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The University of Texas Marine Science Institute: “Granddaddy” of Texas Marine Laboratories

JAIME HABERER, MIYUKI E. DEHART, AND LEE A. FUIMAN

Established in 1941 by the Texas legislature, The University of Texas Marine Science Institute in Port Aransas is the oldest marine research laboratory in Texas. The Institute is located at the north end of Mustang Island, part of the chain of barrier islands that make up the Texas coast. One of the first organized research units created by The University of Texas at Austin, the Marine Science Institute was founded to conduct basic and applied research aimed at understanding the biological, chemical, and physical processes governing the coastal zone ecosystem. Throughout the Institute’s history, research conducted by a staff of resident scientists has been the cornerstone of its activities. These researchers have made fundamental contributions to our understanding of the marine world.

The Institute has focused on graduate education almost since its inception. Its first Ph.D. student was Henry Hildebrand, who received his degree in zoology in 1954 under the supervision of Gordon Gunter. In 1990, a formal graduate program in marine science was introduced, offering both master’s and doctoral degrees. Over the years, our mission has expanded to include a summer program for undergraduate students, emphasizing explorations of the local coastal ecosystem—the bays, marshes, beaches, and offshore environments. The mission expanded further in the 1970s to include informal education and teacher training. These public outreach activities serve a wide range of audiences: busloads of schoolchildren, visiting classes from colleges throughout the country, families on vacation, schoolteachers looking to improve their classroom skills, and active seniors hoping to broaden their knowledge of the coastal environment.

Through the decades, the Marine Science Institute has grown physically and scientifically under the leadership of many outstanding directors (Table 1), many of whom also made substantial scholarly contributions to marine science. The limited space we have here will not allow us to provide a complete history of the Institute. Rather, we give an overview of the Institute’s past and highlight some of the contributions that helped establish this institu-

tion’s reputation and that influenced the scientific community.

HISTORY OF THE MARINE SCIENCE INSTITUTE

In 1892, The University of Texas Board of Regents saw a need for the state to establish a marine facility on the coast of Texas. They took their request to Texas Governor Jim Hogg and reported that

The coast of the great State of Texas, washed by the tides and currents of the magnificent inland sea, the Gulf of Mexico, offers unrivaled opportunity for the establishment of a Marine Station. Strange animals and plants, a fauna and flora little known, invite the research of the student and investigator. (Amos and Amos, 1987)

Eight years later, in May of 1900, The University of Texas Board of Regents approved \$300 for the establishment of a marine laboratory at Galveston, and the new laboratory welcomed its first class of five students, who immediately began their studies of littoral and shallow water fauna. Unfortunately, only a few months later, the hurricane of 1900 struck, devastating Galveston and leaving the marine laboratory’s steam launch research vessel as the lonely remnant of the new laboratory.

Fifteen years later, another attempt was made by The University of Texas to establish a marine laboratory at Galveston. To get the ball rolling, Regent George W. Brackenridge donated his own 114-foot yacht *Navidad*, along with \$500 to convert her into a research vessel. This vessel would serve as the control center for the Gulf Biological Station, but once again, a tropical storm blew through, damaging the vessel beyond repair before it had gone into service.

In 1935, Dr. Elmer J. Lund, a professor in The University of Texas Department of Zoology, traveled to the coast to investigate a major fish kill in Port Aransas, TX (later determined to have been caused by a red tide). Along with Dr. A. H. Wiebe, Lund constructed a small, rough-lumber shack on the Corps of Engineers dock at Port Aransas, which, by 1941, became the first marine laboratory in Texas and the site of today’s Marine Science Institute.

TABLE 1. The University of Texas Marine Science Institute Directors, Past and Present.

