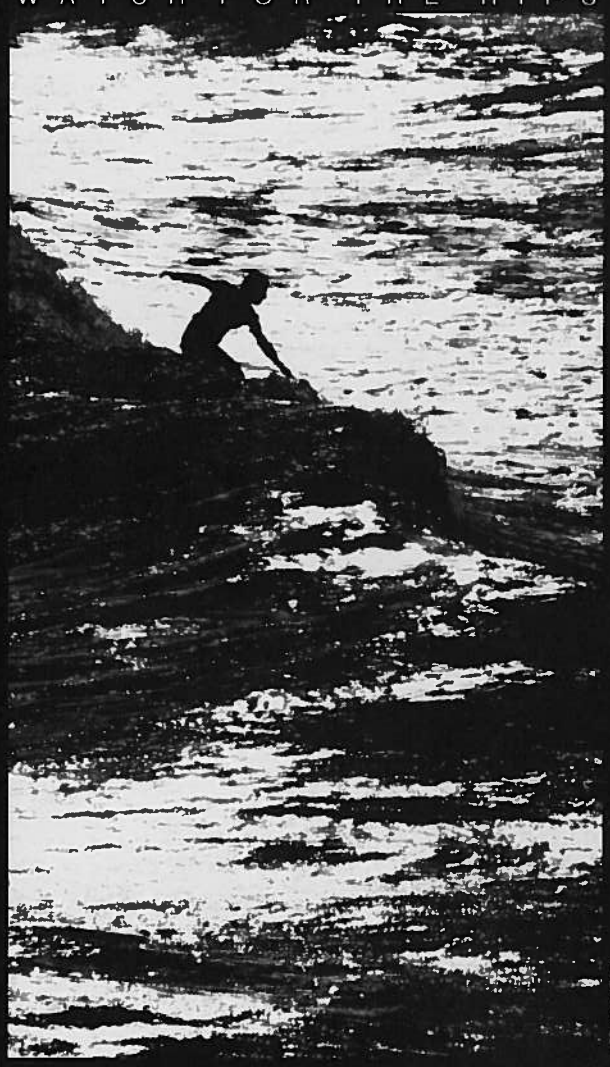
S E A G R A N T C O L L E G E P R O G R A M

TEXAS SHORES

O Y S T E R S

Hi. I'm Lona Dearmont and I'm about to eat my first Texas oyster. Sure looks good. In fact, it looks so great, I'll just read about eating this raw *Crassostrea virginica* for a bit. Yeah, that's the ticket.

WATCH FOR THE RIPS



2 RADICAL

Imagine, if you will, danger in the beautiful waters of the Texas Gulf. Rip tides, sand bars, and stinging marine life wait for you, so do something about it. To help, Texas Sea Grant has prepared a special series of water safety publications. They are Texas Beach Safety (TAMU-SG-81-505 rev.), Water: How Safe are You? (TAMU-SG-87-402), and Texas Rips (TAMU-SG-84-506). Please remember that drowning is the second-leading accidental killer of Americans between the ages of one and 44. For more information, write to: Marine Information Service, Sea Grant College Program, Texas A&M University College Station, Texas 77843-4115. Or phone: 409-845-7524.

Texas Sea Grant

AN ORGANIZATION OF PROFESSIONALS DEDICATED TO THE BETTER UNDERSTANDING OF OUR MARINE ENVIRONMENT

INSIDE

Nebraska native Lona Dearmont not only braved one Texas oyster, but put down a half dozen in this, her first venture into the land of the bi-valve.

–Cover photography by Norman Mattin

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In This Issue: Oysters

STAFF – Dr. Tom Bright, *Texas A&M Sea Grant Director*; Amy Broussard, *Associate Director and Head of Marine Information Service*; Norman Martin, *Texas Shores Editor* and *Art Director*; Rhonda Snider, *Advisory Publications Editor*; Mike Raulerson, *Distribution Manager*; Lona Dearmont, *Production Assistant*; and Celia Jeter, *Graphic and Printing Consultant*.

MISSION – *Texas Shores* is published quarterly by the Sea Grant College Program at Texas A&M University in an effort to promote a better understanding of the Texas marine environment. Sea Grant is a partnership of university, government and industry focusing on marine research, education and advisory service. Nationally, Sea Grant began in 1966 with the passage of the Sea Grant Program and College Act. Patterned after the Land Grant Act of the 1860s, the Sea Grant concept is a broad-based scientific effort to better the world for all those living in and out of the sea.

HISTORY – In 1968 Texas A&M received the distinction of being named among the nation's first six institutional award recipients. Three years later the school was designated a Sea Grant College. The university has a rich heritage of oceanography research dating back to 1949 when the program began. In addition there is an ongoing program to get marine information to the public.

SERVICE – The effort is aided by seven county marine extension agents serving the nine coastal counties of Texas. These individuals are backed by a group of specialists in marine recreation, fisheries and business management, as well as seafood marketing and consumer education.

FUNDING – Sea Grant is a matching funds program. The Texas A&M Sea Grant College Program itself is made possible through an institutional award from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and appropriations from the Texas Legislature and local governments.

Change of Address, Subscription Information or Other Questions: *Texas Shores*, Sea Grant College Program, Texas A&M University, College Station, Texas 77843. Or call 409-845-7524. Please include old label when changing mailing address.

Texas Shores (ISSN 0747-0959), is published quarterly by the Sea Grant College Program, Texas A&M University, College Station, TX 77843. Second class postage is paid at College Station, TX. **Postmaster**: Send address changes to the Sea Grant College Program, Texas A&M University, College Station, TX 77843.

N O T E S

New research funding targets cooperation between schools

Texas coastal waters and the people who use them will be the ultimate beneficiaries of $500,000 in funding aimed at establishing collaborative research involving scientists at Texas A&M University in College Station and Texas A&M University at Galveston (TAMUG).

The Texas A&M University System (TAMUS) Board of Regents allocated the funds from the Available University Fund to establish collaborative research efforts between Texas A&M and TAMUG on problems related to the Texas coastal ocean.

Texas A&M's Sea Grant College Program will administer the funds.

Sea Grant Director Dr. Thomas Bright says the majority of the funding will be used to encourage and finance new researchers and faculty investigating the specific problems of the western Gulf of Mexico, the Texas Shelf and Texas bays and estuaries.

Working closely with Bright will be Dr. William Merrell, who assumed the joint position of president of TAMUG and coordinator for marine programs for TAMUS during the summer.

Merrell was formerly the assistant director for geosciences for the National Science Foundation.

Prior to that appointment he served as director of the Division of Atmospheric and Marine Sciences and associate dean of the College of Geosciences at Texas A&M.

To aid the administration of the newly authorized funding, Texas A&M's Sea Grant College Program established a branch office at TAMUG's Mitchell Campus in Galveston.

The office is under the direction of Amy Broussard, who serves as associate director for Texas Sea Grant and heads the program's Marine Information Service.

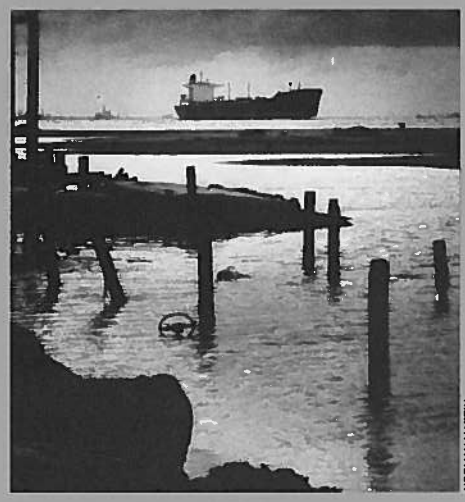
Broussard's staff assistant is Leslye Vaught. Broussard has been with the Texas Sea Grant program for eight years.

In addition to administering the funds, the new coastal office should increase Sea Grant's visibility along the Gulf Coast and make Sea Grant administrators more accessible to coastal residents and visitors, Bright says.

The money provided by the TAMUS regents from the Available University Fund – the interest income earned on state-held oil and gas leases that is constitutionally mandated to enhance higher education within both TAMUS and The University of Texas System – will be used during a two-year period.

During that period, TAMUS and UTS officials will develop a comprehensive funding package for presentation to the Texas Legislature in hopes of providing further funding for research relating to the state's coastal ocean.

–Mary Jo Powell



NORMAN MARTIN

High-pressure methods keep lid on migraine headaches

Deep-sea divers and migraine sufferers have a mutual benefactor: Dr. William P. Fife, who engages in hyperbaric research in his landlocked laboratory on the outskirts of the Texas A&M University campus.

Fife's high-pressure oxygen chamber, which can simulate the pressure of a deep-sea dive in combination with pure oxygen, has led to a new set of decompression tables for divers and relief for migraine sufferers, along with treatment for many other disorders, illnesses and complaints.

On any given day, someone is in Fife's hyperbaric laboratory seeking relief from such disorders as bone infection and carbon monoxide poisoning.

Many visitors are local townspeople, students and faculty at Texas A&M who were referred by physicians, as well as out-of-towners who have heard about his facilities.

Fife, a professor emeritus of biology at Texas A&M, created the hyperbaric research laboratory in the 1960s to investigate diving decompression, and the decompression tables he created through that research are still in use among divers. After noting the beneficial effects of high pressure on diving injuries, he went on to study a wide assortment of medical applications that involve breathing pure oxygen in a pressurized environment.

Recently he has been successful in treating migraine headaches in the hyperbaric facility.

Fife says the high pressure environment inside the hyperbaric chamber causes the body to obtain more oxygen by stimulating the growth of capillaries in areas of the body where blood flow previously was restricted.

In the case of migraine headaches, where blood vessels in the brain become painfully dilated, the hyperbaric therapy helps to reduce the dilation, thus improving blood circulation, thereby reducing blood pressure in the brain.

–Rebecca Adair

Rowe pulls down new post at Texas A&M University

Dr. Gilbert Rowe, a nationally renowned marine biologist, has been appointed head of the Oceanography Department in the Texas A&M University College of Geosciences.

"Dr. Rowe is an outstanding scientist with excellent administrative experience," say Dr. Mel Friedman, Texas A&M's dean of geosciences. "We are delighted he has chosen to join our community of scholars."

Rowe succeeds Robert Reid, who held the rank of distinguished professor and retired in July after 36 years. Rowe, formerly head of the oceanographic sciences division at Brookhaven National Laboratory in New York, holds B.S. and M.S. degrees from Texas A&M and a Ph.D. from Duke University.

Rowe has been a lecturer at the University of Michigan and a visiting professor at the Duke Marine Laboratory. He has served on the editorial boards of the journals of Marine Research, Marine Geotechnology, Biological Oceanography and the South African Journal of Marine Science.

In addition to authoring or co-authoring over 75 research papers and books, Rowe has served on advisory committees dealing with the ALVIN research submersible, ocean dumping, deep-sea waste dispersion, marine pollution and shelf-edge exchange processes.

In other action, Texas A&M oceanographer Larry Weber has been selected for a two-year stint as program manager for the National Science Foundation's U.S.-Japan Program in NSF's cooperative science section. For the next two years, Weber will help plan and administer programs that will support international science activities between the two countries. His headquarters will be Washington, D.C.

Part of his duties include making recommendations about changes in the scope or thrust of a program to take into account changes in U.S. science or foreign policies, says NSF officials.

Weber will also represent NSF on appropriate interagency groups as assigned while promoting research and other international science activities with the nations involved.

After Weber's assignment is finished, he will return to his position at Texas A&M. He is presently a research assistant in the oceanography department, working in the laboratories of Dr. Sayed Z. El-Sayed.

In addition, the crew of the research vessel Gyre operated by Texas A&M has been honored by the Texas Legislature for rescuing a fisherman lost at sea last summer.

Crew member Jennifer Glenn, who was on watch at the time, sighted Zacary Bennett floating in the Gulf of Mexico 30 miles southeast of Freeport. Bennett, 32, had been stranded in the water for 19 hours after he fell overboard.

–Tricia Morgan/Rebecca Adair

Offshore rigs good platform for boosting sports fishery

Oil production platforms off the Texas coast are as important to the sports fishing industry as they are to oil, says a recreation specialist at Texas A&M University who recommends the platforms be used as artificial reefs.

A grassroots effort to sink an obsolete offshore oil platform near South Padre Island is currently under way as the tourist bureau and private citizens have applied for a permit, says Dr. Robert Ditton. During the mid 1970s the Texas Coastal and Marine Council supported the largest program for artificial reefs along the Texas coast, when 12 surplus liberty ships were sunk. Three each were sunk off the coasts of South Padre Island, Port Aransas, Freeport and Matagorda.

"The structures attract the fish that attract sport fishermen who bring a good amount of business to the Texas coast where part of the economy depends on sports fishing," says Ditton of Texas A&M's Department of Recreation and Parks.

"Oil platforms are preferred as reef material because ships don't come up as high in the water column and consequently don't attract the same diversity of fish."

Ditton, who served on a National Academy of Sciences panel looking into a variety of alternatives for disposing of the platforms and whose accomplishments have been recognized by the National Recreation and Park Association, says there is considerable interest in retaining some of the structures, particularly in other states.

"Florida will take all the offshore platforms she can get and Louisiana has begun to recognize the importance of the platforms as artificial reefs. Commercial fishing interests in California are even pointing to the advantages of the platforms for harvesting mussels that grow on the structure's support columns," says Ditton, adding that it is not unusual to see fishermen's boats anchored near the structures.

He says Texas and other states who haven't been as active in sinking the offshore oil platforms for artificial reefs are concerned about the liability involved. Local citizens involved in such projects, such as those who want a reef off South Padre Island, must set up buoys and lights to let ocean traffic know of the reef's location, Ditton says.

