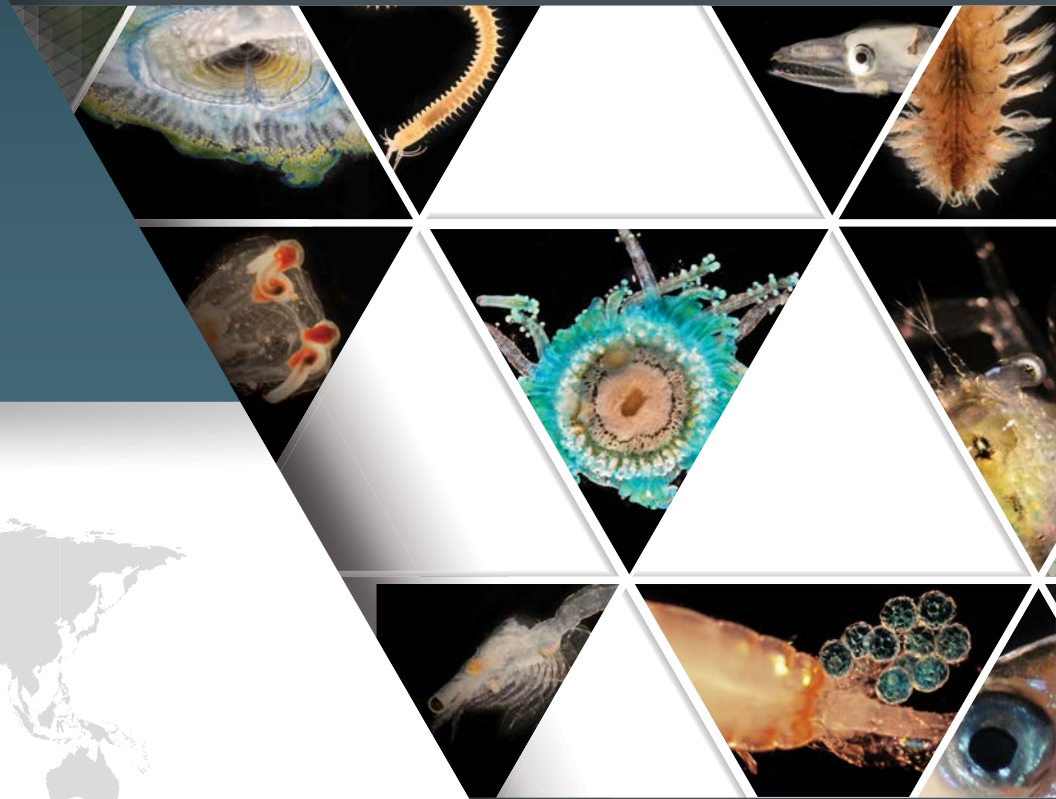


ANNUALreport

School of Ocean Science and Engineering



THE UNIVERSITY OF
SOUTHERN
MISSISSIPPI



2019

GULF COAST RESEARCH LABORATORY
JOHN C. STENNIS SPACE CENTER
MARINE RESEARCH CENTER

TABLE OF CONTENTS

Message from the Director1

Highlights..... 2-5

DIVISIONS

Division of Coastal Sciences 6-7

Division of Marine Science..... 8-9

CENTERS

Marine Education Center 10-11

Hydrographic Science
Research Center12-13

Thad Cochran Marine
Aquaculture Center..... 14-15

Center for Fisheries
Research and Development ... 16-17

Unmanned Maritime Systems
Programs18

Summer Field Program.....19

Gulf Coast Research
Laboratory.....20-21

Research Vessels22-23

Financials and Locations24

Leadership Team 25

Publications26-32

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JOE GRIFFITT
DIRECTOR

Dear Colleagues,

Welcome to the 2019 Annual Report for The University of Southern Mississippi's (USM) School of Ocean Science and Engineering (SOSE). Contained within this report is a summary of all the incredible activities that we have been working on in 2019. I hope you will take some time to look through this report and think about the time, effort, thought, and dedication from all of our people that it took to complete these achievements.

When I agreed to take on the role of Interim Director of USM's SOSE in July of 2019, it was with a mixture of humility and excitement. In the 4 years since we formed SOSE, I have watched, both as a faculty member and as an administrator, as the faculty, staff, and students of SOSE made true on the promise that we made when we formed the School to become a world leader in marine research. I'm honored to be given the opportunity to help SOSE reach new heights of excellence in understanding how humans interact with the ocean, in training new scientists and leaders, and in communicating the importance of the work that we do to the community that supports us.