Dates of service	Director	Acting Director
1941-49	E. J. Lund	
1949-54		Gordon Gunter
1954-55	Gordon Gunter	
1955-56		Henry Hildebrand
1956-63	Howard T. Odum	
1963-65		Patrick L. Parker
1965-70	Donald E. Wohlschlag	
1970-71		Patrick L. Parker
1971-72	Carl H. Oppenheimer	
1973-74		Neal E. Armstrong
1974-76	Patrick L. Parker	
1975-78	Creighton Burk ^a	
1977-78	Oswald A. Roels	
1978		Peter Flawn ^a
1978-79		R. Keith Arnold ^a
1979-82	J. Robert Moore ^a	
1982-84		Robert Boyer ^a Gerhard Fonken ^a Richard Starr ^a
1984-93	Robert S. Jones	
1993-96		Terry E. Whitledge
1996-2004	Wayne S. Gardner	
2004-present	Lee A. Fuiman	

^a Located in Austin—supervised facilities at Port Aransas and Galveston during their tenure.

Dr. Lund quickly recognized that this environment was unique, and he felt it important to educate the public on this natural resource. Through his efforts, The University of Texas established a marine facility on a 10-acre tract of land donated by Port Aransas Mayor Boone Walker. The Institute for Marine Science, as it was named then, was formally founded in 1941, with Dr. Lund as its first director. He and his student Gordon Gunter began their research, focusing on the distribution, life history, and relative abundance of marine fishes of Texas.

Little changed at the Institute during World War II, but soon afterward Lund purchased 12 acres of land and donated the tract to the lab. An old Army Corps of Engineers building, constructed in 1890, was also added to the Institute. This building, still in use today, serves as a dormitory for our summer students and visiting marine education groups and is the oldest building on Mustang Island.

By 1946, Texas had its first permanent marine research station and a small resident research staff. Soon two laboratory buildings were constructed, one on shore and the other on a pier that extended over Aransas Pass, the narrow



Fig. 1. The Institute for Marine Science in the 1950s.

channel between Mustang and San Jose Islands. Housing for the resident scientists was also built (Fig. 1).

During his tenure as director, Lund also established a scientific journal, *Publications of the Institute of Marine Science* (now *Contributions in Marine Science*), and he edited its first volume. He collected books on marine science, which became the basis for our Institute's library. In 1961, Director Howard T. Odum oversaw construction of the Institute's first formal laboratory complex, boat docks, and a set of outdoor seawater ponds (Fig. 2).

Over the next several years, the Institute expanded when Director Donald E. "Curly" Wohlschlag acquired 49 acres of beachfront property from the county and federal governments. Dr. Wohlschlag's leadership also set into motion plans for the next major expansion of the Marine Science Institute, which took place in the early 1970s. These new facilities, constructed under Director Carl H. Oppenheimer, included a major laboratory building, a dormitory, apartment, maintenance complex, and a 5.25-acre boat basin (Fig. 3). The Institute was set for a quantum leap in both the depth and the scope of its activities.

Although several hurricanes, including Carla, Beulah, Celia, and Allen, came ashore near Port Aransas, the Institute always survived. Hurricane Celia, on 3 Aug. 1970, was the most destructive, and she left the Institute's vessel *R/V Marcia K.* damaged beyond repair. Dr. Patrick L. Parker, along with Dr. E. William Behrens, acquired the 85-foot *R/V Longhorn* in 1971. This vessel, which was re-powered, rebuilt, and lengthened to 105 feet in 1986, served the Institute and the national fleet of research vessels for 35 years until she was retired in 2006. Dr. Behrens introduced



Fig. 2. The Institute campus in the 1960s.

many students to the marine science seafaring experience aboard *R/V Longhorn* (Fig. 4).

Public education and outreach became firmly established in the Institute's mission in 1974 when Dr. Parker created our Marine Education Services program and hired Richard K. Tinnin to build and direct it. He developed innovative shoreside and shipboard educational programs in marine science, designed for visiting classes and casual visitors. Over time, our outreach efforts expanded to include teacher workshops, public lecture series, and formal programs matched to a variety of specific audiences.

In 1975, the facilities became known as the Port Aransas Marine Laboratory, and together with the newly formed Galveston Geophysical Laboratory, they comprised The University of Texas Marine Science Institute. The Institute was affiliated with the Department of Marine Studies located on the main campus of the University in Austin.