"You won't find any fly-by-night operation developing an artificial reef today. By law, they must show fiscal capability and responsibility," Ditton says, pointing out that the ancient Chinese threw rocks into the water to create vertical profiles for artificial reefs.

"Since then, we have thrown lots of things in the water for reef development, only in recent years we've been doing it more carefully," Ditton says.

–Michael Courtney

NORMAN MARTIN

Antarctic expert sheds light on concentrated food source

Most people probably do not realize that slimy algae is the base of the food chain and that it is growing even under polar ice, says Dr. Greta Fryxell, a professor of oceanography at Texas A&M University.

"The biggest story is that we are finding that the ice edge triggers life states and the ice can influence the flora over much of the year," Fryxell says of the microscopic plants known as phytoplankton. "They are like the grass of the sea," she said.

Fryxell and graduate student Richard Gould Jr. sailed on the Coast Guard Cutter Glacier to the edge of the Antarctic ice mass last spring. At the edge of the ice, Fryxell says, millions of these one-celled plants colored some layers of ice a golden hue and provided a concentrated food source for grazing sea animals.

One important factor of this finding is that this concentrated resource is available for the small animals to eat, Fryxell says, and it is the small animals that the large animals eat.

Fryxell explained that this source of microscopic plants provides food for those organisms that are vegetarians, which in turn provide a food source for those that are not. Without this beginning link in the food chain, she says, the carnivores would have less of a food source.

Fryxell says the organisms are capable of growing faster when the ice is not present, because sunlight is diminished underneath the ice and in the winter.

One of the main factors involved in plant growth is the need for light.

"Actually light is enhanced right at the edge of the ice," she says, "and it's amazing how such little light seems to be needed to maintain some growth. We used to think in order to find food production that we could drop down no further than the 1 percent light level of what would be at the surface, but in one study we went down to one-tenth of 1 percent."

–Rebecca Adair

Deep-sea sediments trace earth's environmental history

For the first time in the Indian Ocean, an international team of scientists has recovered a complete section of undisturbed deep-sea sediments.

These sediments, recovered during a two-month drilling expedition, will enable scientists to reconstruct this region's environmental history during the past 60 million years, say researchers at Texas A&M University, scientific home of the Ocean Drilling Program (ODP).

Scientists now have the information needed to chart the movement of the Indian tectonic plate over millions of years. When the wandering subcontinent of India bumped against Asia, the collision created two of the world's great geologic features. The Himalayas form the world's highest mountain range and the submarine Bengal Fan contains the world's largest accumulation of redeposited sediments.

ODP scientists will investigate the forces which created these two geologic phenomena. ODP is an international effort to explore the history of Earth's origin and development through scientific drilling using the ship JOIDES Resolution. Both geologic features owe their existence to the activities of the Indian tectonic plate, explains ODP director and Texas A&M oceanographer Dr. Philip Rabinowitz.

At one time, India, Australia and Antarctica were part of a huge land mass clustered at the South Pole. After tectonic forces broke this mass apart, India began about 90 million years ago to make its long trip north. For the next 40 million years, India crossed the ancient Tethys Sea at the relatively fast rate of six inches a year. The plate movement destroyed the Tethys Sea, leaving behind the newer Indian Ocean.

India first made contact with the Asian continent about 53 million years ago in what geologists call a "soft collision." About 10 million years ago, India rammed into Asia in a relatively hard collision, causing the initial uplift of the Himalayas.

The force of this collision also produced long, wave-like folds in the upper portion of ocean crust and overlying sediments of the Indian plate. The wave-like folds from this collision can be compared to the folds in a rug after it is pushed across the floor and hits the wall.

Scientists now plan to drill into these undersea folds to determine when the compression began and what has since happened to this region of the Indian Ocean. The drilling results will also enable them to document the history of uplift that created the Himalaya Mountains.

Twenty-five scientists from the United States and eight other nations participating in ODP want to know more about how the Indian Ocean evolved through time because its ancient environment are tied to today's climate.

–Rebecca Adair

STORY AND PHOTOGRAPHY BY NORMAN MARTIN

RAW DEALS

DWARFED BY THE STATE'S huge $200 million shrimp industry, Texas oysters often sit on the back burner of policy and priority. That could soon change, though.

"Oysters are kind of a second crop, but they're a $25 million second crop," says Dewayne Hollin, a marine business management specialist with the Texas Sea Grant's Marine Advisory Service in College Station.

Despite recent red tide outbreaks and closed harvesting seasons, Texas has slowly and quietly become a factor in national oyster production. The state's oyster fishery contributes roughly 12 percent of the total U.S. domestic oyster supply, says Mike Haby, MAS seafood marketing specialist in Port Aransas.

That figure is up considerably from the late 1970s when Texas' contribution was, on average, about 3 percent. Most of those oysters come from one area – Galveston Bay. The massive, but shallow body of water carries more than two-thirds – sometimes as much as 90 percent – of the state's oyster production.

If Texas' oyster production can get back on track, experts say, there is a massive potential market waiting in the wings. But as with much of American industry, all the Texans have to do is take it out of foreign hands. Today more than half of the oysters consumed in the United States are imports.

Among the possibilities Texas' oyster industry should examine are develop oyster hatcheries; broaden the state's direct marketing of half-shell oysters; target specialty, fresh food-service markets; press for continued freshwater inflow into the bays; and construct salination plants to improve the taste of oysters.

But there is a down side. In many ways Texas oysters are the Rodney Dangerfield of shellfish. They just don't get enough respect. While the oyster is not exactly the most beautiful of beasts, it does have some rather interesting attributes. For example, how many other creatures can change from one sex to the other, or have the distinction of being one of the very few animals still eaten raw.

Then, of course, there is the mixed honor of being near the top of the marine world's hit list. The oyster is afflicted by so many enemies, diseases and other calamities, that it's amazing the species survives. This most famous of bivalves is a prime target for drills, crabs, flatworms, fish, birds, protozoans and microbes, as well as humans. Texas oysters can't even produce a pearl. Commercial oysters lack the essential ingredient to form the mother-of-pearl coating that gives luster to the true pearl.

While often grouped with shrimp and crab under the general heading of shellfish, it is neither. In simple terms, the oyster is a bivalve mollusk with two shell valves hinged together at one end and closed by a single, large muscle attached to the valves near the other end.

The type of commercial oyster generally found in Texas is the American oyster, *Crassostrea virginica*. It's found in all bays along the upper and middle Texas coast, usually in extensive reefs in the middle of the bay. This particular oyster drops out of sight throughout most of the Laguna Madre, but it reappears near Port Isabel and in South Bay.

Mel Russell, Texas Sea Grant's marine advisory agent for Galveston County, says Texas does not have a pure oyster industry. For example, the majority of the Galveston area's oyster boats are primarily bay shrimping boats.

"When the bay shrimping season begins to fizzle out in late fall, most of those boats switch over to their oyster dredges," Russell says. "If the shrimping is holding up, then they'll continue shrimping and hope that the oysters are still there when they're through." Fishermen are allowed to shrimp until December 15 in Texas.

In Texas the principal gear used to harvest oysters is the oyster dredge, a heavy, metal-framed basket with teeth along the bottom edge of the mouth. By pulling the dredge over the reef the oysters are forced into the basket. When full, the dredge is hauled on deck, either by hand or by power winches. Small oysters and shell are culled from market-size oysters, and are discarded overboard.

Russell says the only true, task-specific oyster dredge boats are owned primarily by oyster leaseholders, who use their boats year round. Some of the larger vessels are 50 feet long with large awnings on top.

Usually, the catch is sold to an oyster dealer, who in turn sells the oysters either in the shell or shucked. Shucked oysters are sold fresh by the pint, quart and gallon. In Texas, most of the oysters are sold freshly shucked.

Oysters left in the shell are usually placed in sacks and kept in cold storage until sold. Most of the shell stock is sold to restaurants and oyster bars for half-shell trade. All oysters sold in Texas must be certified, which means they must be harvested, handled, processed and stored in accordance with state and federal standards.

Despite considerable problems with pests and the gloom and doom mood of recent media reports, Texas has recently had two good calendar years of oyster production in a row. Production in the 1986 calendar year registered a 9.1 percent increase, 5.6 million pounds, compared with 1985's 5.1 million pounds, even though there was a red tide in the latter part of the year. And, 1985 was up some 2 percent over 1984. Value went up substantially, as well. The value in 1985 was $8.755 million and in 1986 the sum was $10.403 million dollars for the state.

An interesting fact about Texas oyster production is the fluctuations seen in Galveston Bay as a percent of the total of the state, Marine Business Management Specialist Hollin says. In 1985, the most recent full year for which data are available, the bay had

The oyster is afflicted by so many enemies, diseases and other calamities, that it's amazing the species survives.

Between 1977 and 1985, Texas experienced dramatic fluctuations in oyster landings. In terms of total U.S. oyster supply, Texas has ranged from as little as 2 percent in 1979 to almost 16 percent in 1983.

almost two-thirds of the state oyster production. But in 1984, production was less than half of the total state production. Meanwhile, San Antonio Bay's contribution to the state's overall production varied widely, as well. In 1984, it was 34 percent, but in recent years it has dipped to 8 percent, and once to 1.2 percent.

Still, shrimp are the big guns on the bay, both in terms of dollar value and pounds landed. But oysters are the second-largest shellfish in production, almost three times greater than blue crab production in Texas. Statewide, shrimp in 1986 equaled $217 million in value compared to $10.4 million for oysters.

"But in terms of the overall economic impact, considering ancillary benefits beyond just the receipts from oyster sales, you're probably looking at a 25-million-dollar industry here in Texas, which is pretty substantial," Hollin says.

In order to break into new markets, marketing specialist Haby says, "We need to sell more oysters on the half-shell." Oyster consumption on the half-shell is cyclical and the industry is moving toward an upswing now. This has several beneficial options from an industry standpoint, including lower cost and reduced requirements for finding and retaining skilled labor.

In addition, Haby says, Texas must work toward developing direct marketing of oysters. Processors must cull their product better. "Shuck the ones that don't have a nice-shaped shell. But the ones that make a nice package and come out of more saline waters ought to be your half-shell oyster."

Between 1977 and 1985, Texas experienced dramatic fluctuations in oyster landings. In terms of the total U.S. oyster supply, Texas has ranged from as little as 2 percent in 1979 to almost 16 percent in 1983. "There are a lot of reasons for this, including natural events, regulation and the combination of natural events and directives of resource managers," Haby says.

Just as foreign heavyweights have splintered the American auto and electronic markets, other nations are edging into the American oyster market.

Between 1977 and 1985, total supply of oysters and oyster products increased some 13 percent, from 79.9 million pounds of meat in 1977 to 90.1 million in 1985, the latest year data is available. During the same period, the American-produced portion of the total supply dipped from 50.1 million pounds to 44.2 million pounds, roughly a 12-percent drop. The domestic contribution hit a high in 1980 of 69 percent, but by 1985 the rate had fallen to 49 percent.

"More than half of the oysters that Americans consume come from imports," Haby says. Generally, 99 percent of domestic oysters enter the fresh, frozen and raw bar trade. Industry estimates are:

– 80 percent of U.S. landings were shucked for fresh and frozen trade;

– 14 to 20 percent of U.S. landings were for shellstock trade;

– 1 to 5 percent of U.S. landings were for canned specialty items – gumbos, soups, stews, smoked products.

Imported oyster products enter the U.S. as canned specialty items or low-cost, frozen shucked meats. These imported products are so-called value-added products. Value-added means that somewhere along the marketing system, the product is transformed from raw material into a product that is demanded by a target market.

In the case of imported oyster products, they add convenience and variety to ultimate consumers' meals, and the frozen, shucked meats may offer a significant price advantage to food processors who prepare ready-to-eat oyster products such as soups, stews or breaded specialties.

Haby points out that strength in the market for U.S.-produced oysters exists for only two product forms: canned specialty items, or the fresh, raw product – either alive or shucked. Shucking oysters is expensive. Generally, the oysters themselves are 50 percent of the total production cost, while shucking labor, overhead and other fixed costs represent 50 percent.

Some 80 percent of domestically produced oysters are shucked, while 14 percent to 20 percent are destined for the raw bar trade. Texas can carve a niche for itself in the latter, Haby says.

One option for Texas is targeting specialty, fresh food-service markets. During the past 15 years America's food service sector has been increasing its share of the total food market, especially in the area of marine foods. In Texas, for example, there is an increased emphasis in seafood restaurants.

Another option, putting oysters in saltier water before selling them, may also boost value. The process, known as salination, improves the flavor by increasing the percentage of salt and raising the amount of amino acids present, which in meats are flavor components. The process requires approval and monitoring by regulatory officials, particularly if a closed system is used.

This type of new process technology provides oyster processors with a more diversified product line, Haby says. This diversity focuses on a market different from traditional shucked-meats by being a specialty product, which carries a premium and larger profit margin.

"Jumping into new technology should be gradual, but it's clear from similar operations in Virginia that higher than normal profits are available for those few who choose to test this new idea," he says.

Meantime, one regulatory area that must continue to have high priority is the issue of freshwater inflow into Texas bays and estuaries. Low salinities are essential for the survival of many species, especially oysters. Part of the oyster's survival depends on freshwater inflow from the interior of the state.

Today more than half of the oysters consumed in the United States are imports. Texas' oyster industry can boost domestic supplies, but the state must look toward high-tech research and marketing.

Oysters grow on the graveyard of those who have gone before. Developing slowly and often erratically, reefs change constantly. Reef size varies greatly, depending largely on the direction of water currents.

Marine scientists say the freshwater inflows dilute the salty tidal waters and transport nutrients and sediments that maintain marsh environments and promote productivity. Texas has a mandated index for use of water resources. The Department of Water Resources lists municipal and commercial uses first, followed by industrial, which includes water for cooling electric power generators, irrigation, mining, hydroelectric power, navigation and recreation.