One of the earliest signs that 2019 was going to be an interesting year for all of us was when the Bonnet Carré Spillway was opened in May, for an unprecedented second time in one year. This opening was notable for the volume of water it released into the Mississippi Sound, and for the duration of its opening. USM and SOSE were at the forefront of the response to this event, pairing with MDMR and MDEQ to rapidly assemble a team of experts who sampled the water, assessed the impacts to the ecosystem, and made innovative models to quantify the flow of the fresh water. The Harmful Algal Blooms that resulted from this freshwater intrusion event were also unprecedented in our waters, and the scientists of SOSE were deeply involved in helping the state of Mississippi evaluate the threat.

In happier news, SOSE faculty were key in the decision by the National Science Foundation to select a consortium lead by USM, the Gulf-Caribbean Oceanographic Consortium, to operate the newest Regional Class Research Vessel in the NSF fleet. This was a tremendous honor for the Consortium, SOSE, and USM, and points out that our scientists are again leading the nation in our efforts to understand the oceans, with a focus on the Gulf of Mexico. The fact that the vessel was named after an icon of the Biloxi civil rights movement, Dr. Gilbert R Mason, was deeply moving to all of us in SOSE. Dr. Mason was known for his efforts to desegregate the Biloxi beaches, and so the motto of the R/V Gilbert R Mason, *aequa mari*, translated as "equal access to the sea", is quite apt.

There are many other wonderful things that happened in 2019, too many for me to mention here, and I hope you will continue reading to learn about all of them, but there is one other that I want to highlight. Late in the year, USM and SOSE joined with the Mississippi Port Authority to break ground on the Roger F Wicker Center for Ocean Enterprise building, located at the Port of Gulfport. This facility will serve as a centerpiece of close interactions between academics, industry, and government organizations, and is an example of how USM and SOSE are taking the lead in ensuring that the success and productivity of our researchers benefit the community and the region we are in, and that academic research is not limited to publishing in journals, but has a deep and meaningful impact on the lives of all around us.

At the end of the year, we had a glimmering of the issue that would preoccupy our attentions for 2020, and while it is too soon as I write this to say exactly how it will end up, I can say with certainty that we will face this challenge as we face all others, with confidence, with careful thought, and with concern for those around us, and that in the end we will end up stronger from the experience.

2019 Highlights



USM Joins \$94-Million Ocean Exploration Institute

USM is joining four other nationally renowned ocean science institutions to form The National Oceanic and Atmospheric Administration's (NOAA) Ocean Exploration Cooperative Institute (OECI).

The goal of OECI is to provide NOAA access to powerful academic research capabilities located at the individual institutions. In this program, researchers are focusing on areas that will improve the efficiency and effectiveness of ocean exploration in deep and remote areas of the U.S. Exclusive Economic Zone. This will be done through new robotics and telepresence approaches. In joining the Ocean Exploration Cooperative Institute, USM is initially set to receive \$11.25 million over five years to fund a multitude of ocean science projects including much needed exploration of the Gulf of Mexico.

Some of the educational benefits for South Mississippi include technical training for autonomous vehicles, information technology and telepresence, STEM education opportunities for local schools, and telepresence of ocean exploration to USM's Marine Education Center and the Mississippi Aquarium through USM's ongoing partnership.

USM is also teaming with Tuskegee University to train STEM students from underrepresented communities in unmanned technologies for ocean exploration, including both maritime and aerial drones, and to provide experiences both on shore and at sea as a means to attract them into employment pipelines within and beyond the cooperative institute.

SOSE Associate Director Appointed by Governor to Gulf States Marine Fisheries Commission

Governor Phil Bryant appointed Dr. Read Hendon, Associate Director for SOSE's Gulf Coast Research



Laboratory (GCRL), to the Gulf States Marine Fisheries Commission (GSMFC). Hendon will serve as the citizen

representative on the Commission for Mississippi. The Gulf States Marine Fisheries Commission was established in 1949 as a compact of the five Gulf States. Its charge is 'to promote better utilization of the fisheries, marine, shell and anadromous, of the seaboard of the Gulf of Mexico, by the development of a joint program for the promotion and protection of such fisheries and the prevention of the physical waste of the fisheries from any cause.