By 1983, another expansion of facilities took place. A visitor's center, complete with auditorium and seven seawater aquaria, was added to the facilities, with space dedicated for the Institute's research library (Fig. 5). At about the same time, Anthony F. Amos, one of the Institute's researchers, began to care for injured sea turtles and



Fig. 4. The Marine Science Institute's *R/V Longhorn*.

marine birds, and facilities were constructed to support these activities. The Animal Rehabilitation Keep (ARK), as it is now known, operates through the combined support of the Institute, grants, donations, and volunteers.

In 1984, The University of Texas Institute for Geophysics in Austin took the Galveston Geophysical Laboratory under its wing, leaving the Port Aransas facility as the only seaside location for the University's marine science work. The name of the Port Aransas facility then became The University of Texas Marine Science Institute (Fig. 6).

A few years later, the Institute welcomed the addition of a new fisheries and mariculture facility. This facility had been constructed in 1972 as a National Marine Fisheries Service Laboratory. The building and 10 acres of land on the ship channel were transferred to the Institute in 1987. This nearby satellite campus, located just 2 km from the main facility, became the Institute's Fisheries and Mariculture Laboratory. Dr. Connie R. Arnold, Associate Director



Fig. 3. Expansion of the Institute in the 1970s.



Fig. 5. The Institute in 1983. New additions of the visitor's center, library, and auditorium appear on the right side of the photo.



Fig. 6. Aerial view of the Marine Science Institute in 2010.

for Mariculture, developed this facility into a center for research on captive spawning and larval rearing of marine fishes and crustaceans.

The role of graduate education at the Institute continued to grow as the facilities expanded. Director Robert S. Jones and former director Patrick L. Parker developed a graduate degree program that would train graduate students at the Institute through the Department of Marine Science, rather than through other departments of The University of Texas at Austin. In preparation for this new program, seven new researchers were hired in the late 1980s, with an eye toward appointing them as faculty. The new graduate program admitted its first marine science graduate students in 1990. Fittingly, Dr. Jones served as department chairman, and Dr. Parker was the graduate adviser and chairman of the graduate studies committee.

Director Wayne S. Gardner joined the Institute in 1996 and brought with him administrative and research experience from years of service at the Great Lakes Environmental Research Laboratory. He was the first to hold the Institute's first endowed chair, and during his tenure, two additional endowed chairs were created. He also recruited six new faculty members over a period of 8 years. This was made possible through the forging of a stronger connection between the Institute and the university's campus in Austin, almost 250 miles away. Faculty began teaching fall and spring semester classes to undergraduate students in Austin using newly installed teleconferencing technology.

In 1999, using privately donated funds, a new building was built to house rehabilitating sea turtles. This represented a major expansion of the Institute's ARK. After many years of planning by the Director of the Institute's Marine Education Services program, Dr. Rick Tinnin, groundbreaking for a 3.5-acre artificial marsh took place

in 2006. This Wetlands Education Center, located on the Institute's grounds, serves as a focal point for formal and informal education programs related to the importance of wetlands to nature and man. Also in 2006, the Mission–Aransas National Estuarine Research Reserve was established by the National Oceanic and Atmospheric Administration (NOAA). The reserve, managed by The University of Texas Marine Science Institute, includes 185,708 acres of marshes, mangroves, open water, and coastal prairie just north of Port Aransas. The reserve provides for long-term research and monitoring, as well as education and stewardship programs (Fig. 7).

The close working relationships with local sportfishing groups, developed by the Institute's fish biologists over many years, provided research funding for small projects of mutual interest. Between 2003 and 2006, two of these organizations made separate contributions totaling almost \$1 million for the construction of new laboratory buildings at the Institute's Fisheries and Mariculture Laboratory. The Saltwater-Fisheries Enhancement Association's (SEA) donation funded the 6,000–square foot “SEA lab,” which opened in 2005. Two years later, a gift from the Coastal Conservation Association (CCA)–Texas funded construction of the CCA Texas Laboratory for Marine Larviculture.