Some threats to the Texas oyster simply can't be stopped at this time. Either in spite, or because, of its protective shell, the oyster has a number of enemies. The conch is probably the most serious predator in the Gulf Coast. Though small, this snail has an enormous appetite. It can eat almost a hundred small oysters per day, with spat as the preferred diet. Crabs, especially the blue and stone crab, are also a serious problem. The blue crab chips away part of the oyster's bill and inserts a claw as a wedge. Once this is done, the crab reaches inside the shell with the other claw and tears off pieces of meat. The stone crab simply uses its powerful claws to crack the oyster shell as though it were a peanut.

Meanwhile, disease-causing parasites can reach epidemic proportions, killing large numbers of oysters within a short time. *Perkinsus marinus* (Dermo) infections have been common among oysters in all Texas bay areas with the exception of South Bay. The organism has been responsible for mass mortalities among market oyster stocks in Aransas Bay and has caused considerable loss among market oysters in other bay areas. Oyster parasites are not harmful to humans.

In addition, the oyster can be plagued by fouling organisms, shell inhabitants and scavengers. Although these organisms do not actually prey upon the oyster, their activities may be detrimental to the oyster population. Fouling organisms, such as mussels and barnacles, compete with oysters for food and space. They are the weeds of the oyster bed.

Sometimes, even the oyster interior is invaded. Shell inhabitants, like certain sponges and mollusks, live within the oyster's valves for their own protection but may riddle the valves with extensive burrows, weakening the shell and making the oyster more vulnerable.

But the death of old oysters often leaves room for new. Oysters grow on the graveyard of those who have gone before. Developing slowly and often erratically over time, reefs change constantly. A firm bottom composed of sticky mud, clay, sandy mud or gravel is essential to creation of a reef.

The first oysters on the scene attach to whatever is on the bottom, and succeeding generations attach themselves to these oysters and dead shells. On the reef itself, live oysters basically form a crust on the surface of the reef. This crust is only a few inches thick, but the entire reef can be several feet thick.

Reef size varies greatly, depending largely on the direction of water currents. In Texas, many large reefs have developed outward from shore. Usually these reefs are long and narrow and are surrounded by soft mud.

Robert Hofstetter, recently retired from the coastal fisheries division of the Texas Parks and Wildlife Department, explains that oyster survival depends of numbers. A single oyster can spawn millions of larvae during warm weather in late spring through the early fall. Due to predators and pollution, the percentage of larvae that develop to the setting stage is small. But small as the percentage is, it can result in huge numbers of tiny oysters.

Larvae that settle to the bottom and cement themselves to a suitable surface are called spat. Spat aren't really picky about where they set down roots. They'll set on bricks, bottles, cans, tires, even crabs and turtles. But oyster and clam shells are the home of choice. Under perfect conditions spat can reach one inch in three months, two inches in seven months and three inches in 15 months.

Growth rates vary and oysters of identical age may differ greatly in size. Most Texas oysters reach the legal market size of three inches in 18 to 20 months.

Marine experts say the lifespan of an oyster is not definite, but estimates range from 25 to 30 years. In Gulf waters that lifespan is considerably shorter. Still, oysters are highly adaptable animals. They can tolerate moderate siltation, wide temperature ranges, near-fresh to very salty water, and extreme tidal fluctuations.

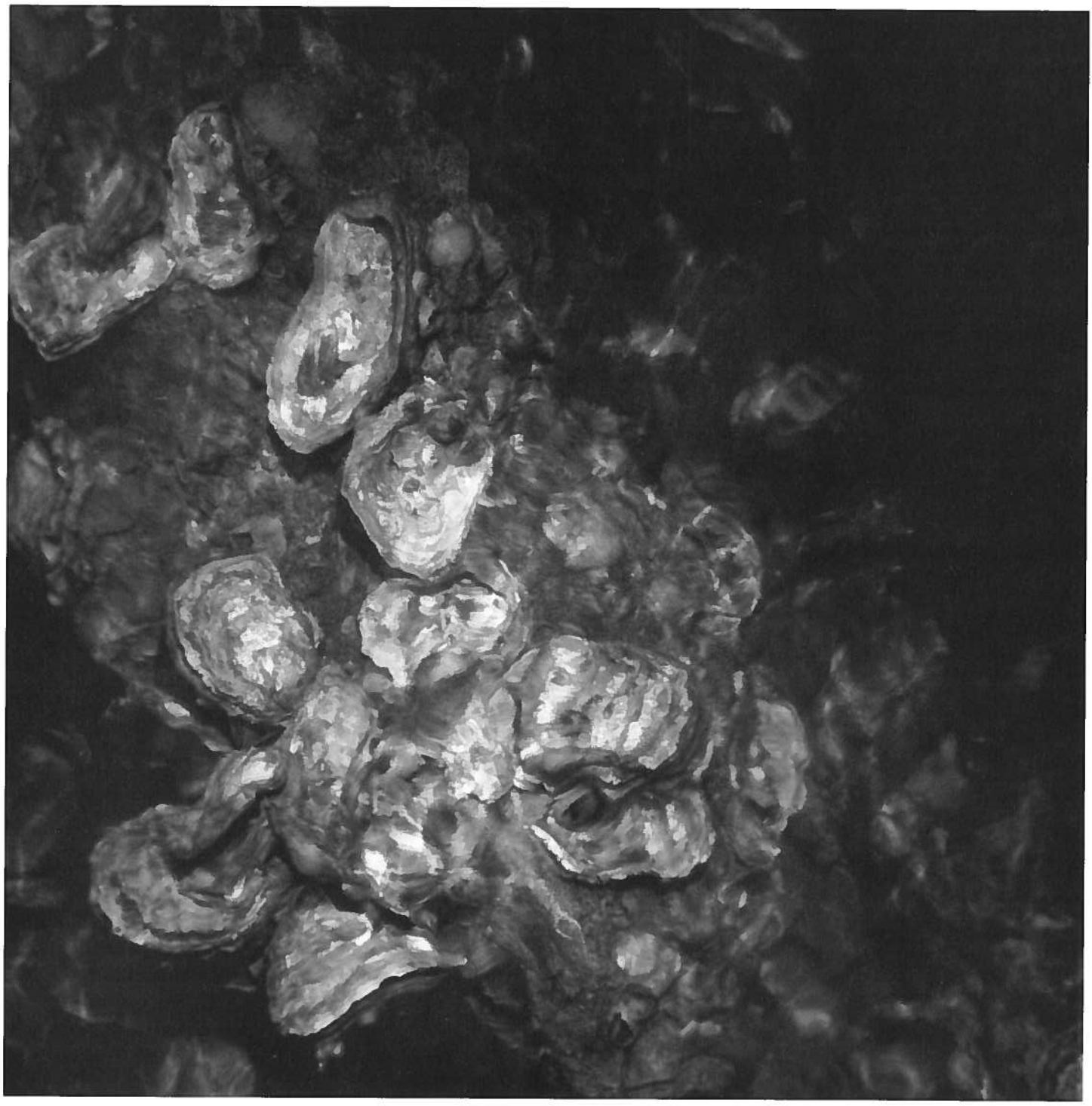
By tightly closing its shell, it can avoid contact with the harmful environment. But sometimes that's not enough. There may be a time in the near future when Texas oystermen must give nature a helping hand.

Texas oystermen take the majority of their catch from public reefs, but oyster farming on leased and privately owned bottom has been a way of life in Washington, Oregon and California since the 1800s. One reason for the trend is an historic pattern of oyster depletion. Generally, the pattern is initial discovery of the oysters, followed by heavy harvesting, ineffective management to conserve and replenish them, and eventual depletion of the resource.

As a result of falling production, oyster producers in other areas of the United States are turning to hatchery technology for assistance. In the ten years since hatcheries started producing larvae, 90 percent of all the oyster seed planted on the West Coast has come from hatchery tanks.

The first oyster hatchery in Texas has recently been developed by Dr. Sammy Ray of Texas A&M University at Galveston, with support from Texas Sea Grant and Kempner Interests. This summer, Dr. Ray's hatchery has spawned millions of larvae which have successfully set on cultch at the hatchery and remotely in tanks at a commercial oysterman's facility in Galveston Bay. ▬

Marine experts say the lifespan of an oyster is not definite, but estimates range from 25 to 30 years. In Gulf waters that lifespan is considerably shorter. Drastic salinity changes, predators and disease deplete populations.



NORMAN MARTIN

Oysters are in general tidy creatures. Once placed in clean water, they will purge themselves of contamination.

State and federal agencies monitor oyster populations

Oysters have no legs.

Hardly a bit of startling news, but an important fact to remember when considering public health or eating this popular shellfish.

The oyster is what marine scientists call a filter-feeder, pumping as much as 300 gallons of water per day through its system. Food particles, as well as bacteria and other contaminants, are filtered out.

But when the water is polluted, the oyster's filtering system concentrates contaminants in its tissue. So, waters that are perfectly fine for swimming and fishing may not be safe for harvesting oysters for human consumption.

Texas Department of Health officials say the agency makes every effort to classify growing waters properly, certify and inspect processors, and eliminate bootleg sales operations. Even so, the consumer is still the ultimate decision maker.

As long as the general public continues to buy oysters from someone selling from the back of a truck or from coolers on a parking lot – without demanding a certified product – these operations will continue and people will continue to get sick, health department officials says.

The Federal Food and Drug Administration, state health departments and shellfish industry members know potential problems could arise if someone eats oysters harvested from impure waters.

The National Shellfish Sanitation Program regulates the harvesting, processing and distribution of these products. This program has three main functions:

– Assess and monitor water quality in all areas where oysters, clams and mussels are found.

– Certify businesses that shuck, repack and/or ship oysters, clams and mussels. Plants that meet guidelines are given a certification number that appears on all packages.

– Establish and maintain an identity link for the product from the location of harvest through ultimate consumer.

One important aspect of the NSSP is the ability to track suspect products back through the distribution network to their point of origin. This important aspect of the program is often inadvertently lost at the retail level.

Mark Sobsey, a biologist at the University of North Carolina at Chapel Hill, says that frequently sewage treatment plants and malfunctioning septic tanks allow partially treated or untreated sewage to flow or seep into shellfishing waters.

Fecal wastes in this sewage contain bacteria and often enteric, or intestinal, viruses such as those causing infectious hepatitis and gastroenteritis.

Shellfish pick up the viruses and bacteria as they feed on suspended particles in the water. The viruses can, in turn, be passed to people when they eat raw or cooked oysters or clams. Contaminated oysters don't necessarily look or taste different, Sobsey says.

To determine if an area is polluted, regulatory agencies usually survey for waste sources. Tests are run to determine levels of fecal coliform bacteria.

If bacterial levels are high, the shellfish are unmarketable. If low, the shellfish are fit for consumption. Sobsey points out, however, that bacteria counts are not always a reliable indicator of viral contamination.

Luckily, though, oysters are in general tidy creatures. Once placed in clean water, they will purge themselves of contamination.

Fishermen are sometimes allowed to move oysters, under close supervision, from contaminated waters to clean waters, and then harvest the shellfish when the cleaning process is completed.

Although shellfish clean themselves of contaminants, cleansing rates vary during the year.

Meanwhile, safety experts say improper storage of shellstock, exposing it to contamination, or poor refrigeration can result in high levels of bacteria, which can make the consumer sick.

Also, improper shucking or storage of shucked oysters can cause contamination of the oysters.

As a result, health officials caution against purchasing shucked oysters in "mayonnaise type" jars with no seals, numbers, or identification of the packer. ▬

Texas government can close the door on oyster harvest

For such a simple animal, the business of managing the Texas oyster fishery is amazingly complicated.

Texas' oyster program is controlled by two state agencies – the Texas Parks & Wildlife Department and Texas Department of Health.

The Texas Parks & Wildlife Department's responsibilities include resource management and enforcement of resource laws and classification boundaries.

The Texas Department of Health has two main functions regarding oysters – classification of the growing waters and certification and licensing of processors. Within the Department of Health, these functions are directed by the Division of Shellfish Sanitation Control.

C.E. Bryan, fishery resource program director for the Parks and Wildlife Department, says the department is especially interested in closing overworked areas, gathering statistics on commercial landings and monitoring the oyster population for abundance and change.

For decades both shrimp and oysters have been regulated by the legislature, with some authority given to the state's Parks and Wildlife Commission. But in 1985, the legislature gave the commission authority to regulate shrimp and oysters coastwide.

Briefly, the state empowered the commission to close Texas bays to the taking of oysters when those areas are being depleted, overworked or damaged. Those criteria are based on the abundance of oysters or relative abundance of oysters of various sizes, in various areas, as indicated by the department's sampling of those areas where oysters occur.

The information is used to make recommendations to the Parks and Wildlife Commission on when the season should be adjusted, and to what extent it should be adjusted. Another factor in determining the length and time of any closure is the number of oysters boats either working or preparing to work, primarily within the Galveston Bay system.

Before the TPWD can make any changes in existing oyster management laws, the legislature demanded that the agency first produce a comprehensive oyster management plan for Texas. As yet, even the first draft of an oyster management plan for Texas is not complete.

"We've been through public hearings, and on the basis of those public hearings and research, we're putting together a first draft," says Jerry Clark, chief of coastal fisheries for the department.

That draft is still at least a year away from completion.

And, once that draft is finished, there will be another round of public hearings. He emphasizes that there are public comment periods on virtually every step of the draft process. "We encourage everyone to participate. It's not a closed process at all."

Still, Clark admits, "It's just a very tedious, time-consuming activity, but we want to make sure that everyone who wants to participate in the process does."

Meanwhile, oysters, mussels and clams are also covered under the health department's jurisdiction.

The reason is they're filter feeders, and can concentrate bacteria, viruses, natural toxins and manmade toxins to many times the level occurring in the water.