The GSMFC coordinates management and research activities for fisheries related issues of mutual interest among its member states and in collaboration with federal agencies. Within the scope of those activities are inter-jurisdictional stock assessments, habitat/ reef priorities, law enforcement, data collection, aquaculture and restoration.

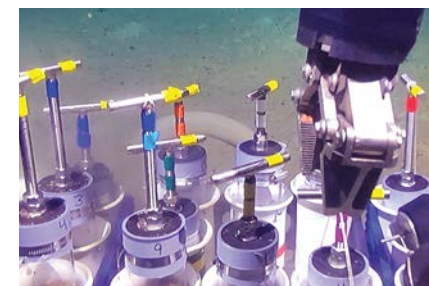
Partnership

An education partnership agreement between USM and the U.S. Navy's Naval Undersea Warfare Center Division, Newport (NUWC DIVNPT) hopes to encourage and enhance study in many scientific disciplines.

The purpose of the agreement is to further the education of USM students by providing a program where students can get hands-on experience in research projects using the unique facilities and equipment related to undersea technologies available from NUWC DIVNPT.

Students in future programs will receive academic credit for work on defense laboratory research projects pertaining to advanced undersea technologies.

Offering the only ocean engineering degree in Mississippi and one of only 10 schools in the Nation, USM has been on the cutting edge for marine science education. In 2017, USM created the first Unmanned Maritime Systems Certificate program seen in the United States. Students participate in compressed, five-week course schedules during which they study oceanography and ocean engineering topics and hands-on exercises needed for safety and efficiency operating underwater and surface unmanned systems. The UMS program is currently comprised of foundational and advanced level tiers.



USM Takes Scientific Lead in Investigating Effects of Bonnet Carré Spillway Reopening

A team of USM researchers is working to advance the state of Mississippi's scientific understanding and the public's comprehension of the effects of the reopening of Bonnet Carré Spillway on the Mississippi Sound.

The U.S. Army Corps of Engineers opened the spillway located in St. Charles Parish, La., for the second time in 2019 on May 10 in order to reduce the risk of flooding in southeast Louisiana due to dangerous levels of sustained rainfall in the area. The spillway regulates the flow of water from the Mississippi River into Lake Pontchartrain and eventually the Gulf of Mexico. The flow of freshwater into the Mississippi Sound, which runs east to west along the Gulf Coast, has the potential to significantly impact water quality and marine life, as well as tourism and the Coast's economy.

"The state of Mississippi has a strong and reliable partner in The University of Southern Mississippi," Gov. Phil Bryant said. "The work of their research team will be critical in ensuring that our communities and federal government are informed of the adverse effects of the Bonnet Carré Spillway opening. I appreciate the continued collaboration between academia and government as we work to meet the needs of the people of Mississippi."

SOSE Associate Professor Appointed President-Elect CERF Governing Board

The Coastal and Estuarine Research Federation (CERF) elected Dr. Leila Hamdan, Interim Associate Director, SOSE and Associate Professor of Coastal Sciences at USM, as its president-elect for its 2019-21 Governing Board.



Hamdan will then serve as CERF President from 2021 to 2023 and as Past President from 2023 to 2025. Founded in 1971, CERF is an organization of approximately 1,700 members engaged in study, management and stewardship of estuarine and coastal environments. The Federation's members are dedicated to advancing human understanding and appreciation of the Earth's estuaries and coasts, to the wise use and management of these environments and to making the results of their research and management actions available to their colleagues and to the public.

2019 Highlights



Thad Cochran Marine Aquaculture Center

The design and engineering for renovation and expansion of the USM oyster hatchery is nearing completion. An Amendment of \$4,000,000 was awarded by the RESTORE fund for the oyster hatchery expansion announced at the MDEQ restoration summit held in Biloxi, MS on November 12th.

TCMAC oyster hatchery is participating in the Gulf of Mexico Research Consortium SALT (Selection of Aquaculture Lines with improved Traits) to develop genetically improved lines of eastern oyster to support the industry in the Gulf of Mexico. This selected breeding program for oysters is the first of its kind in the Gulf of Mexico. All Gulf States are participating in the five-year funded program through the Gulf States Marine Fisheries Commission with a mix of academic and industry partnerships from each state.

