

# Marine Science Institute

THE UNIVERSITY OF TEXAS AT AUSTIN



**75 years**  
**of landmark**  
**discoveries**  
**in marine**  
**science**



## **Discovery Starts Here.**

From tropical seas to polar oceans, our faculty and students expand our understanding of marine ecosystem structure and function, fisheries biology and biogeochemical cycles to promote natural resource conservation and improve societal well-being.

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### STUDENTS

Enrollment (2021/2022)  
58 Graduate  
451 Undergraduate majors

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### SENIOR SCIENTIFIC STAFF

16 Faculty  
8 Research Associates  
10 Postdoctoral Fellows  
1 President of National Association of Marine Laboratories  
1 Ramón Margalef Award for Excellence in Education  
1 Sloan Fellow  
1 National Academies of Sciences Gulf Research Program Fellow  
1 William R. and Lenore Mote Eminent Scholar Chair in Fisheries Ecology and Enhancement  
1 Lifetime contribution awardee from North American Society of Comparative Endocrinology  
1 Early Career Investigator in Marine Microbial Ecology and Evolution Award

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### RESEARCH

Red tide / Oil spills / Drug Development  
Biodiversity / Land-ocean linkages  
Larval fish ecology / Climate trends / Hypoxia and dead zones / Fish migration  
Captive spawning / Ciguatera / Ocean acidification / Nitrogen fixation

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### OUTREACH POST PANDEMIC

School children / Teachers / Retirees / Families / Elected officials / Public

# 2:1

**awarded funds were 2 times**  
**greater than the biennial**  
**non-formula support**

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### HIGHLIGHTS

- First marine laboratory on the Texas Coast, established in 1941.
- First to spawn redfish, flounder, croaker and cobia in captivity.
- Manages the Mission-Aransas National Estuarine Research Reserve, which at 186,189 acres, is the third largest estuarine reserve in the nation and the only one in Texas.
- Operates the Beaufort Sea Lagoons Long Term Ecological Research program that focuses on understanding long-term changes in Arctic ecosystems.
- Manages two visitor education facilities and associated trails for the public: the Patton Marine Science Education Center in Port Aransas and the Bay Education Center in Rockport.
- Science and the Sea™ radio program is heard on 361 affiliates in 49 states and in 52 countries.
- Developing a new Center for Coastal Ocean Science to study and teach marine chemical ecology and toxicology.
- Leads Texas in the mapping of seagrass. Over 95% of the seagrass on our coast has been characterized.
- Amos Rehabilitation Keep rescues and rehabilitates thousands of animals annually.
- An innovative undergraduate Semester by the Sea program combines coursework with hands-on research.
- Awarded \$23.2 million in 2020 for competitive research and construction grants.

**51 research**  
**articles published**  
**in leading**  
**scientific journals**  
**in 2021**

# Amos Rehabilitation Keep



**3,535  
sea turtles  
have been  
released  
since 1982**



The Amos Rehabilitation Keep, or ARK, rehabilitates marine turtles, migratory and marine birds and raptors from the coastal zone of Mustang Island and San Jose Island.

Animals that recover are released back to their native habitat. The ARK also strives to educate the community about how they can help with problems our local marine animals face.

## ACTIVITIES

- Conduct beach surveys on alternate days along Mustang Island and weekly surveys on San Jose Island to recover injured or stranded marine turtles and birds.
- Conduct beach patrols with the help of volunteers to detect nests of the endangered Kemp's Ridley and other nesting sea turtles.
- Receive and rehabilitate marine turtle and birds that are found by the local community.
- Work with federal and state agencies such as Padre Island National Seashore, the Sea Turtle Stranding and Salvage Network, and the Texas Marine Mammal Stranding Network to coordinate recovery and rehabilitation efforts.

## EXTERNAL SUPPORT

- The ARK receives a tremendous amount of support from volunteers in the local community and Winter Texans. Volunteers assist with patrolling beaches for nesting turtles and strandings, in addition to animal husbandry and rehabilitation efforts.
- The Friends of the ARK is a 501(c)(3) organization that provides financial support for routine operations, special activities, and volunteer efforts.
- The Anthony F. Amos Endowment was also established to support the day-to-day operations of the ARK. Each month, the ARK purchases 1,700 pounds of fish to feed its patients. There are also veterinary bills and salaries for part-time workers.
- Several philanthropists including, Edith and Taddy McAllister, have also provided support for the sea turtle facilities and the new pelican aviary.



*The ARK has recovered and rehabilitated more sea turtles than any other facility in the nation.*



## FACILITIES

- Turtle building with several large and small turtle holding tanks
- Bird building (clinic)
- Greenhouse tank
- Raptor cages
- All-purpose cages
- Walk-in freezers
- Oiled Wildlife Facility with several sea turtle holding tanks
- Pelican aviary
- Several utility terrain vehicles for beach surveys
- Pick-up truck with lift-gate

*The ARK began in 1982 and is one of the largest wildlife rehabilitation centers in South Texas.*



# Fisheries and Mariculture Laboratory



The Fisheries and Mariculture Laboratory (FAML) is a one-of-a-kind facility that focuses on captive spawning and rearing larvae of recreationally and commercially important fishes.