"Early on it became clear that water perfectly fine to eat shrimp or fish from could make and did make people ill if they tried to eat the oysters out of the same water," says Kirk Wiles, who is in charge of classification of growing waters for the Texas Department of Health.

Wiles points out that within the Texas Department of Health, growing waters are classified in accordance with the National Shellfish Sanitation Program Guidelines and reviewed by the Federal Food and Drug Administration.

FDA also reviews all other state programs to determine that each is properly classifying its waters, so that oysters from any other shellfish-producing state are just as safe as oysters from Texas.

To determine where oysters, clams and mussels can be taken, the department produces what are called shellfish growing water classification maps.

The maps, which are available through the state Health Department or Parks and Wildlife, show each bay system and where fishermen can harvest. The term used to indicated restricted areas is *polluted.*

"We don't particularly like the term polluted, but that's the one that the Legislature stuck with us," Wiles says. "It's not necessarily polluted. It just isn't safe to harvest shellfish."

Requirements for shellfish-producing waters are very stringent. Briefly, in order to produce classification maps the department completes pollution surveys of each bay system to determine what actual or potential sources of contamination occur in an area. In addition to surveys, routine monitoring of water and oysters is done.

"In general, we check for bacteriological pollution," Wiles says. "However, we also look for possible chemical pollution such as heavy metals or pesticides, and recently red tide toxins were added to the list."

Wiles emphasizes that the pollution maps apply only to normal conditions, that is moderately low rainfall in Texas. But under certain conditions a bay may not meet the criteria for shellfish growing waters bacteriologically.

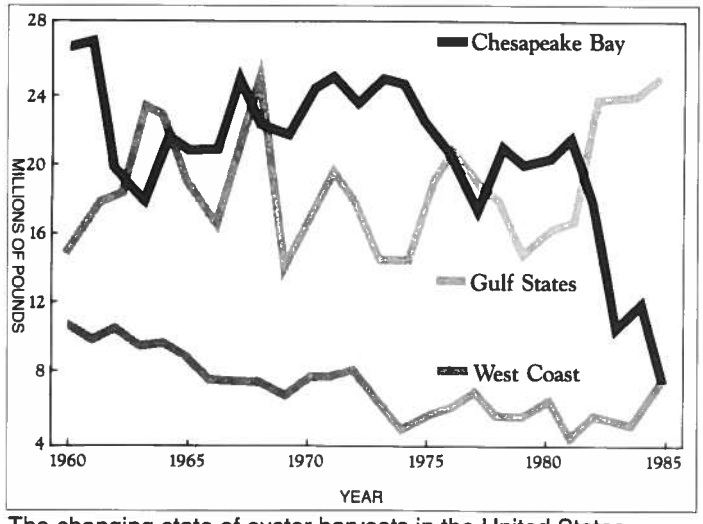
So, the department can enact emergency closures or temporary closures. "We do this very quickly because if it rains bacteria counts go up. We can't wait until it rains 10 inches, then go sample and then four days later when we get sample results back, close the bay."

Closures are announced through NOAA National Weather Service broadcasts, as well as certified dealers and the local media in the area.

After the events that caused the temporary closure abate and the shellfish have time to cleanse, the bay is returned to its normal classification map. "A lot of people don't understand that the maps we produce are not set in stone. They only apply in an average condition.

"What we try to do is supply anybody who wants to listen with the proper information," Wiles says. "We're not going to open a bay unless that bay is safe."

Closures do not mean there is something wrong with Texas oysters, Wiles says. "This is a precaution. In fact, it enhances acceptability of Texas oysters because what we do put on the market is good." ■



The changing state of oyster harvests in the United States.

Oysters are coming out of their shell on diet menus

Oysters are finally shucking their negative image in dietary circles.

For years, shellfish were regarded as a forbidden food for people with high blood cholesterol, says Annette Reddell Hegen, a Texas Sea Grant seafood consumer education specialist in Port Aransas.

But new research studies have demonstrated that cholesterol values for shellfish are far lower than previous studies indicated.

Apparently the older cholesterol tables were based on chemical analysis of foods that detected non-cholesterol components along with cholesterol. In reality, she says, oysters, clams, scallops and mussels are the lowest of all seafoods in the cholesterol area, ranging from 39 mg to 77 mg per serving, depending on season of catch, state of reproductive cycles and the food they eat.

Even shrimp is now reported to have between 125 mg to 180 mg for a 3 1/2-ounce serving as opposed to older values that were always reported to be much greater than 180 mg. Unfortunately, Hegen says, many physicians still pose dietary restrictions based on old, inaccurate tables.

But while oysters are good for you, they aren't magic. Contrary to legend, oysters really aren't aphrodisiacs. Hegen says the popular myth that oysters possess powers above nutritional benefits is not quite true.

However, oysters are loaded with zinc – an essential nutrient crucial to sexual maturity and fertility. Now the mineral is also known to play several roles in a healthy lifestyle, including protection against infection and possibly cancer. Zinc speeds the healing of wounds and is important to the proper working of the immune system.

"Only a small portion of the zinc we consume is absorbed," she says, "so the Recommended Daily Allowance for adults is set at 15 mg, even though we need only 2 mg a day." Three ounces of oyster meat provide 75 mg of zinc. An average 3 1/2-ounce serving of raw oysters also provides 74 calories, 50 mg of cholesterol and 110 mg of sodium.

Another superstition of eating oyster only in the "R" months was discarded long ago.

The adage, "never eat oysters in months without the letter 'R' in the spelling," was based partly on difficulties associated with keeping the mollusks from spoiling during warmer weather – May through August – before efficient refrigeration methods were developed.

To be sure oysters are safe to eat, the Texas Sea Grant specialist says to make sure there is a Texas certification number on the original container. "Ask to see the original container if the oysters have been removed to a display tub or bowl," she says.

In addition, look for a clear, thin liquid surrounding the oyster, Hegen says. It should have a fresh mild or no odor. As oysters spoil, the liquor becomes thick and ropey, and has a strong ammonia odor. Good quality oysters are plump and free of extraneous material.

Oysters are most abundant in Texas from November to April, although oysters from private leases are available all year around.

Louisiana oysters are also frequently seen on the Texas market. Oysters harvested from approved waters, kept at proper temperatures, and handled correctly from harvesting to consumption are safe to eat every month of the year, Hegen says.

Oysters are available in several forms in Texas:

Live, in the shell – In this form, oysters are available by the dozen or bushel. Hegen says make sure the shells are closed tightly. This indicates the animals are alive. Plan to serve at least six oysters in-the-shell per person.

Shucked, fresh or frozen – Look for plump, natural cream-colored meat and clear liquor. No shell pieces should be present. Fresh oysters are packed by the pint, quart or gallon in metal, glass or waxed containers. Depending on the size of the oysters, a gallon will contain 160 to 400 oysters.

Hegen points out that at times there is a wide variation of color in fresh shucked oysters. This is due to the type of food the oyster was feeding upon. Certain algae, when eaten by an oyster or clam, will result in that mollusk assuming the same color as the plant.

"Consumers shouldn't consider a variation in color a health hazard," she says. Oysters are normally pale gray in color. The inside of the shell may vary as well from purple, to brown or black because of harmless trace elements in the water.

For those who want to fix oysters in some other form than traditional frying, Hegen says, the options are plentiful.

Oysters are often prepared in a variety of ways, including scalloped, baked in casseroles, broiled such as in nachos, used in soups, chowders, bisques – even grilled or smoked in the shell. Of course, they are also served raw with a red sauce.

"Never overcook oysters," Hegen warns. "They are naturally tender and require only a few minutes cooking time, if you prefer to cook them at all."

All that is necessary to serve oysters attractively is a small investment in rock salt and oyster shells, she says. The rock salt, poured into a dish, stabilizes and insulates the shells. The shells, of course, hold and accent the oysters.

Hegen says consumers are often disappointed when they expect frozen oysters to taste as good as fresh, shucked oysters. "It's almost impossible to avoid changes in flavor, texture and color, as well as drip, or moisture, loss during frozen storage," she says.

However, with proper handling these changes are not severe, especially if the oysters are to be cooked after thawing. ▬

Troubled producers drop cowboy credo and form association

While the oyster may be the paragon of mild-mannered marine life, the job of obtaining and selling this high-demand shellfish delight has for decades been what one expert calls a decidedly "cutthroat business."

Often producers and dealers followed the Texas cowboy credo of going it alone with every person for himself. The pattern changed last year when a massive red tide and subsequent action by state regulatory agencies struck a deadly blow to the livelihood of many oystermen. The bulk of the 1986 and now the entire 1987 oystering season was closed due to a depleted fishery in state waters.

Troubled times have caused a tiny band of 10 oyster producers and dealers to team up and form the TOA, the Texas Oyster Association. "I'll be the first to tell you, this association is very small," says Tom Hults, acting president of the Texas Oyster Association and owner of Seabrook Seafood, Inc., in Seabrook. "But we've got representation from up and down the coast from a variety of entities in the business. It's not a one-sided organization."

Hults says his goal is to

Cumulative impacts of Corps water projects worry environmental groups and oyster producers.

establish lines of communication between the oyster industry and the various state agencies. During the past two years there have been several problems associated with the opening and closing of the bays. "We didn't feel it was fair or equitable," Hults says.

Efforts to organize the exceedingly independent members of the oyster industry have not met with smooth sailing. Texas Sea Grant marine advisory agents tried three times in 1985 to bring together the principal oyster dealers in the state to form a marketing association.

"We worked and worked, but they just did not organize," says Mel Russell, Texas Sea Grant marine advisory agent for Galveston County. "So, we just abandoned the idea, and said. 'If they want to, they'll do it themselves.'" Last season, when the bottom fell out of the oyster business, a group of hardcore oyster dealers and growers finally came together.

To understand the reluctance of the oystermen to organize better, first understand the market. Oysters are a finite resource. "There's a definite place where they grow on a reef and what one person doesn't get the other one will," Russell says. "Consequently, the oyster dealers have not been cooperative with each other in years past. It's kind of a cutthroat business."

However, due to severe economic conditions, as well as ecological and management problems, Russell says some producers now believe it is either organize or get out of the business.

John Valentino, Jr., owner/operator of Eagle Point Marina and Seafood in San Leon, expresses the typical sense of frustration Texas oystermen have regarding their business. "It's a pathetic situation when the Corps of Engineers, state agencies, the Houston industry, can just wipe the hell out of your business and not pay one penny.

"The oyster industry has no respect. You wouldn't be able to do that to other industries that are a little more organized."

Valentino believes he and other industry leaders have made a step in the right direction by forming an oyster association. "Some folks aren't going to have any part of it.

"They want to lobby for themselves and themselves only." But, he says, this will pass and the TOA will eventually be recognized as a spokesman for the majority of the oyster industry. Valentino, who was raised on an oyster transplanting boat, adds that data obtained by state and federal agencies are too spotty to give any accurate picture of the industry today.

The state should be more closely attuned to the needs of local producers, Valentino adds. "These reefs are getting worked down further and further. Yet there's no program for watching these reefs or for limiting production off these reefs."

Russell says a major complaint state oyster fisherman have on the agenda is the out-of-state fishermen. "The Texas oystermen believe the Louisiana boats come over and rape the reefs and then go back home."

The Texans can't simply go to Louisiana waters either. Today the majority of the fishable reefs in Louisiana are under private cultivation, and the wild reefs, as they refer to them, are very limited.

Texas is just the opposite. The state has a large amount of public reefs and only a small amount of private reefs.

In addition, fishermen going to Louisiana have always had to pay four to five times what the Louisiana residents have to pay for licenses. But there has been a move toward a more protective stance here, too. In 1987, each vessel harvesting oysters from public waters in Texas will be required to have a commercial oyster dredge license. The cost is $50 for residents and $200 to the non-residents. ■

Corps water projects raising storm of controversy

At least seven U.S. Army Corps of Engineers dredging and reservoir construction projects planned for the next several years threaten the multi-million-dollar Galveston Bay oyster industry, including some of the bay's most productive oyster reefs, say industry experts.

Corps officials hotly dispute any doomsday scenario, pointing out that their studies suggest minimal damage to the bay or the sport and commercial marine life there.

Still, comments from those in the oyster business today range from allegations that the federal agency "low-balls" its data to dire predictions that oystermen can simply kiss the Texas oyster goodbye if these projects are allowed to hurtle toward completion. The Texas oyster fishery has already been decimated by back-to-back closed seasons and a profit-taking plague of red tide.

Three of the Corps' long-range planning projects involve deepening the Houston and Galveston ship channels and the Gulf Intracoastal Waterway. Also, several reservoirs are planned for rivers that flow into Galveston Bay. Six state agencies and several environmental groups contend that these projects could reduce the flow of freshwater into the bay, which can adversely impact marine life, especially oysters.

According to Ric Jensen, a spokesman for the Texas Water Resources Institute, freshwater inflow is essential to the delicate health of the bays, estuaries and wetlands of Texas because it carries nutrients and sediments into these systems. Also, opponents say a deeper, wider channel will let substantially more saltwater flow into the bay, further altering the bay's water and reducing the oyster crop.

Easily the greatest point of contention is the Corps plan for a

Please turn to page 28

The life of an oyster is not a pretty one. Sure, all you do is sit inside a hard shell and eat, but you're also a sitting duck for predators and disease. If vampire-acting snails don't suck up all your blood, the dreaded disease Dermo is fully prepared to spread a killing infection.

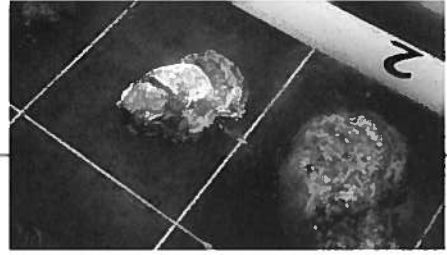
A grim certainty of massive death hovers over each year's new oysters throughout Texas' most productive bays. Almost 50 percent of the current crop is killed annually, an astonishing figure that marine scientists have tried to lower with little success so far.