Center for Ocean Enterprise Breaks Ground at Port of Gulfport

"This facility will serve as a hub for research and innovation that will bolster our Blue Economy and help in the protection of our country for decades to come,"

— Governor Phil Bryant

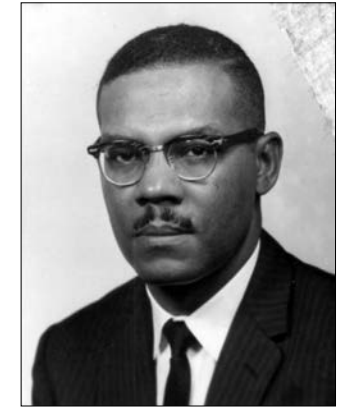
Gov. Phil Bryant along with U.S. Senator Roger Wicker and U.S. Congressman Steven Palazzo, in conjunction with the Mississippi State Port Authority (MSPA) and The University of Southern Mississippi (USM), celebrated the groundbreaking of the Roger F. Wicker Center for Ocean Enterprise located at the Port of Gulfport. The facility will serve as the centerpiece of research and development in the Gulf, further establishing the initiatives of the Governor's Ocean Task Force and creating a unique maritime technology environment on the Mississippi Gulf Coast. By connecting our major research universities, federal partners and private companies, the Governor's Ocean Task Force has been able to develop a roadmap that will build new capacity for Mississippi's Blue Economy.



USM and LUMCON Selected to Lead Consortium to Operate NSF Regional Class Research Vessel

The National Science Foundation (NSF) has selected the Gulf - Caribbean Oceanographic Consortium, cooperatively led by The University of Southern Mississippi (USM) and the Louisiana Universities Marine Consortium (LUMCON), to operate the third new oceanographic research ship to carry out regional scale research in the Gulf of Mexico, Caribbean Sea and Atlantic Ocean.

Owned by NSF and valued at over \$100 million, this Regional Class Research Vessel (RCRV) is scheduled to begin construction in late 2019 with delivery to the Gulf - Caribbean Oceanographic Consortium in 2023 after a year of rigorous sea trials. The ship will have dual home ports in Mississippi and Louisiana to support scientific research and vessel maintenance, respectively. The primary home port, and base for embarkation of research expeditions will be the Port of Gulfport in Gulfport, Miss. USM's Marine Research Center, and forthcoming Center for Ocean Enterprise at the Port of Gulfport, will provide marine technical services and scientific support for the ship. LUMCON's future facility in Houma, La. will serve as the maintenance, crew, and secondary embarkation port.



NSF officials have informed the National Science Board that the ship will be named Research Vessel (R/V) *Gilbert R. Mason*. For decades until his death in 2006, Dr. Gilbert Rutledge Mason Sr. was a pioneering Civil Rights leader and physician to the mariner community along the Gulf Coast.

"This new vessel provides limitless opportunities for the science community as it relates to research, education and enterprise. The benefits of a healthy Gulf of Mexico are vast - spanning productive fisheries, habitat for marine species, understanding of geological hazards, assessing risks and benefits from energy exploration and much more."

— USM Vice President for Research, Gordon Cannon



Division of COASTAL sciences

The Division of Coastal Sciences (COA) consists of 18 faculty positions covering a wide range of disciplines within GCRL's four core research areas. Our faculty is nationally recognized in their respective fields, having authored hundreds of scientific publications and serving on regional, national and international councils and advisory panels. Forty-nine resident graduate students are working toward graduate degrees under the direction of the COA faculty.