Research conducted at FAML has led to significant advances in commercial production of fish. Our mission is to use the scientific approach to ensure there are healthy fish populations and to promote sustainable aquaculture.



**First to spawn Red Drum in 1977**



## MARINE SPECIES BEING INVESTIGATED

- Red drum (*Sciaenops ocellatus*)
- Southern flounder (*Paralichthys lethostigma*)
- Common snook (*Centropomus undecimalis*)
- Pigfish (*Orthopristis chrysoptera*)

## RESEARCH SPECIALTIES

- Fish nutrition and development
- Egg quality
- Impacts of environmental factors, physiology, and early survival
- Feeding success and growth
- Baitfish production
- Biology of natural populations of fish

## SUSTAINABLE AQUACULTURE RESEARCH

- Contributes to rebuilding fish stocks
- Reduces fishing pressure
- Reuses water to grow fish
- Utilizes efficient, highly digestible diets



A mile west of the main building complex, FAML occupies 33,000 sq. ft. of building on 10 acres adjacent to the ship channel. This center comprises six buildings which include 11 distinct rooms with temperature and photoperiod control.



## FACILITIES

- Recirculating systems that are smaller than more production-oriented facilities
- Maintain a large capacity for highly replicated larval rearing experiments (4 separate laboratories) with fiberglass tanks ranging from 150-1600 liter in capacity
- Maintain 17 broodstock tanks (10-23 feet in diameter), 4 large raceways (3 x 8 x 45 feet)
- Culture systems are equipped with sand and biological filters
- Analytical and physiological laboratories with high performance chromatograph, gas chromatograph, microplate spectrometer, microplate spectrofluorometer, cryostat, microtome, freeze dryer and 4 thermal cyclers for PCR and qPCR.

# Center for Coastal Ocean Science



Marine biologists and chemists at the Center for Coastal Ocean Science (CCOS) will study and teach marine chemical ecology and toxicology. A preeminent scholar and first holder of the *Mary Anderson Abell and Joseph Miles Abell, Jr., M.D. Endowed Chair in Marine Science*, will be recruited to lead the new Center.



CCOS will engage university scientists, students, industry, and government agencies to explore the chemical language of the sea. The Center will investigate chemical signals from as small as microscopic one-cell organisms, up the chain to fishes and finally as far-reaching as impacts to our own human health.

## Supporting the wise use of marine resources



### BENEFITS

- Answer vital questions about the health and status of Texas coastal waters;
- Train future generations of marine scientists to carry on discovery and transfer of knowledge;
- Provide essential information and data to regional industry and municipal leadership to manage, restore, and develop coastal areas;
- Strengthen Texas leadership in marine science to inform policy and decision-making at the state and federal levels.

### DIVERSE RESEARCH OPPORTUNITIES

- Identify the chemical cues and signals that marine plants and animals use to detect, attract and repel (i.e., build the dictionary for the chemical language of the sea)
- Uncover the specific biochemical pathways involved in sending and receiving chemical cues and signals
- Describe exactly how chemical cues and signals change behaviors and physiology of marine plants and animals
- Explain exactly how human-introduced chemicals in the marine environment might interfere with chemical cues and signals
- Build the database needed for restoring and maintaining healthy marine systems to better address future changes

### A FOCAL POINT FOR COLLABORATION

- CCOS will work with academic peer institutions, industry, state and federal government environmental and public health agencies.



*The CCOS is directly adjacent to the Fisheries and Mariculture Laboratory. CCOS occupies 15,000 square feet of dry and wet laboratory building space.*



### SCIENTIFIC ASSETS

- High quality sea water filtration, distribution and treatment systems
- Recirculating, static, and flow-through exposure systems that permit multiple treatments/replicates
- State-of-the-art environmental control systems in all wet labs and aquatic exposure chambers
- Advanced analytical chromatography and mass spectrometry instrumentation
- High throughput in-vitro and in-vivo assay systems
- Confocal microscopy systems and flow cytometry

**37,500**

**Average number of students,  
 educators & visitors educated  
 by us per year**



**Healthy Estuaries Minimize Disasters and Yield High Return on Investment**

The best defense is a good offense, which is what the 29 National Estuarine Research Reserves provide. The natural system gives coastal communities extra protection from flood events, and the Reserves themselves provide the science-based research and education community members need.