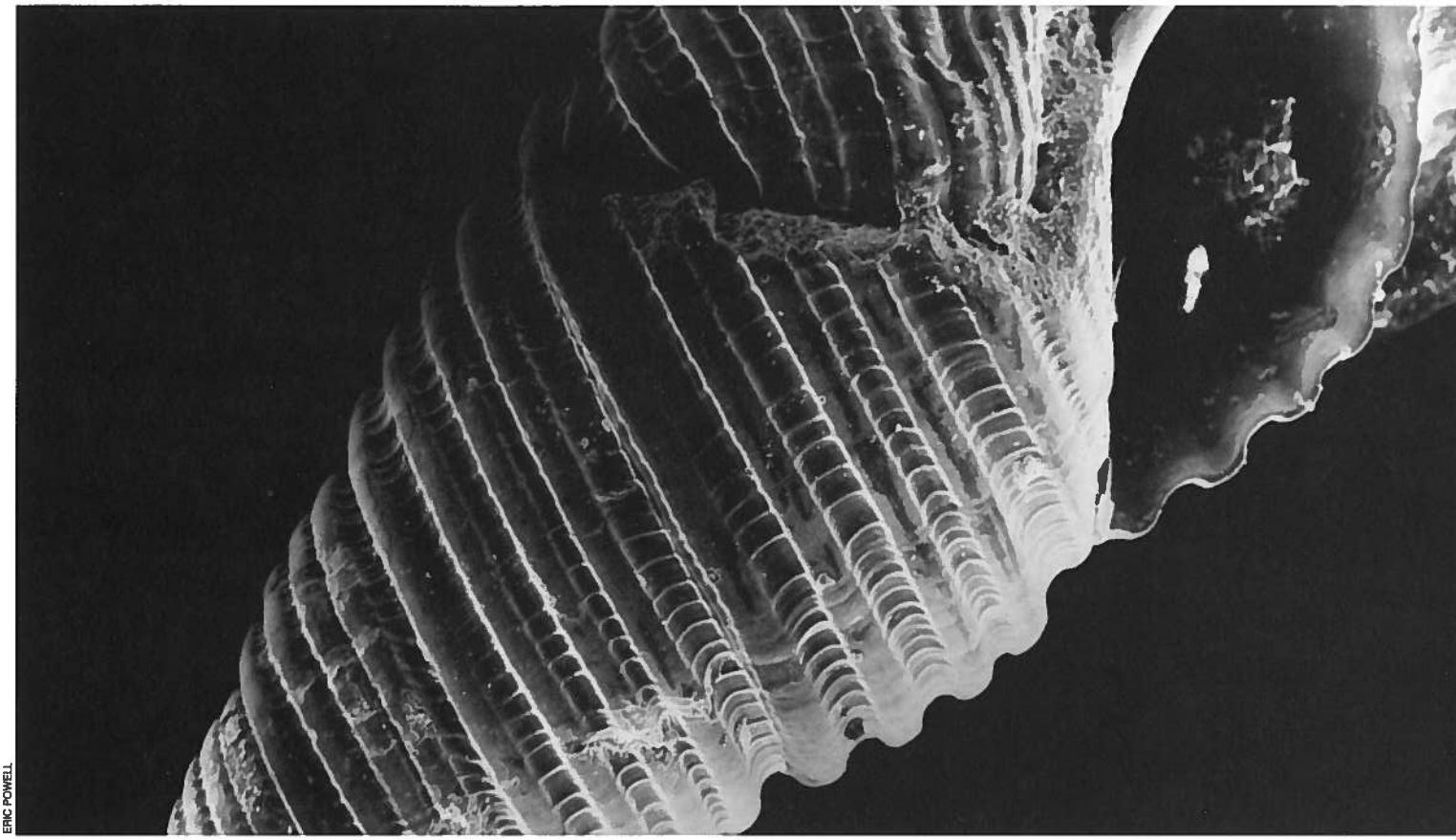
But there is new hope. For the first time, researchers at Texas A&M University at Galveston this summer began hatching millions of native Texan oyster larvae. The hatchery operation is the first step toward eventually spawning specially selected oysters that can resist disease, either through conventional breeding or through genetic engineering.

Whether such oysters can be used to help nature boost Texas' oyster production or whether such techniques are more feasible for oyster farmers is still open to question. But the foundation for research is set and moving forward.

Dr. Sammy Ray, an oyster biologist at Texas A&M–Galveston, coordinates the program that in June fertilized 6.5 million eggs. More than 4 million larvae survived to setting stage. Many of these young oysters have been placed in

Among the deadliest of oyster predators is a snail called *Boonea impressa* (bottom). Dr. Sammy Ray (top, right) at Texas A&M–Galveston coordinates a program that recently began hatching millions of native Texan oyster larvae. The oysters are induced to spawn (top, center). Note wisp of smoke–like larvae at edge of shell. Scientists believe the hatchery operation is the first step toward a hatchery source of oyster larvae and spat for possible commercial ventures (top, left).





ERIC POWELL

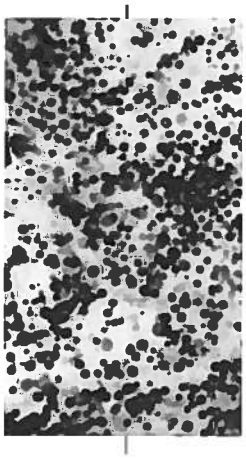
nearshore waters where their growth is being closely monitored. Two other multi-million level spawnings have since occurred.

"We're basically trying to provide a hatchery source of oyster larvae and spat for possible commercial ventures," Ray says. The project is funded by the Texas A&M Sea Grant College Program and Texas A&M University at Galveston, and supported by the

PEARLS OF WISDOM

OYSTER RESEARCH IN TEXAS

STORY AND PHOTOS BY NORMAN MARTIN



BESS WILSON

use of Kempner Interest properties.

Meanwhile, Dr. Thomas Bright, director of the Texas Sea Grant Program, views the hatchery as a research facility where scientists will be able to pursue studies relating to the diseases that impact on oyster populations, selective breeding of the local oysters to obtain a faster growing, more disease-resistant strain, and depuration of oysters to rid them of bacteriological or viral contaminants.

He would also like to examine such imaginative concepts as immunization of oysters against infection in the larval stage, while they're being produced.

In simple terms, Ray says, "We raise the larvae to the stage where they're ready to attach themselves, then put them in a flask. Fishermen can then come get the flasks and take the oysters to their own places. The private growers provide their own shells, or the material the oysters need to set on in order to reproduce, and the right balance of water, and can do the setting in tanks or pools."

The technique is known as remote setting. Essentially, Texas oystermen interested in putting oysters back into an aquaculture system handle the labor-intensive tasks.

Instead of maintaining expensive environments for growing out adults, oyster farmers first introduce the larvae into tanks or impoundments containing cultch (clam or oyster shell fragments). The larvae settle on and attach to the cultch and become spat. The cultch and live oyster spat are then placed on the bay bottom where nature feeds the oysters. Thus, instead of shipping heavy shell, the Texas A&M hatchery sends only plastic pouches containing millions of larvae.

With remote setting, oystermen distribute the risks, and at the same time distribute the labor. Since oyster larvae would be set by planters in different areas, risks of losing an entire stock because of some unpredictable problem also decrease.

The Texas A&M team is studying distribution of a parasitic protozoan called *Perkinsus marinus*, Dermo for short. The parasite is found throughout the Gulf coast and is a leading cause of death among oysters, especially in high-salinity bays during the summer. "It's not because oysters can't take salty water," Ray says. "It's because the disease organisms and predators, its enemies, do well in salty water."

Among the deadliest of predators is a snail called *Boonea impressa*. The snail behaves somewhat like a mosquito with a long, sharp mouth similar to a hypodermic needle. The snail punctures the oyster's flesh like a mosquito does a human, and sucks out the fluid.

The snail is small, about the size of a single narrow letter in this article. Dr. Eric Powell, an oceanographer at Texas A&M University in College Station, explains that the snails are ectoparasites, which means they stay outside the oyster even when feeding. To get about, the snails walk or, perhaps more accurately, slime their way across a surface of the oyster shell, and eat, so-to-speak, when the oyster eats.

If it weren't enough to have your blood sucked out by a snail, Powell says, these long-nosed raiders also spread *Perkinsus marinus*, the Dermo disease. In Texas bays, Dermo will kill more than half of the available market-size oysters in a year. Texas A&M scientists, involved in what is called the Status and Trends Program of the Gulf coast, have discovered that Dermo ranges from Texas to the East coast. "We've found it everywhere along the Gulf coast."

Powell emphasizes that the disease affects only oysters and does not hurt humans. Even so, Dermo is tough on oysters. Once the disease strikes, it takes over the oyster's tissue, eventually killing it as infection spreads. And, if the disease doesn't kill the oyster, it definitely affects reproductive ability and growth rates.

Among the Texas A&M findings are:

– The snails can definitely transmit the disease from one oyster to another.

– The disease also can spread through the water. Snails intensify the disease if it is already present.

– Oyster growth rates can be decreased by as much as 75 percent, depending on the level of the snail parasitism.

– And, if there are a lot of snails on the oyster, there's a chance the oyster prepares for reproduction much more slowly and doesn't actually reproduce as often as oysters that don't have the snails.

The next step, Powell says, is to develop a computer model that will take into consideration all water properties, temperature and salinity, the way the water flows around the oysters themselves, and the movements of the snails and the level of the disease. The model should trace the interaction of the snail, the disease and the oyster.

Problems with the snails and associated disease are not new. Marine scientists have been writing about them since the early 1950s. Apparently, Powell says, seasonal conditions play an important role in the spread of the disease.

The hotter and saltier the water, the greater the spread of the disease and infection. But once an oyster has the disease, there's very little it can do, although at low temperatures the oyster's immune system works better so it may get rid of the disease. The Texas A&M scientists have found that disease declines when temperatures cool in the winter months. As the water gets colder and less salty because of influx of fresh water, the disease almost goes into remission.

Trying to kill the snails with chemicals isn't a good alternative, Powell says. While the spraying of troublesome pests in corn fields works fine, the same technique doesn't work nearly as well in an aquatic environment.

At least Texas doesn't have to battle the mysterious and deadly parasite MSX, technically known as *Haplosporidium nelsoni*.

The single-celled parasite got its military-sounding name in 1957 when officials first discovered its effects on oyster beds in lower Delaware Bay, when 95 percent of the oysters in its high salinity waters died.

Merrill Leffler, managing editor of Maryland Sea Grant Magazine in College Park, MD, says no one had ever seen the microscopic organism before. Because it couldn't be classified, researchers named it for its spherical shape and numerous nuclei, "Multinucleate Sphere X." In 1959, the parasite invaded oyster grounds in Virginia and immediately became "epizootic," a condition resembling an epidemic, when disease spreads quickly throughout a population.

Leffler says where MSX came from and why it is so prevalent when water salinities go above 15 parts per thousand salt has so far eluded researchers, as has the life cycle of the disease itself. No one has yet been able to grow MSX in a laboratory, nor do scientists know just how it attacks oysters. And for years, he says, researchers have traveled MSX-infested waters to collect tiny copepods, crabs, fish and many other animals, bringing them into their laboratories, and searching for evidence of MSX in carriers other than oysters. They have not yet been successful.

Marine scientists, state officials or oystermen can do little to avoid the ravages of certain predators, such as the oyster drill, except by getting more freshwater in the bay. But with the current trend toward more water protectionism, Ray believes, the oyster industry is looking at less freshwater coming into the bays, rather than more.

So if naturally occurring environmental factors can't be controlled, perhaps they can be circumvented. Rather than letting Mother Nature do everything, marine experts believe that Texas producers can grow oysters under more controlled conditions. In order to develop a Texas oyster aquaculture industry, researchers want to develop oysters through genetic manipulation that have greater commercial value.

"We're looking at the genetics of oysters, particularly inheritability of rapid growth, as well as shape and disease resistance," Ray says.

Among the best markets Texas can target is the raw, half-shell trade. "We don't necessarily want big oysters," Ray says. "Shape is the important factor to that particular trade."

Other ongoing research at the hatchery involves the genetics of fast growth and disease resistance among oysters. A cooperative project supported by the Texas Sea Grant College Program is being conducted with Dr. James Lester of the University of Houston–Clear Lake to initiate such genetics studies.

"Certainly, there is the potential here for producing oysters that are faster-growing and more resistant to environmental stresses," Lester says. "It may be possible to produce a strain of oysters that has a high resistance to infection by parasites."

But the marine scientist cautions about expecting a quick-fix type of project. Depending on manipulations used, "you're looking at probably 10 years before you get anything you would want to turn loose to a commercial hatchery," Lester says.

"We're just planning the basic work that's needed to analyze populations of oysters that are already adapted to our environment," Lester says. The research team is seeking the degree to which genetics determine growth rate, and the possibility for environmental modification of growth.

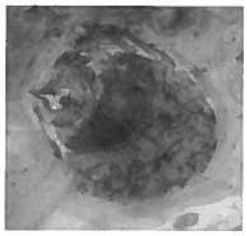
Among the research areas of special interest are sex determination and sex change. "Oysters seem to have the best of both worlds," Lester says. "They can switch from one sex to the other."

Lester says the area of oyster sex determination has always been fascinating due to the variety of different genetic mechanisms involved in determining whether an organism is male or female. More research is needed to determine how rapidly they can make that change, what stimulates it, and what is involved in the sex shift.

"Until you understand how the oyster works, you're not going to be in a position to control it," Lester says.