Soon after becoming Director in 2004, Dr. Lee A. Fuiman created our successful *Science and the Sea*TM initiative, a program that expanded the Institute's public education about marine science. *Science and the Sea* began in 2005 as a monthly column in a fishing magazine with a circulation of more than 25,000. By 2006, the initiative had expanded to include a website (www.ScienceAndTheSea.org), a radio program and computer-based direct feeds of audio (podcasts), and visual materials (Real Simple Syndication feeds). As of 2011, the *Science and the Sea* radio program airs on 183 radio stations in 39 states and 52 countries. The Institute has also continued to expand its facilities with construction of a 36,000–square foot Estuarine Research Center and an oiled wildlife facility on the campus and a public outreach facility, known as the Bay Education Center, in nearby Rockport, TX.

The accomplishments of the Institute and its important role in marine science research, education, and outreach were officially recognized by the State of Texas in 2006. Through two separate resolutions, the Texas House of Representatives and the Texas Senate honored the Institute for its accomplishments over the previous 60 yr.

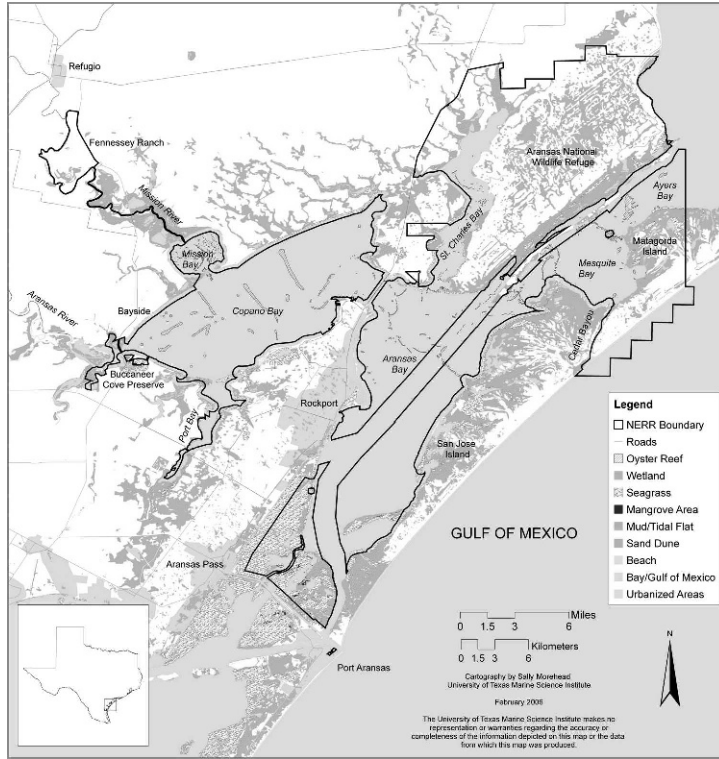


Fig. 7. Map of the Mission–Aransas National Estuarine Research Reserve.

THE MARINE SCIENCE INSTITUTE'S
 CONTRIBUTIONS TO SCIENCE

Since its inception, research has been the cornerstone of the Institute's activities. Although it is not possible to present all of our Marine Science Institute researchers' many notable scientific accomplishments, following are profiles of some of the people who have been of particular importance to the Institute's development.

Elmer J. Lund (1941–50).—The Institute's founder, Dr. Lund, was a prominent physiologist and experimentalist (Fig. 8). His main interests were intracellular respiration and oxidation and bioelectric fields. He developed the oxidation-reduction theory on the origin of electric polarity in cells. He was one of the founders and editors of *Biological Abstracts*, and he was named among the first 1,000 scientists in North America by *American Men of Science*. In 1932, he became the sixth honorary professor elected at The University of Texas. His former student and successor in the directorship of the Institute, Dr. Gordon Gunter, wrote,

The intense concentration of the man and his scintillating dedication to the field of general physiology are impossible to describe, but the memory of these things will remain with his students to the end of their lives. (Gunter and Marsh, 1970)

To honor him, The University of Texas Board of Regents established the E. J. Lund Founder's Fund in 1979. Income from this Marine Science Institute endowment provides fellowships in marine science for graduate students of exceptional merit.