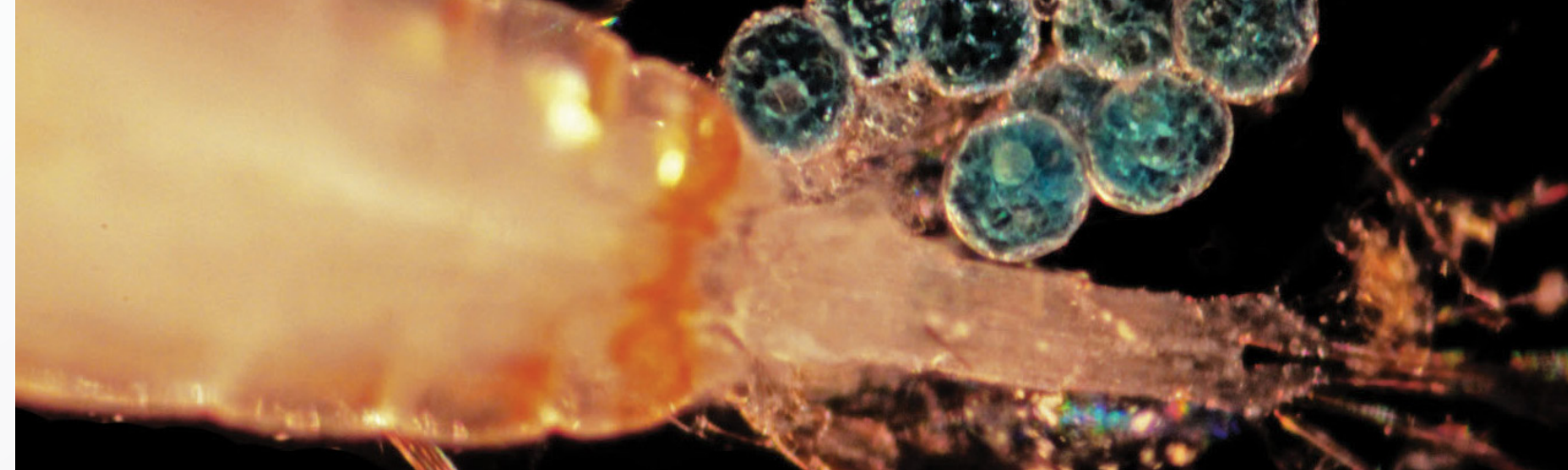
DR. LEILA HAMDAN
Interim Associate Director
SOSE



 **49**
STUDENTS

 **18**
FACULTY

 **26**
STAFF



2019 HIGHLIGHTS

Members of COA, spanning students, staff and faculty stepped into leadership roles at local, regional, national and international levels during 2019.

Carla Culpepper received the 2019 USM Staff Excellence Award. She exemplifies outstanding service through her work, from her at-sea command of the research deck on R/V *Point Sur*, to day-to-day management of the Hernandez lab, and willingness to organize the GCRL Holiday party.

Darcie Graham, COA Graduate Program and Grants Coordinator, received a USM Presidential Distinguished Service Award. Darcie transitioned to a new role of Assistant Director of Finance Administration in late 2019.

Leanne Poussard, COA MS student, was selected as a 2020 finalist for the Sea Grant John A. Knauss Marine Policy Fellowship Program. The 2020 Knauss finalists will become the 41st class of the fellowship joined a group of over 1,300 professionals who have received hands-on experiences

transferring science to policy and management through one-year appointments with federal offices in Washington, D.C.

Dr. Wei Wu, COA Associate Professor, became the new chair of global change section of the Society of Wetland Scientists for 2019-2020.

Dr. Kelly Darnell, COA Assistant Research Professor, was elected as President-Elect of the Gulf Estuarine Research Society (GERS).

Dr. Frank Hernandez, COA Associate Professor, was Co-chair of the Attendee Experience Committee for the Coastal and Estuarine Research Federation's (CERF) 2019 Conference. His work on the committee resulted in one of the most successful international conferences in the Federation's history.

RESEARCH EXCELLENCE

- Dr. Zack Darnell, COA Assistant Professor, received a new National Science Foundation (NSF) grant for \$357,577. Titled is "An integrative field and biophysical model of thermal stress, physiological performance, and reproductive fitness." This work combines lab and field measurements and modeling to understand how climate change will impact fiddler crab behavior.
- Drs. Kelly Darnell, COA Assistant Research Professor, and Zack

Darnell, COA Assistant Professor, received an \$80,869 grant from the Coypu Foundation to establish a network of continuously recording water quality sensors at the Chandeleur Islands, LA. Sensors will be deployed in the shallow seagrass beds on the western side of the islands starting in Summer 2020.

- Dr. Leila Hamdan lead a team of USM, BOEM and NRL scientists in the first scientific exploration of two newly discovered 19th century wooden

shipwrecks in the deep Gulf of Mexico during a study supported by NOAA's Office of Ocean Exploration and Research.

- COA expanded research expertise in Social Science and Policy and welcomed Dr. Leslie Acton and Dr. Luke Fairbanks to the Faculty to investigate how marine and coastal people, spaces, and resources interact and impact coastal and marine ecosystems, science, policy and communities.