By no means is Texas alone in oyster genetic studies. Significant research has been conducted in the U.S. and other countries. Indeed, work done here is minimal compared to that of Oregon, Washington, Maryland and Virginia. The Northwest already has a number of commercial oyster hatcheries that sell the spat to commercial oystermen who own oyster-harvesting lands.

A Texas A&M research team (left, center) is studying distribution of a parasitic protozoan called *Perkinsus marinus*, Dermo for short. Dr. Eric Powell (top, left) says the parasite is found throughout the Gulf coast and is a leading cause of death among oysters, especially in high-salinity bays during the summer. Once the disease strikes (bottom, far left) it takes over the oyster's tissue, eventually killing it as infection spreads. The study involves a variety of investigative techniques (below).



Ray cautions that there is a long way to go for commercial applications in Texas. "It's one thing to talk about genetic manipulation. It's more difficult to carry out.

"All of this may be pie-in-the-sky. It's much more difficult to do these things when you're dealing with aquatic organisms than with chickens or cows."

Still, if several technical questions can be solved, the Texas coast does have potential to grow oysters in ponds, much like a farmer would raise a crop. But there are valuable lessons to be learned from those states that have gone before into this oyster abyss.

As oyster harvests in the mid-Atlantic states leveled out and then plummeted in the last three decades, two waves of oyster aquaculture experiments sought to halt the fall. Dr. Jack Greer, director of communications for the Maryland Sea Grant College Program, says researchers first sought to grow healthy oysters in the controlled environments of large hatcheries. They were successful in spawning and rearing larvae, setting them and then growing the new spat to maturity.

"What they didn't reckon was the cost," Greer says. Large hatcheries could spawn and set oysters, they concluded. But high energy and labor costs, as well as inconsistent results, put the price of each market-size oyster beyond reasonable limits. "As a practical solution, the first wave of oyster aquaculture died."

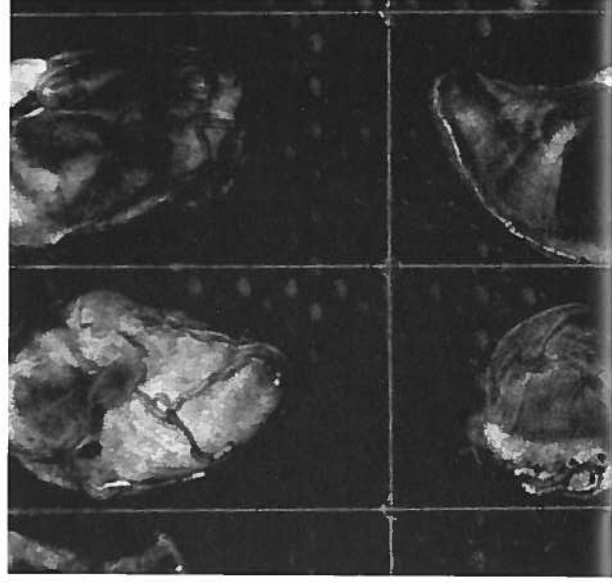
The second wave was remote setting. The technique called for taking hatchery-spawned larvae and then setting them in stand-alone tanks near the grounds to be planted. "The beauty of this, they all agreed, was that hatcheries could then concentrate on what they do best – producing enormous numbers of larvae – and avoid what they do ineffectively – setting and growing oysters to harvest size," Greer says.

Strangely enough, Texas – the vaunted land of wheeling and dealing – is at a business enterprise disadvantage. Put simply, the state isn't much on private enterprise in the oyster business. Louisiana, for example, is much more of a private enterprise state when it comes to the oyster industry than Texas.

Of course, it should be noted the Bayou State has vast areas of suitable bays and marshes for growing oysters, primarily because of the influence of freshwater inflow from the Mississippi River. Texas has no natural seed ground comparable to Louisiana, so private enterprise is difficult to foster.

In order to understand the future of the Texas oyster fishery, one first has to understand how the oyster business is set up now. Mel Russell, Texas Sea Grant marine advisory agent for Galveston County, says the vast majority of the state's oyster crop comes from public lands. But oysters can also be taken under special conditions from privately leased underwater bay lands.

The rules governing purchase of private oyster reefs are best described as murky. But, briefly, the requirements call for selection of bay bottom that has not produced oysters on a significant basis for the past four years. "You can't go out and lease a live, producing oyster reef for private use," Russell says. The last step in the procedure is a hearing process by the state's Parks and Wildlife Department.



If the application is approved, the leaseholder will plant cultch, which is dead oyster shell, and spread it along the bay bottom. An alternative is to take oysters out of the closed waters during transplant season and put those on the private reef. The leaseholder must then allow the transplanted oysters to purge themselves for two weeks, then they can be sold.

Russell says the lease program is designed to enhance or increase production of the bay and to take oysters out of closed, or polluted, waters that are not accessible to the public, put them in clean open waters, allow them to purge themselves, and then go ahead and harvest them.

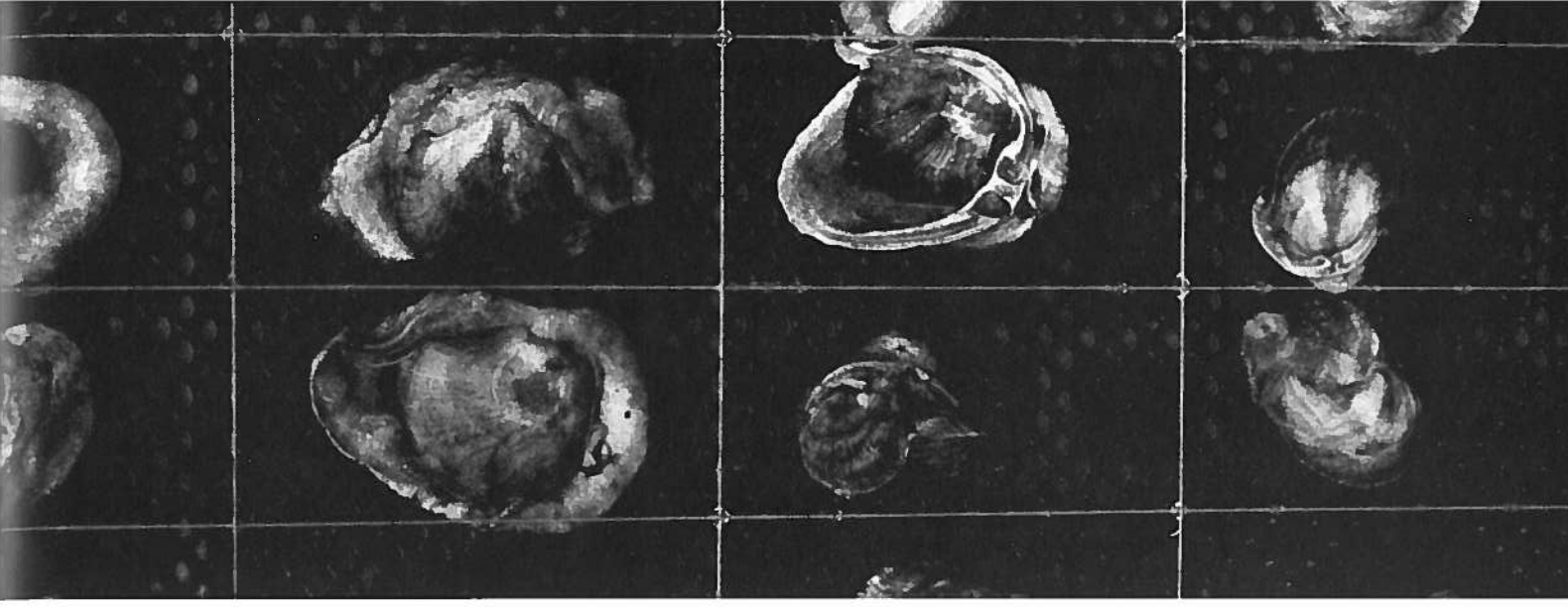
"The lease concept is probably a good one, and it's really the only real cultivation we have," Russell says. "You're taking a non-productive bay bottom and you're putting oysters on it that can be harvested. Really what they're doing is shifting the oysters around in the bay. They're not really growing new oysters."

Texas oystermen can take the oysters from areas the state's Department of Health calls polluted during the closed season, generally from May through October. The oysters are moved from polluted areas to non-polluted areas. They must stay there a minimum of 14 days. Then, the health department examines them. "If they've cleaned up, they certify them as safe to sell," Ray says.

The attitude of Texans, in general, is that "we're going to get most of our oysters from public reefs." Private enterprise is simply not encouraged. Ray says, "That's one of the reasons why a hatchery program is needed. We can improve the private enterprise climate in Texas if we can provide young oysters."

One area gathering interest along the coast is introduction of oyster depuration plants to Galveston Bay. The premise is that operators of depuration plants would operate year-round, taking oysters out of closed waters, under monitoring by law enforcement and state regulatory agencies.

Currently, Texas does not have a commercial oyster depuration plant in operation. But a pilot project by a commercial oyster business was begun



last year in the Galveston Bay area. In many areas of the world oysters are depurated as a normal part of commercial production. "That has a potential in Texas as well," Russell says.

There is opposition, though. "Folks with private reefs look at those oysters in closed waters as their bread and butter," Russell says. "They don't want anyone taking oysters and putting them in their depuration units throughout the year." Their contention is that oyster depurators will keep the polluted reefs depleted during the year, so when transplant season arrives, private reefs would not have any oysters to transplant.

Another research area under consideration, especially by the Texas Department of Wildlife and Fisheries, is rehabilitation of existing oyster reefs by planting shell or putting down broodstock. Ray believes that may not work. "If you don't know why it disappeared in the first place, you're not going to rehabilitate it. The conditions still exist. It's not going to help to put a few spawners out there. You'd need to know why they died."

At times, the data to even determine a research direction are simply not there. Gary Matlock, division director for fisheries for the Texas Parks and Wildlife Department, says the state agency is now in the process of developing an oyster fishery management plan for Texas. The Legislature instructed the agency to complete a management plan before making any changes in existing regulations.

"That research is going on now and includes every area of the oyster fishery that we can identify," Matlock says. But there are problems. Matlock points out that the oyster fisherman individually and the oyster industry as a whole can do a better job of assisting the department in managing the Texas oyster fishery.

"They should provide us accurate, timely information on what they handle – how many oysters, what weight, how much are they worth, where do they come from, how many people are involved in selling them," he says. This information is presently a legal requirement, but often is ignored by oystermen.

Another data base needing additional input concerns cost of operation and profit levels. Economic information in almost every commercial fishery in this state is, at best, lacking, he says. No one wants to share economic information very freely with a state agency that is responsible for managing the fishery.

Matlock says oystermen need to recognize that oysters are a public resource. "It's not like making a product in your own home or your own private business, and selling it. It's a public resource, and having that economic information is essential for us to make decisions that are in the best economic interest of the state."

With luck and a good research program, the Texas coast could make progress in the oyster fishery. Marine experts say success will depend on breakthroughs in selective breeding of disease-tolerant oysters or naturally resistant stocks. It may lie in application of genetic engineering techniques.

Texas Sea Grant's Bright points out, "Probably the most critical need from the standpoint of management of oysters right now is a better understanding of the causes of decline in the oyster populations in the Texas bays. This involves what causes mortality in the adult oysters, what limits recruitment of the larvae to the substrata that are present, and what environmental effects there are on the reproductive capacity of the oysters in the bays."

There is a multitude of environmental and ecological questions that should be addressed in relation to oyster biology in the bays that will be extremely important in the future in terms of proper management of the oysters, he says. "We have no dearth of potential research subjects," Bright says. "We are constrained in our ability to approach these subjects by limited funds and limited numbers of researchers in the area with expertise to do the work."

In the future, he says, Texas Sea Grant's research programs will in all likelihood concentrate on the role of disease organisms in affecting oyster populations in the bays, the role of predators, and what methodologies can be developed to study the ecological aspects of disease.

Other research areas receiving attention are genetics and selective breeding, and depuration problems relating primarily to viruses. ▬

Millions of larvae have survived to setting stage (top, right). Many of these young oysters (left, top) have been placed in nearshore waters where their growth is being closely monitored. Scientists, like Chris Combs in Galveston (left, middle), say there is a critical need to better understand causes of decline in Texas oyster populations. This involves carefully examining water conditions (left, center), as well as close examination of what causes mortality in the adult oysters, what limits recruitment of the larvae to the substrata that are present, and what environmental effects there are on the reproductive capacity of the oysters in the bays (left, bottom).

OUT OF SEASON

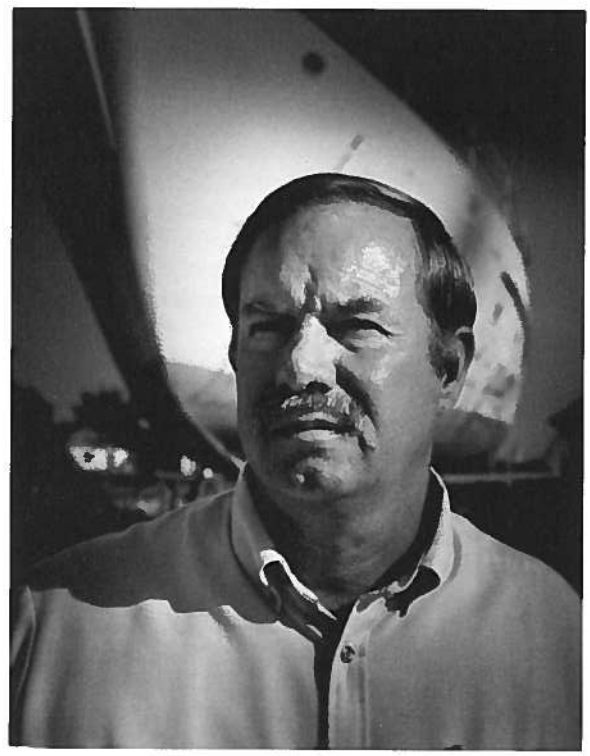
THE STATE OF TEXAS SAYS WE'RE RUNNING OUT OF OYSTERS, AND TEXAS OYSTERMEN SAY THEY'RE RUNNING OUT OF TIME.