Gordon P. Gunter (1945–55).—Dr. Gunter, the Institute's second director, built a reputation as an expert in fisheries and conservation in the Gulf of Mexico (Fig. 9). Gunter contributed the first article, "Studies on marine fishes of Texas," to the Institute's inaugural issue of *Publications of the Institute of Marine Science* (published in 1945). After leaving the Marine Science Institute, Gunter became Director of the Gulf Coast Research Laboratory in Ocean Springs, MS, which flourished under his leadership for 17 years. His most notable recognition occurred



Fig. 8. Dr. Elmer J. Lund.

on 28 August 1998, when the NOAA's ship *Relentless* was recommissioned as the *Gordon Gunter*.

Howard T. Odum (1958–63).—Dr. Odum was a preeminent researcher and teacher of ecology and zoology (Fig. 10). His work had a profound influence on marine science and matters beyond science. He brought a new, comprehensive way of thinking to the field of ecology by using marine examples. While at the Marine Science Institute, Odum's focus was on large ecosystems



Fig. 9. Dr. Gordon P. Gunter.



Fig. 10. Dr. Howard T. Odum.

in the Gulf of Mexico. He studied bay and reef metabolism and relationships among light intensity, productivity, and chlorophyll concentrations. Odum developed the use of the "microcosm" as a means of understanding and conducting research on complex ecological systems (Hall, 1995). He also developed concepts for using natural systems for wastewater treatment.

Odum's work on the Texas coast is considered to comprise some of the most important contributions to ecosystem-based research. His scientific career culminated in his idea of the "Principle of Maximum Power," which he applied broadly to ecological systems and even to human economics (Hall, 1995).

Odum is recognized in the scientific community for determining organism–environment interactions and for broadening our view to a scale at which society plays a role, thereby integrating ecology and economics. He has been called a "Father of Modern Ecology" (Spivey, 2002). He and his brother, Dr. Eugene P. Odum, were awarded the Prize of the Institut de la Vie in Paris in 1976 and the Crafoord Prize in 1987 for their many decades of environmental research.

Patrick L. Parker (1959–94).—Dr. Parker founded the Institute's marine chemistry program (Fig. 11). He developed an internationally respected research program on stable isotopes and organic geochemistry, which was included in a review of the greatest achievements in chemical oceanography in the last 50 years (Farrington, 2000). Parker and his students demonstrated how stable isotopes of carbon and nitrogen could be used to decipher food-web structure and biogeochemical cycling in the Gulf of Mexico and particularly in the seagrass communities of the coastal bay systems. Parker was awarded the Alfred E. Treibs Award by The Geochemical Society in 1996 in honor of his accomplished career in organic geochemistry. Four years later, Dr. John Hedges, one of Parker's students, won the same award.



Fig. 11. Dr. Patrick L. Parker.

Chase Van Baalen (1961–86).—Dr. Van Baalen built an internationally recognized laboratory for algal physiology during his 25 years at the Marine Science Institute (Fig. 12). His early studies focused on the nutritional requirements of cyanobacteria, which led to discoveries in quantitative surface plating, lipid composition, mutant production, ultraviolet killing and photoreactivation, nitrogen fixation, trace metal nutrition, and the *Trichodesmium* survival problem. He was the first to isolate the cyanobacterium *Synechococcus* sp. His colleagues at The University of Texas recall

He was a tireless and constant champion of the academic function of the Marine Science Institute. To say that Professor Van Baalen was an excellent scientist and teacher does not do justice to his unique contributions to science and the University. For him teaching and research were synonymous. (Parker et al., 1986)

Donald E. "Curly" Wohlschlag (1965–88).—Dr. Wohlschlag arrived at the Institute already a well-established scientist from Stanford University; he played a major role in establishing the Antarctic Biology Program at McMurdo Station, Antarctica, for the National Science Foundation (Fig. 13). In fact, the U.S. Board on Geographic Names named Wohlschlag Bay, at the northern end of Ross Island, where McMurdo Station is located, in his honor. Wohlschlag's research at the Marine Science Institute focused on physio-