Division of MARINE science



DR. JERRY WIGGERT
Associate Director
Division of Marine Science

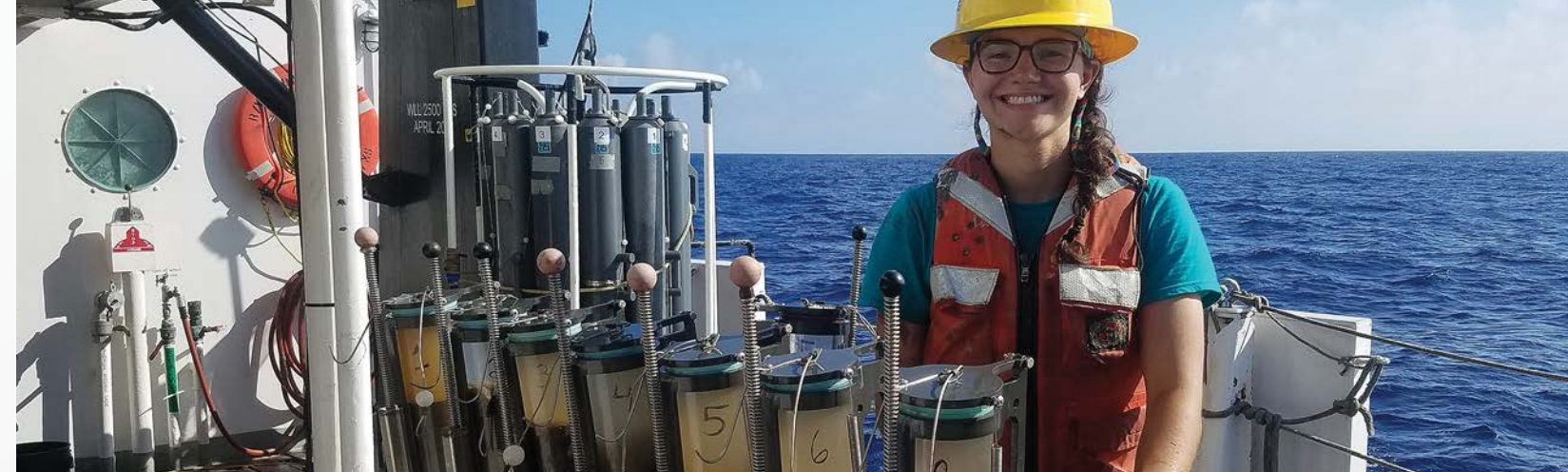
The Division of Marine Science (DMS), located at John C. Stennis Space Center in Hancock County, is situated among the largest community of oceanographers and hydrographers in the world. Researchers and students regularly interact with scientists from the National Aeronautics and Space Administration, the Naval Meteorology and Oceanography Command, the Naval Oceanographic Office, the Naval Research Laboratory, the National Data Buoy Center, and the U.S. Geological Survey.



 **97**
STUDENTS

 **21**
FACULTY

 **22**
STAFF



2019 HIGHLIGHTS

Global to Local Research

Postdoctoral associate Kehsav Raja, working with Dr. Maarten Buijsman, participated in a mooring deployment cruise from May 11-22 on R/V *Neil Armstrong* in the North Atlantic near Iceland as part of the Office of Naval Research (ONR) funded Near Inertial Shear and Kinetic Energy in the North Atlantic Experiment (NISKINE).

USM's Coastal Hazards Research Lab including, Eve Eisemann (USM DMS graduate alumna), Dr. Davin Wallace, Shara Gremillion, Erin Miller, and Bill Funderburk, deployed multiple sensors and cameras to capture modern storm and overwash activity on the Outer Banks of North Carolina in collaboration with U.S. Army Research and Development Center and others to understand the depositional history. The lab completed a 10-day expedition on R/V *Apalachee* collecting 45 sediment cores on the Mississippi-Alabama continental shelf to map paleochannels, funded by BOEM.