The air was hot and muggy even though the leading edge of the dark rain line was still five miles out from Moses Bayou. Kenneth Muecke wasn't paying any attention to the weather.

Poking a fresh cigar in his mouth, Muecke continued to storm softly at the Texas Parks and Wildlife Commission for its blanket closing of the Texas oyster season for yet a second year. "They treat us like dogs," Muecke said, while the toe of his white rubber boot pushed forward into the mud beside his 500-foot dock.

Special outdoor spotlights began to click on. And his four 50-foot oyster boats shifted gently as the heavy clouds raced toward the bayou. None of the weather-battered vessels would see action anytime soon. But their covered decks, lightly rutted by the memory of thousands of hard oyster shells, spoke of better, busy days. A stack of empty, unused burlap sacks, used to pack the normally profitable second crop of Galveston Bay oysters, lay on deck next to a rusty oyster dredge.

Above:
Docked boats at Moses Bayou
Right:
Marine Agent Mel Russell
Far Right:
Oyster dredge



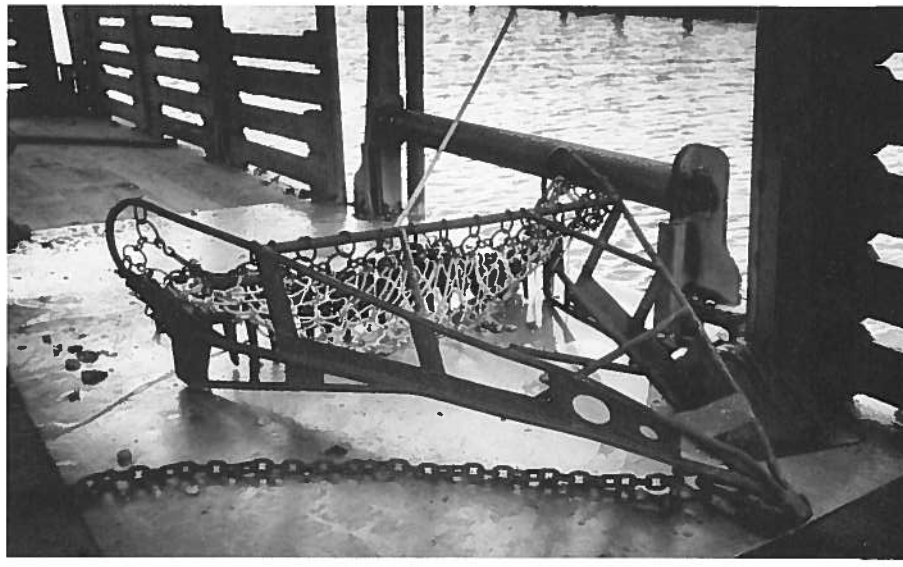
Muecke scoffed at the state's premise that oystermen would strip already depleted reefs if allowed. "A man's just not going to stay out there if there are no oysters. The fuel will eat you up. It's like trying to commute from here to a job in New York City," Muecke said.

Muecke is not alone in his disgust with the raw deal they believe the Texas government has served up. Oyster fishermen, up and down the Texas coast, say

STORY AND PHOTOS BY NORMAN MARTIN

closure pushes oystermen from a recession to a depression, especially after last year's shortened season, a season cut short by the record-setting red tide and abnormally heavy rains.

The recommendation to close the bays thundered down in August from Parks and Wildlife Department biologists, who say oyster populations had plummeted as much as 80 percent in the past year and fishing for oysters could seriously deplete oyster populations for years to come. Gary Matlock, division director for fisheries for the department, says oystering would be closed for at least 120 days. The season would normally run from Nov. 1 to April 30. The closure affects all the state's major oyster-producing bays – Galveston Bay, Aransas Bay, San Antonio Bay, and Matagorda Bay. But Galveston Bay is, by far, the most critical, since it produces about 80 percent of the total oysters dredged commercially in Texas. San Antonio Bay produces another 10 percent, while the remainder are harvested in smaller bays along the coast.



Unlike the fishermen, Matlock says, the commission, and apparently the Texas legislature, believes oysters can be affected by overfishing. If overfishing continues, it will ultimately result in there being no oysters to harvest at all, he says. "That's a very different view than most people in the oyster industry hold," Matlock admits. "Yet, there's a substantial body of scientific information behind the belief that fishing can impact oyster populations, especially when it's coupled with environmental effects that can be devastating." Among the list of woes facing the industry this year were severe flooding, disease organisms, and siltation from dredging activities. "Those things certainly impact oysters," Matlock says.

Parks and Wildlife officials also point out that an overabundance of boats is depleting the oyster crop faster than it can regenerate. Officials were estimating the number of boats working oysters in recent seasons at 500, with 400

Top:
Sorting
Center:
Shucking
Bottom:
Cleaning off bay mud is a messy business

of them working in Galveston Bay. That compares with 60 boats in 1982, and fewer than 10 boats in 1978.

Commission Chairman Edwin Cox, Jr., adds that the commission's primary obligation is to marine life, the oyster in particular. "The socio-economic aspects of this are secondary to the protection of this resource, and I have never seen us in quite this bad shape."But those in the Galveston Bay area who depend on oyster harvesting for a living in the winter months say they, not the oyster, are in immediate danger of depletion.

Clifford Hillman, a third-generation oystermen and owner of Hillman Shrimp and Oyster Co. near Kemah, believes state agencies in control of the oyster fishery have a troubling tendency to overreact. "The agencies put too much emphasis on human factors. You'll never see over-harvesting of oysters because you can never take out all the broodstock. Regardless of the human element, the effect is very, very minor compared to what nature does itself, as far as depletion or replenishing of the product."

Tom Hults, acting president of the Texas Oyster Association and owner of Seabrook Seafood, Inc., in Seabrook, says the Parks and Wildlife Department's contention that harvesting mature oysters damages the survivability of the species for next year's crop is wrong. Take all of the oysters larger than 3 inches out of the bay, Hults says, and there would still be plenty of oysters to produce a spat set and a crop for the following year.

"If there's a poor crop, we should go out there and try to make the best of it. But that also means obeying the law and leaving the small oysters alone." The state places a maximum number of sacks a boat can harvest, and a minimum harvest size.

Hults compares the situation to an orange grower having a poor crop. "They don't let them sit there on the tree and die. Well, the oyster is not the most important part of the system. What's important is the reef that it lives on. The reef is like a living animal. As long as the

reef is healthy and productive, and Mother Nature does her thing, and man doesn't screw it up with pollution, there will be oysters."

Dr. Sammy Ray, most recently interim president of Texas A&M University at Galveston and now coordinator of special programs, believes the commission is taking the wrong approach to solving Texas' oyster problem. More research is needed. "You shouldn't adopt a policy of shutting it down and not adopt a policy to find out what happened," he says. "I do not believe you are going to ever overfish," says Ray, who's been studying oysters for 40 years.

"It's too simplistic to say overfishing is the problem. Fishermen will stop fishing when it is no longer economically feasible, then there will still be ample broodstock, provided they don't take away the substrate."

Oyster production is tied to wet and dry cycles, Ray says, and constant production is not realistic. Instead of arguing over reasons for cancelling the oyster season, Ray says, state officials and fishery experts should be talking with each other about it to come up with the best plan. "Fishermen know when to quit," Ray says. Fuel, labor and price control whether it's practical for oystermen to continue fishing. "The department should be more flexible in letting them fish in areas where there are oysters and restricting them from where there aren't any," he says.

Some oyster fishermen contend the Texas Parks and Wildlife Department's closure of the Galveston Bay to oystering this season is simply a mistake in counting. The blame for the department's finding of a scarcity of oysters, fishermen contend, lies with the department's reef-sampling methods and with natural cycles of oyster abundance and scarcity. Ben Nelson, owner of Jeri's Seafood on Smith's Point, told the Galveston Daily News that the Department had melded into its samples some reefs long known to be dead, but before the system was changed, dead reefs were not counted in the sampling program.

Closing the bay doesn't simply affect oystermen on the boats. There is a socio-economic impact in related industries as well, including those who build the dredges, repair boats, and sell the hardware. Hillman, whose family started in the seafood business in 1919, says, "When we wake up 365 days from today, there's probably going to be half as many people left in the business. The ones that aren't laterally protected from being too dependent on

Top:
One gallon
of oysters
Middle:
Shipping
to the East coast
Bottom:
Oyster shell

one specific species of sea animal, be it oyster or shrimp or whatever, are going to be in dire straits financially."

Mel Russell, Texas Sea Grant marine advisory agent for Galveston County, says, "A lot of the old timers have gotten out. They just couldn't hack the oyster business anymore." Johnny Valentino, who owns and operates Eagle Point Marina in San Leon, says his oyster shucking and packing plant employs about 60 people. With no oysters, there'll be no shucking – and few jobs this year. "It just ripples through the industry," he said. "It doesn't affect just the fisherman."

Valentino, a third-generation oysterman, estimated that oystering in Galveston Bay alone directly employs 10,000 people in everything from harvesting and unloading to shucking and shipping. Everyone – processing facilities, retail markets, boatmen – are in the same position, adds Hults. They all look on oysters as a wintertime crop. "We're a lot like farmers," he says. "We harvest the crop, bring it through the distribution channels and it goes to the public. The only difference is we can't go out and tend our crop. If we aren't allowed to take the product, we basically starve to death."

However, Hults believes that for some reason state agencies have it in for them. "They have the idea that we're raping something that belongs to the public, and that's not it. That's not the way we feel. We're providing access to a public resource, in this case, the oysters.

"The oysters belong to the people of the state of Texas, as far as I'm concerned. They're in state waters and they're on public reefs and they belong to the people," he says.

The effect on oyster prices at restaurants and seafood markets could be substantial, because 1986 and 1987 oyster harvests in other Gulf states and Chesapeake Bay have been poor. Many Texas oyster wholesalers also buy oysters from Louisiana, which has had a sharp decline in production due to the extensive loss of coastal marshland. Restaurant owners say the price of oysters for consumers could double because of short supplies. Other

Galveston area wholesalers and restaurant owners predict only a $10 per gallon increase because of the closings. The size of the increase will depend, in part, on how much Louisiana increases its production to pick up the slack. Last year, a gallon of oysters cost about $28. Jerry Clark, director of coastal fisheries for the Parks and Wildlife Department, counters that it will probably be January before the price increases are known. Other fishermen add that they are afraid this year's closure on top of last year's closure might change the public's eating habits enough to damage the industry. In any case, most believe the closure means jobs lost, marginal oyster houses closing, and fishermen who relied on oysters in the winter putting pressure on other resources.

C.E. Bryan, fishery resource program director for the Parks and Wildlife Department, says the Texas oyster industry, which ships tons of the shellfish all over the United States, experienced record harvests in 1983, 1984 and 1985, but unusual weather forced closure of some bays last season. Some bays were closed by the state Department of Health because the oysters were contaminated by the red tide, a rust-colored microorganism that makes oysters unpleasant or even dangerous to eat. Unusually heavy rains along the coast last winter flooded the bays with freshwater, diluting the salinity and killing oysters.

Joe Surovik, Texas Sea Grant marine advisory agent for Calhoun County, says the Lavaca Bay and Matagorda Bay areas were expected to be very productive this season. "We had just about the right amount of water. We had a good oyster spat set in those areas," Surovik says. "It looked like our oysters were going to be in good shape for this coming year." The San Antonio Bay area, a major oyster harvesting bay area, was a different story. Due to huge amounts of rainfall in the Texas Hill Country earlier in the summer, the bay had near zero salinity. "The bay was fresh during our spring oyster spat set," Surovik says. "We didn't have a very good survival of spat in San Antonio Bay, if any. "All the oysters that we are looking at now on most of the reefs are dead, and it looks like it may be a couple of years before the San Antonio Bay area becomes productive," Surovik says.

Some commercial oyster harvesters have private leases in Galveston Bay that are not affected by the state agency's ban. Bryan said the extent of depletion in the private leases is not known, but in the past production from the leases has varied from 10 percent to 50 percent of the annual state harvest of more than 3 million pounds. Matlock says the department continues to have contracts for transplantation of oysters from polluted areas to fishable areas.

MARINE ADVISOR
BY RHONDA SNIDER

Sea Grant runs middle course on turtle device

Fisheries Specialist Gary Graham has spent much of his time lately on shrimp boats installing, pulling and evaluating turtle excluder devices. Funded by a grant from the Gulf and South Atlantic Fisheries Development Foundation, Graham has supervised data collection on more than 20 cruises off the Texas Gulf Coast.

Two years ago, with the proposed federal regulations making TEDs mandatory appearing more and more likely to be approved despite fishermen's objections to them, Graham and Marine Advisory Project Leader Donn Ward agreed that more information was needed on TEDs. Ward says that although the Marine Advisory Service does not advocate a position regarding TEDs, he wanted MAS to help make the transition as smooth as possible for the shrimpers.

Ward and Graham knew, before the federal regulations went into effect, that the various TED designs needed to be evaluated to determine handling efficiency, shrimp production and elimination of by-catch. The installation procedures and the potential handling problems needed to be determined as well.

"We aren't pushing TEDs," Ward says. " We don't advocate their use or non-use. But, when they do become mandatory, we're going to be there to help."

Beginning March 1, offshore Gulf shrimpers trawling up to 15 miles out, with a boat length of 25 feet or larger, will be required to have TEDs on their trawls. Shrimpers trawling in the same area with vessels less than 25 feet and all inshore trawlers will be required to either use TEDs or restrict their tows to 90 minutes or less. By March 1, 1989, the regulations will go into effect, as well, for those vessels fishing in offshore waters farther than 15 miles out.