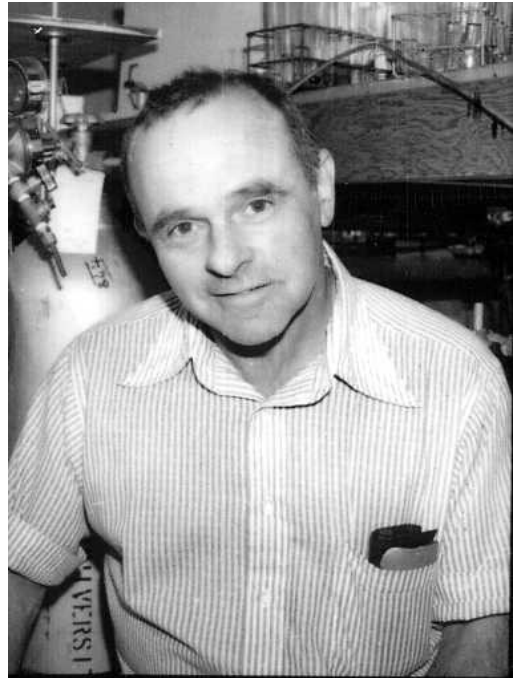


Fig. 12. Dr. Chase Van Baalen.

logical ecology, specifically the energetics of marine animals. In honor of his accomplishments in fisheries research, he received the Oscar E. Sette Outstanding Marine Fishery Biologist Award from the American Fisheries Society.

Joseph A. Colin Nicol (1967–80).—Dr. Nicol held faculty appointments at The University of Texas at Austin in both the Marine Science and Zoology Departments (Fig. 14). His research at the Marine Science Institute focused on the vision and eye structure of birds, fishes, and invertebrates. He also studied the ecological effects of oil pollution. Nicol developed many new techniques for measuring bioluminescence, visual pigment function, and fish skin reflectance. He authored more than 100 research papers and many books, including the well-known textbook *The Biology of Marine Animals*. A British citizen, he was elected Fellow of the Royal Society for his outstanding scientific career.

Carl H. Oppenheimer (1957–92).—Dr. Oppenheimer, trained as a microbiologist, is regarded as one of the world's founding fathers of modern bioremediation technology (Fig. 15). He supervised the first open-water testing of bioremediation in the United States, using naturally occurring communities of aerobic and micro-aerophilic microbes to break down hydrocar-



Fig. 13. Dr. Donald E. Wohlschlag.

bons. Dr. Oppenheimer continued to develop this technology to successful commercialization.

Connie R. Arnold (1977–2002).—Among the Institute’s important and enduring contributions is Dr. Arnold’s success in developing techniques for captive spawning of spotted seatrout and red drum (Fig. 16). The protocols he developed were implemented by the Texas Parks and



Fig. 15. Dr. Carl H. Oppenheimer.

Wildlife Department’s stock-enhancement program as part of their very successful effort to manage red drum populations on the Texas coast. Many other state agencies and private businesses throughout the world are applying these techniques to a great variety of marine fish species. Dr. Arnold published over 100 scientific papers and mentored some of today’s leaders in fisheries and aquaculture. He received the Outstanding Fisheries Worker of the Year Award

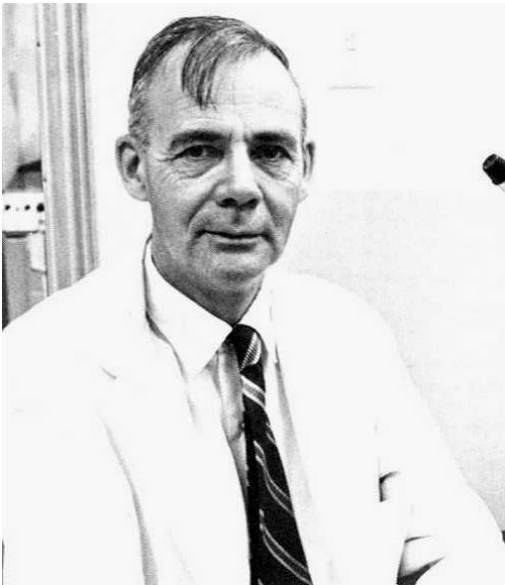


Fig. 14. Dr. Joseph A. Colin Nicol.