Dr. Stephan Howden and Kevin Martin launched a Seaglider into the Gulf of Mexico for a 90-day mission to study heat content for hurricanes. The project was funded by Shell as part of an Integrated Office Observing System (IOOS) Hurricane glider mission, complementing the continued operation, along with Dr. Arne Diercks, of the Central Gulf of Mexico Ocean Observing System that includes three long-range High Frequency Radar stations, two new additional stations in partnership with Fugro, two short range stations funded through MBRACE, and a 3-m discus buoy funded by IOOS and the NOAA Ocean Acidification Program, along with Co-I Dr. Chris Hayes. Graduate student Amy Moody, working with Dr. Alan Shiller, maintained a monthly time-series of five beaches along Mississippi Sound, collecting data on submarine groundwater discharge for her dissertation.

R/V *Point Sur* was used for the inaugural cruise for the Ocean Engineering undergraduate students (photo on left), in which participants deployed and recovered the autonomous vehicle IVER3 for a seafloor mapping mission, tested satellite-tracked surface drifters, cored bottom sediments, and performed CTD casts at locations including the former Deepwater Horizon.

Ocean Engineering Update

The Ocean Engineering undergraduate program, established in 2017,

has been experiencing steady growth. The program has grown to a total of 21 students at the beginning of academic year 2019-20 from two students in its 2017 beginning. All program specific courses except for senior year projects & design and capstone courses have been developed. The program is expecting its first graduation class in 2021. The search for a third Ocean Engineering faculty member, in addition to Drs. Gero Nootz and Kemal Cambazoglu, has begun and the program is working toward ABET (Accreditation Board for Engineering and Technology) accreditation.

Welcome New Members to the Team

- Dr. Kristina Mojica, tenure-track biological oceanographer
- Mrs. Sheila Malley, Instructor, Hydrographic Science program
- Dr. Allyson Tessin, tenure-track geological oceanographer

Awards

Faculty, students and staff received numerous awards this year and here we name a selection.

- Dr. Alan Shiller hosted a symposium on coastal issues at the Marine Education Center in March as part of the T.W. Endowed Professorship. Dr. Shiller also received the College of Arts and Sciences Faculty Advising and Mentoring Award.
- The Butch Oustalet Distinguished Professorship Award for Research was given to Dr. Christopher Hayes.
- The 2019 USM Faculty recipient for the Higher Education Appreciation Day Working for Academic Excellence (HEADWAE) was Dr. Davin Wallace.

Graduate Student Awards: Erin Miller received a National Science Foundation (NSF) Graduate Research Fellowship; Laura Whitmore was inducted into the USM Graduate Student Hall of Fame; Nadine Doiron was awarded the 2019 Marine Technology Society Scholarship for Graduate Students; Allison Savoie received the Howard Scholarship from the Gulf of Mexico Coastal Ocean Observing System Regional Association; and Peng Ho received an NRC Postdoctoral Associate award with the EPA.

Undergraduate Student Awards: Evan Rohde and Jesslyn Davis received Eagle SPUR awards for undergraduate research at USM.

MARINE Education Center



CHRISTOPHER SNYDER
MEC Director

The Marine Education Center (MEC) at The University of Southern Mississippi's Cedar Point teaching site in Ocean Springs, Mississippi, serves as the education and outreach arm of SOSE. The MEC's education programs reflect current coastal science research conducted within the Gulf of Mexico. MEC programs provide participants with a better understanding of the Gulf of Mexico and the diverse ecosystems found along the Mississippi Gulf Coast.

Awards

- Canadian Wood Council International Honor Award
- Texas Society of Architects Design Award
- Mississippi AIA Honors Award for Gulf State Region

2019 HIGHLIGHTS

2019 brought continued growth and expansion to the Marine Education Center's efforts to engage both residents and students in the broad field of ocean sciences. The MEC's programs are designed to highlight the role that The University of Southern Mississippi's School of Ocean Science and Engineering plays in understanding and managing the Gulf's resources and how they affect our daily lives. During the past year, the MEC engaged a broader array of audiences with an increasing diversity of programs. Our programs reached out to over 9000 students in grades 4 to 12 from twenty-two states across the country, local community members, including local naturalists, governmental leaders, and the public at large. The School of Ocean Science and Engineering's Marine Education Center located at the Cedar Point teaching site in Ocean Springs continues to be recognized for

