			
Environmental Considerations of the Operation, Maintenance and Enlargement of the Texas GIWW, James				N	Automatic Marine Corer, Bailey	T			
Environmental Management of the Ship Channel-Harbor Complex, Withers				N	Analytic Solution / Dynamic Pile, Coyle	T			
Water Quality in the Coastal Canal Communities, Reynolds				N	Electrical Logging / Aquatic Environment, Bouma	T			
Technical Aspects of Ocean Dumping of Industrial Wastes, Hann, Ball				N	MAN-IN-THE-SEA GROUP				
Quantitative Assessment of Viral Hazards in the Galveston Bay System, Melnick	N	C	C	C	DIVING SAFETY				
Enhancement of Estuaries, Hann	R	R	C	T	Maximum Safe Depth for Saturation Diving on Compressed Air, Fife, Beckman				N
Control of Hazardous Materials, Hann		N	C	T	Safer Decompression Procedures for Diving, Beckman		N	C	C

N—New Project

T—Terminated Project

C—Continued Project

R—Redirected Project

*Incorporated into Shrimp Mariculture System, Parker.



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