Fig. 16. Dr. Connie R. Arnold.



Fig. 17. Dr. Terry E. Whitledge. Courtesy of Carin Bailey, UAF/SFOS.

from the Texas Chapter of the American Fisheries Society and the Lifetime Achievement Award from the Texas Aquaculture Association.

Terry E. Whitledge (1986–2002).—Before arriving at the Institute, Dr. Whitledge had already established his expertise in nutrient dynamics of plankton populations, eutrophication, hypoxia, and harmful algal blooms (Fig. 17). This prepared him well for an unexpected 7-yr-long “brown tide” event in nearby Laguna Madre, which severely affected local seagrasses, plankton, and benthic organisms. Dr. Whitledge also served as chief scientist aboard the Institute’s R/V *Longhorn* during the Nutrient Enhanced Coastal Ocean Productivity study of the effects of high-nutrient riverine input from the Mississippi River into the Gulf of Mexico. Through this project, he and his colleagues determined that anthropogenic nutrient loading increased phytoplankton growth and bacterial degradation, which, in turn, created the hypoxic zones over the Louisiana and Texas continental shelf now known as the Gulf of Mexico “dead zone.” After deciphering nutrient dynamics in this system, Whitledge was able to recommend management strategies to reduce environmental impacts on Gulf and Texas fisheries. He also studied restoration of wetland communities in South Texas estuaries, lower trophic-level processes in the Bering Sea, and organic carbon in the Arctic Ocean.

PRESENT RESEARCH AT THE INSTITUTE

Today’s researchers at the Institute are generally organized into three overlapping areas: ecosystem dynamics, fish biology and fisheries, and biogeochemistry. Their research extends from the Texas coast to many parts of the world.

The shallow coastal lagoon systems that characterize the Texas coast have been a major focus of the ecosystem dynamics group at the Marine Science Institute. Zooplankton ecologist Dr. Edward J. Buskey documented the probable cause and impacts of the Texas brown tide algal bloom that occurred in the Laguna Madre ecosystem during the 1990s, the longest harmful algal bloom on record. Phytoplankton ecologist Dr. Tracy A. Villareal conducted the first comprehensive survey of the Texas coast for red tide organisms before, during, and after a red tide bloom. He continues to research harmful algal blooms as well as the effects of the toxic dinoflagellate that causes ciguatera poisoning. During his 22-yr tenure at the Institute, benthic ecologist Dr. Paul Montagna demonstrated the importance of freshwater inflow for maintaining estuarine productivity and advised policy-makers on minimum flows for coastal ecosystem health. Large expanses of seagrasses characterize Texas’ estuaries, and Dr. Kenneth H. Dunton established the light and nutrient requirements of these seagrasses to help protect these habitats from human impacts. He also continues three decades of research on the north slope of Alaska to assess the impacts of ozone depletion and enhanced ultraviolet radiation on arctic and subarctic kelp beds as indicators of the earth’s changing climate. Dr. Dunton has also led two “GK-12” projects that promoted the professional development of K-12 teachers and Institute graduate students, resulting in improved comprehension of science by participating school children. Mr. Anthony F. Amos has spent nearly 30 years documenting the state of the Gulf beach of Mustang Island by conducting an intensive survey of birds, sea turtles, people, and debris along an 8-km transect of beach. His survey data have been used to help create the Adopt-A-Beach program in Texas and as one of the models for the National Marine Debris Monitoring Program. Now, with more than 30 years of surveys, the data have revealed astonishing declines in the abundances of many species of birds associated with an increasing human presence and significant changes in the timing of bird migrations associated with long-term changes in climate.

The Institute’s excellent facilities for experimental work on captive animals, the ongoing

mariculture program, and its close proximity to nursery areas have fostered the work of the Institute's fish biologists. Dr. Peter Thomas has established a renowned reproductive physiology laboratory that uses fishes as models with which to study the fundamental processes that occur in many classes of animals. Among his many noteworthy accomplishments is the discovery of a novel family of membrane hormone receptors that is present in both fishes and mammals (including humans). This discovery yielded critical new insight into fish physiology, but it is also important to human disorders, including premature birth, infertility, and cancer. His research team developed a comprehensive marine fish model for studying how brain neurotransmitters control reproduction in fishes and other vertebrates. Dr. Thomas' research also includes endocrine disruption caused by pollutants and the effects of hypoxia in the Gulf of Mexico on the reproductive status of fish populations.