**99%**  
**of training  
 participants  
 increased  
 knowledge  
 and skills**

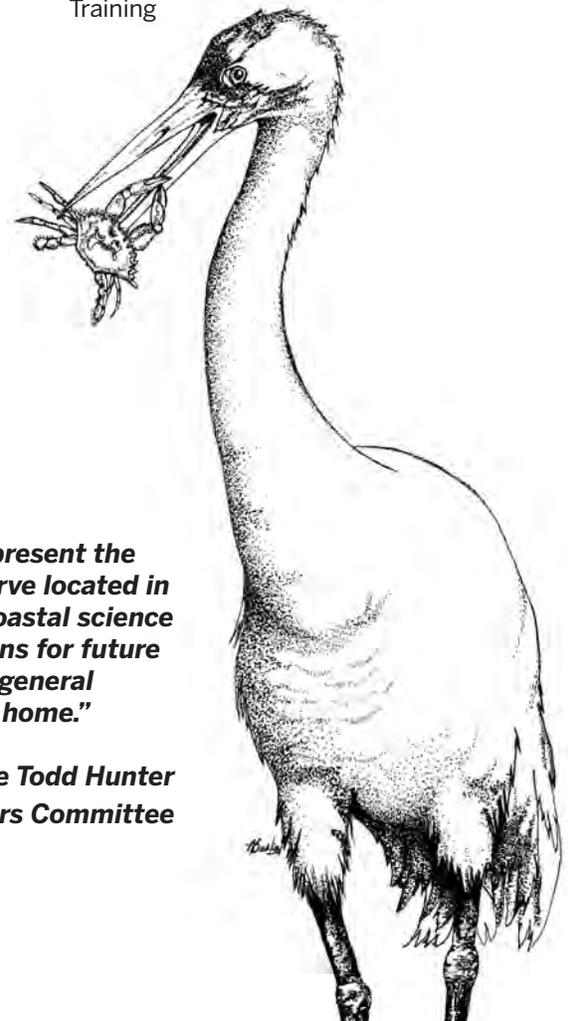


**HIGHLIGHTS**

- The Mission-Aransas National Estuarine Research Reserve is only one in the Western Gulf of Mexico.
- We are responsible for protecting 186,189 acres of bays, wetlands, and uplands including purchase of a conservation easement on Fennessey Ranch.
- The Mission-Aransas National Estuarine Research Reserve has secured >\$55.7 M dollars in federal, state, and non-profit funds since its designation in 2006.
- We have built exceptional visitor centers in Rockport and Port Aransas. Our Estuarine Research Center houses world-class researchers.
- The Mission-Aransas National Estuarine Research Reserve serves the community with educational programs for students, teachers, and the public.
- Our research programs collect data on water quality, weather, nutrients, and vegetation that are being used by fisherman and researchers throughout the nation.
- The Mission-Aransas National Estuarine Research Reserve puts good science to good use by putting it in the hands of policy-makers.

**INTEGRATED PROGRAMS**

- Research
- Monitoring
- Stewardship
- Education
- Training



***“As Texas State Representative I am honored to represent the Mission-Aransas National Estuarine Research Reserve located in District 32. Their charge of putting cutting-edge coastal science in the hands of policy makers ensures good decisions for future generations. The education component allows the general public to appreciate this special ecosystem we call home.”***

**Texas State Representative Todd Hunter  
 District 32, Chairman, Calendars Committee**

# Beaufort Lagoon Ecosystems

## Long-Term Ecological Research



## An Arctic ecosystem in transition



### *Studying ecosystem change where land meets sea at the top of the world.*

Beaufort Lagoon Ecosystems LTER is a new Long Term Ecological Research\* site. We use diverse methods to study lagoons and other aquatic sites along the northern Alaskan Arctic coast. Our interests include land/sea interactions in these unique ecosystems, their biogeochemical and biological makeup, their seasonal dynamics and long-term changes, and using our expertise to serve local communities.

#### WHY

Lagoon ecosystems along the Alaskan Beaufort Sea coast act as receptacles and processors of materials arriving from freshwater rivers and terrestrial zones before water moves to the sea. These areas are used for local subsistence fishing and hunting, transportation, and oil and gas extraction.

#### RESEARCH

This research provides a much needed mechanism for tracking and understanding 1) how natural climate cycles influence coastal ecosystems in the Arctic, and 2) how climate change effects such as permafrost thaw, shifting precipitation regimes, and losses of sea ice alter coastal ecosystems through effects on inputs, nutrient cycling, and ocean mixing. We believe that the differential availability of seasonally distinct resources is critical for maintaining the high productivity of these ecosystems. BLE will use sampling, monitoring, and modeling to study these lagoons and their interactions with the surrounding environment to better understand how these ecosystems function and to predict how they will change in the coming decades.



#### RESEARCH

- Measures and model terrestrial inputs of organic matter and inorganic nutrients via runoff, groundwater, and coastal erosion
- Captures year round data on weather, sea ice conditions, currents, and water qualities
- Accounts for fate of inorganic and organic nutrients by measuring CO<sub>2</sub> and N<sub>2</sub> fluxes, and nutrient cycling processes
- Examine seasonal and annual shifts in microbial and metazoan community structure, trophic function, and organic matter supply.
- Integrates data from the different project components and tests ecosystem change scenarios with coupled circulation and biogeochemical models

#### COMMUNITY ENGAGEMENT

- The BLE has fostered a traditional knowledge (TK) panel with Native Alaskan elders and hunters to inform site selection and bolster citizen science potential
- An on-going K-12 summer science oceanography camp provides hands-on experiences for students in the lab and field (below)
- Long-term field surveys of Barter Island erosion engages high school citizen science to collect and interpret environmental data from their own backyards