Ward says he realizes that Graham and the rest of MAS seem to be caught in the middle of the TED controversy, with the environmentalists on one side and the fishermen on the other. "Our position has been to be the honest broker, the neutral third


NORMAN MARTIN

party," he says. "We want to identify objectively whether or not they (the TEDs) are effective, whether they exclude turtles. We try to maintain an unbiased opinion."

Graham defines his role as one of "technology transfer." Graham says, "I'm just evaluating everything that comes along and disseminating the information." He says most fishermen understand that he's objective, that he's not taking sides and that he's just trying to evaluate the TED. But he admits there are a few shrimpers that want no part of it.

Nevertheless, Graham managed to get a group of volunteers from the shrimp industry to agree to use various TEDs aboard their vessels. Production guarantees were offered to minimize financial risks of potential shrimp loss.

Graham notes that production guarantees were paid only when he was on board. He says he is indebted to the shrimpers who have remained dedicated to a long-term evaluation of TEDs. Two have fished with TEDs on their trawls for a full year, sometimes at a substantial loss in shrimp income for themselves.

Shrimp harvest and catch parameters were maintained by Graham and Marine Advisory agents. Relative comparisons were drawn by fishing with a TED-installed trawl on one side of the vessel and a standard, non-TED trawl on the other side. Graham says two results of the study have become apparent. First, different TED designs seem to be better for different fishing areas. A design that works well in one area may not be practical for another. Second, he says two designs, the "Georgia Jumper" and the "Morrison Soft TED," seem to be more readily accepted by the fishermen than other designs.

Graham plans to continue his studies at least until the second wave of regulations go into effect for offshore fishermen. Graham believes the TEDs will continue to be modified and new designs will come out after the regulations go into effect – not by researchers and developers, but by the fishermen themselves.

He says he doesn't see himself involved in the development and perfecting of these new TED designs, but he will continue to evaluate them and inform the industry of his findings. ▬

Byte into more mariculture profits with Lotus software

Thanks to work by Marine Business Management Specialist Dewayne Hollin, potential redfish mariculture investors now have an in-depth program for analyzing profitability data. The analysis program is set up on the software package LOTUS 1-2-3, the standard in spreadsheets for budgeting agriculture-related businesses.

Hollin worked with industry economist Ray Rhodes of the South Carolina Wildlife and Marine Resources Department to develop a program that provides calculations of an internal rate of return for both redfish hatcheries and growout operations. This measure of profitability is preferred by most financial institutions or investment firms for evaluating an investment.

Prior to development of this program, entrepreneurs interested in redfish farming had only a less sophisticated budgetary program developed in BASIC available. Hollin says that program gave only a "snapshot" of a business for a one-year period, while the new LOTUS program allows an investor to look at the potential profitability of a business over a period of five or ten years.

"More people looking into this kind of investment need to be more sophisticated in their analysis," Hollin says. "They need to look ahead a minimum of five years. That's what LOTUS allows you to do – to plan over a longer period of time."

Hollin says the old program is fine for people who are just beginning to investigate the possibility of getting into the busi-

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ness. However, if a person thinks a particular redfish operation has potential, and he wants more information with which to make a decision, the LOTUS program is what he needs, Hollin says.

Both programs allow a person to insert various cost and income variables to see what impact they will have on the profits of a business. The LOTUS program also gives an investor or operator an idea of when the redfish operation will began to make a profit.

"Just about everyone expects to lose money the first few years," Hollin explains, "but with LOTUS you can see how long it takes to recover your investment."

In addition to being an industry standard, Hollin says the LOTUS software was chosen for development of the program because it has great flexibility in the types and amounts of data that can be entered and garner results.

Similar business analysis programs also are available for shrimp, crawfish and catfish aquaculture operations. Hollin says with this assortment of programs available, he can assist potential investors in other mariculture operations – whether it be mudminnows, alligators or bullfrogs – in developing profitability data.

People interested in using the new program need to have a copy of LOTUS 1-2-3, version 2, software. To receive a copy of the redfish business analysis program contact Hollin or send a blank 5-inch disk to him at the address below. ▬

Marine education hub gains Palacios community support

The Palacios Independent School District, Matagorda County Navigation District 1 and Matagorda County have joined in a unique consortium to establish a marine education center for the area. Willie Younger, Matagorda County marine agent, and Dr. Bill Reaves, superintendent of Palacios schools, developed the initial proposal for a center, describing the development and utilization possibilities for a marine education facility in Palacios.

Younger says the basic concept is to develop a center where people can receive

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a better understanding of the marine environment and where young people can get an idea of marine career opportunities that are available. Information on aquaculture, seafood, coastal tourism and community development also could be offered, Younger says. With local leaders seeking a better way to educate the general public, and school children in particular, the establishment of a marine education center seemed like the logical solution when the Navigation District offered the school system a piece of property adjacent to the Port of Palacios. The school district received an additional windfall with the Navigation District's offer to supplement development of the site, as well.

Younger says the site is perfect for a marine educational facility as it is a waterfront site at a higher elevation than most land in the area. It also has a marsh area on the site, which the steering committee sees as an asset that will enhance teaching. In addition to a classroom and office complex, Younger says a series of boardwalks and nature trails could be built through the wetlands area to facilitate the study of estuarine ecology.

To ensure that a facility is created that will adequately meet the marine education needs of the Gulf Coast, Texas Sea Grant is participating on a team working with the steering committee and local community advisors, and will be visiting similar facilities throughout the country within the next month. Based on what they see and their prior experience with similar facilities, the team will compile its recommendations into a feasibility report, which the steering committee will use as a guideline in constructing the center. The feasibility report should be ready early next year. ▬

Support spreading for oil spill emergency planning

A 1984 oil spill near Galveston caused concern in Brazoria County, not because officials were worried about any effects from the spill, but because they realized how "sorely prepared they were to make any adequate response to an oil spill," according to County Marine Agent Charles Moss. Recognizing the need for a planned response, Moss organized an oil spill conference and drill. He arranged for state agencies and city and county officials to attend the conference so that each group represented could better understand what the role of the others would be in an oil spill crisis.

Boeing Petroleum Services coordinated an oil spill drill in conjunction with the conference. Company representatives conducted two "spills," one in the open water and one in the marsh. Instead of dumping oil overboard, however, popcorn was dumped into the water to simulate the spreading of oil. The petroleum company then demonstrated the cleanup methods for such a spill.

Moss says the meeting participants realized what must be done – a plan needed to be developed, outlining the countywide response and each individual's responsibilities. Moss and his Marine Advisory Committee chairman Sharron Stewart were put in charge of the development of the much-needed contingency plan for oil spills.

To get more background in emergency management, Moss attended four emergency management training courses. He learned the four steps to lessening the effects of any emergency:

(1) mitigation – lessening the likelihood or effects of an emergency before it happens,

(2) preparation – getting residents and emergency response participants ready before the impacts of the emergency hit them,

(3) response – reacting in the proper way to the emergency situation, and

(4) recovery – doing what must be done to return to normal. ▬

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$355 million dredging project to enlarge the Houston Ship Channel across Galveston Bay to 50 feet deep and 600 feet wide. The channel is now 40 by 400 feet. Corps studies show the project will provide an economic benefit of $97 million a year after annual costs. The project would not begin for four or five years and would take eight years to complete.

But environmentalists say many of the best oyster reefs in the center of the bay will be covered with three- to four-feet-thick mounds of mud from the dredging.

The Corps plans to dump 69 million cubic yards of mud, clay and silt dredged from the ship channel into the bay. It maintains that all disposal sites will be at least 2000 feet from any oyster reef. The U.S. Fish and Wildlife Service estimates that navigation projects have already eliminated or disrupted 18,494 acres, or about 29 square miles of the 600-square-mile bay.

An estimated 97 percent of the Gulf of Mexico fishery is estuarine dependent. Many species of marine fish move inland and spawn in the estuaries. Others spawn in the Gulf, but use the estuaries as nursery grounds in some stage of their life cycle.

The Corps' draft environmental impact statement puts the average yearly loss at 8 percent of Galveston Bay's oyster fishery. Commercial production of fish, shrimp and oysters from the bay is about $65 million annually. The bay supplies about 40 percent of the state's commercial fishing hauls and nearly 80 percent of the oysters consumed in Texas.

The Corps acknowledges there will be increased inflow of saltier water, but denies allegations that its project will have a major permanent impact.

Few oyster producers believe the Corps' prediction of little damage to the bay. "From my experience, when the Corps does a study like that, they low-ball the figures," says Tom Hults, acting president of the Texas Oyster Association and owner of Seabrook Seafood, Inc.

Hults' own forecast calls for more than half of bay's production to be "wiped out" if the project goes forward in its present design. "How that (project) can even be considered with those kind of numbers I honestly don't understand," he says.

The battle to stop, or at least slow down, the Corps has not met with a great deal of success. "We have consistently and very early opposed the major dredging activity proposed by the Corps of Engineers for Galveston Bay, partly on the basis of its impact on the oyster fishery in Galveston," says Gary Matlock, division director for fisheries for the Parks and Wildlife Department.

Matlock says that the area given the least attention by the Corps has been the cumulative effects of Galveston Bay dredging and several other projects would have on oysters, both directly and indirectly. "By that I mean siltation being placed upon oyster reefs and subsequent increases in the salinity distributions within the system," he says.

"The best chance of success in minimizing the impacts on the oyster industry is to stop or to greatly modify the proposals now," Matlock says. "Certainly whenever there are changes made to just about any bay system, there are ways to address those changes so that the impacts are lessened in some fashion."

William Wooley, chief of the planning division for the Galveston District Corps of Engineers, admits, "It's a highly emotional issue whenever you take away a man's livelihood. When you deal with a man's pocketbook, he's going to get excited."

But, Wooley emphasizes, the questions concerning environmental issues will still be addressed at length by Corps reviewers. "There's a lot of technical people above me that are going to hammer hard on this project," he says.

"Even if everything ran smoothly, we're still talking probably four to five years before we would be in a construction mode. And again, it depends on the Congress coming up with the funds to start construction."

The Corps estimates the average annual loss to the Galveston Bay system's sport and commercial fishery at $1.4 million per year when amortized for 50 years at 8-5/8 percent interest. According to the Corps that is about 2.1 percent of the total annual valueof the fishery.

And to mitigate the damage the Corps plans to build 407 acres of new oyster reefs, at a cost of $40,000 per acre.

Oyster shell provides a highly valuable habitat for a wide variety of marine animals that find food and cover in the shell structure. These organisms, in turn, provide food for larger fish of interest to sportsmen.

The Corps says the U.S. Fish and Wildlife Service, in consultation with the Texas Parks and Wildlife Department, has recommended that reef development be conducted in an area of existing scattered small reefs in upper Galveston and lower Trinity bays, and one small area near Smith Point in central Galveston Bay.

According to Corps' studies, commercial oystering should begin about two years after the reefs are built, and could be producing oysters before any potential dredging effects are felt. The end result, the Corps says, could be no reduction in oyster production, or, in the worst case, the loss of perhaps 9 percent per year. The time frame is disputed by oyster producers, as well as many state and environmental organization biologists.

"Production of an oyster bed is a variable thing, depending on a lot of factors," Wooley says. He attributes the differences in oyster damage rates to interpretation in the frequency of annual freshwater inflow.

Asked if the project was still a good idea, Wooley says, "If I weren't happy, I'd be looking to make a different recommendation. Whenever you're dealing with oysters, everybody's got an opinion. It's not as precise as measuring the size of a reinforcing steel bar in a concrete monolith."

Meanwhile, there is the Wallisville Reservoir near Houston, another controversial Corps project that opponents say will hurt the bay. The reservoir's main backer is the city of Houston, which says the water is required for future growth and to halt subsidence by reducing the need to pump groundwater.

Critics say the reservoir will seriously increase the salinity in Galveston Bay and that the city has exaggerated claims of how much water it will provide.

Wooley says Wallisville's environmental problems have been corrected and the courts have cleared the project. "We have plans and specs for the next increment of construction on the shelf waiting. Really, congressional funding is the only thing that keeps Wallisville from being reactivated and construction reinstated," Wooley says.

The state once again believes the Corps should re-examine the stalled project in a comprehensive environmental impact study of the possible combined impact on Galveston Bay of Wallisville, the ship channel plan and other work on bay tributaries.

The Fish and Wildlife Service has expressed concern that major impacts to the oyster fishery would occur from the predicted salinity changes.

But the Corps of Engineers maintains that materials discharged into the bay will not cause any violation of EPA water quality criteria, and that deepening the channel will have no significant effect on the salinity regime of Galveston Bay.

– Facts by Norman Martin

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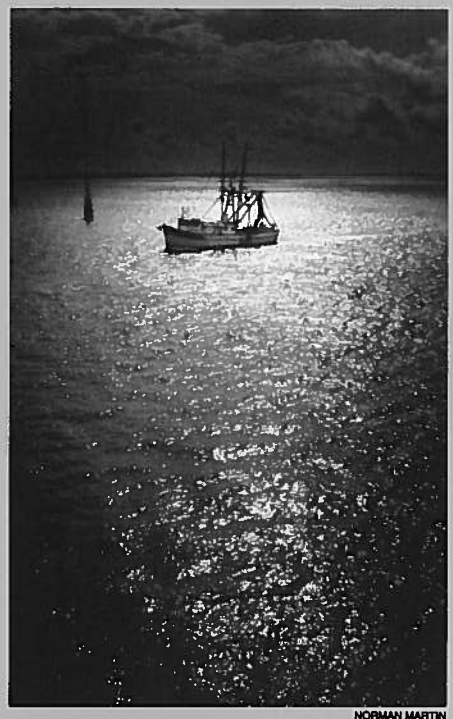

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