Three Institute researchers, Dr. G. Joan Holt, Scott Holt, and Dr. Lee Fuiman, established a strong program of research on larval fish ecology, physiology, and behavior. Joan Holt's research, which focuses on mariculture and larval fish studies, has defined the biological needs of red drum and spotted seatrout larvae—information that is essential to larval fish culture and, ultimately, stock-enhancement and aquaculture programs. She has also developed rearing methods for larvae of many important game fishes. Scott Holt identified seagrass meadows as essential habitat for many species of larval fishes in South Texas estuaries, and, through a long-term ichthyoplankton sampling program, he developed a fundamental understanding of the recruitment dynamics of many local fish species that use estuarine nursery habitats. Lee Fuiman's research examined the relationships between ontogeny and ecology in larval fishes and their role in recruitment, with special emphasis on predator–prey interactions. His work in behavioral ecology has extended to much larger animals; he and colleagues at two other universities have attached video cameras and data recorders to marine mammals (primarily Weddell seals) to gain new insights into the energetics and foraging behaviors of large marine mammals.

The biogeochemistry group at the Marine Science Institute continues to focus on issues of local and global importance. Their research has taken them across the globe and from the coast of Texas and the Gulf of Mexico to the bottom of the oceans. Dr. Henrietta N. Edmonds, using her expertise in tracer geochemistry, was among the scientists who discovered the first hydrothermal

vent system in the Arctic Ocean. Gakkel Ridge extends 1,770 km from north of Greenland to Siberia; it is a slow-spreading ridge in a region where this type of ridge was thought not to exist. Dr. Wayne S. Gardner's research focuses on nitrogen dynamics in the water and sediments of Texas estuaries and other coastal and lake ecosystems. He developed unique methods with which to study nitrogen transformations at the sediment–water interface of shallow dynamic environments by measuring changes in the composition of seawater as it passes over intact sediment cores. Gardner and his team discovered that dissimilatory nitrate reduction to ammonium is a significant mechanism for keeping bioavailable nitrogen in hypersaline marine environments. This discovery provided an explanation for why bioavailable nitrogen is replete in Florida Bay, and it may help explain the persistence of the 7-yr brown tide event that occurred in Laguna Madre in the 1990s.

THE MARINE SCIENCE INSTITUTE'S FUTURE

Opportunities for marine research inspired the creation of the Marine Science Institute when Dr. Lund visited Port Aransas to study the massive fish kill of 1935, and research is at the core of our other central activities: education and public outreach. The education focus developed early, providing undergraduate and graduate students opportunities to work at the side of prominent researchers in the laboratory and in a variety of pristine coastal habitats. By extending our marine education efforts to the public through significant outreach activities, we have broadened the Institute's scope and impact even more. The Institute has grown considerably over the past 70 years, from a staff of two researchers in the late 1940s to today's complement of nearly 150 faculty, postdoctoral associates, graduate students, technicians, and support staff.

The Marine Science Institute continues to grow. Eight new faculty members have joined the Institute over the past 7 years and are establishing productive research programs of their own. A new Estuarine Research Center currently under construction (Fig. 18) will expand our research capacity. The Mission–Aransas National Estuarine Research Reserve, established 5 years ago, significantly augments the Institute's research, education, and outreach activities and adds a new dimension—public service—to our portfolio. Our Wetlands Education Center enables us to enlighten thousands more people per year about coastal ecology. The reach of our public education efforts extends globally via our *Science*



Fig. 18. Expansion of the Institute in 2011. The Estuarine Research Center under construction.

and the Sea initiative. These efforts, together with strong continuing support from the State of Texas and The University of Texas at Austin, herald continued success for the granddaddy of Texas Marine Laboratories: The University of Texas Marine Science Institute.

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