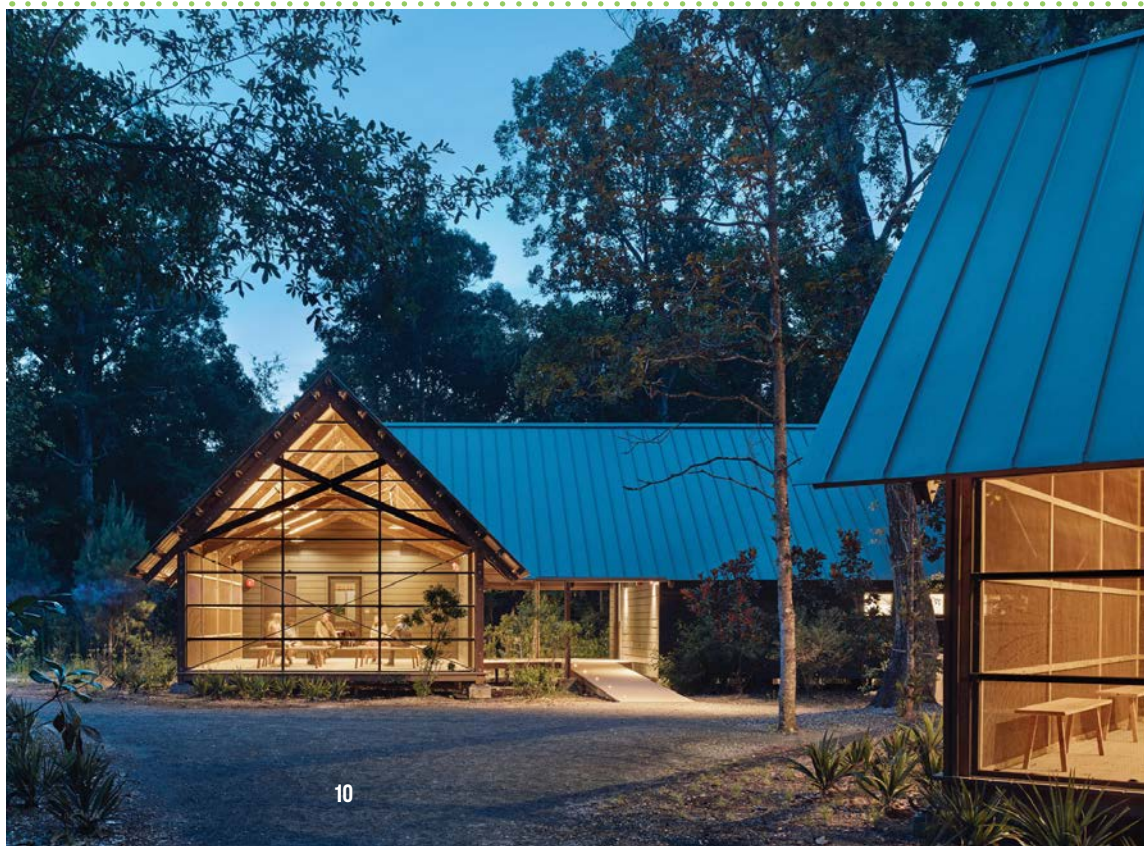
both its architectural designs and innovative approach to outdoor-based learning.

Future Teachers' Hands-on Learning

USM Gulf Park Education Department and the MEC partnered to provide students studying to be science teachers a dose of informal education with an experiential field trip at the MEC. Future teachers were exposed to the impact of outdoor hands-on learning during a tour of Davis Bayou by kayak.

Ocean Exploration Club

As part of the Ocean Exploration Cooperative Institute (OECI), USM MEC partnered with Tuskegee University (TU), a Historically Black College and University to provide internship opportunities in ocean exploration, exposing college students



Ocean Science and Technology Camp

The MEC introduced Ocean Science and Technology summer camp with twenty 9th-12th grade students for a week-long coast-wide collaboration of marine science professionals from different SOSE departments. Students had educational modules at the MRC, R/V *Point Sur*, GCRL, DMS and R/V *Jim Franks*. The focal point for the camp was Dr. Leila Hamdan's Microbial Stowaways expedition funded by NOAA Ocean Exploration and Research. Students engaged in a "first-look" at a wooden shipwreck in the Gulf of Mexico using ROV *Odysseus* to take samples and relay images. The MEC offered a residential option for students coming from other states. Pelagic Research Services sponsored the camp, joining the MEC corporate sponsor list.

to potential career paths in ocean sciences. The MEC worked with professors at TU to form an Ocean Exploration Club linking multi-disciplinary students to ocean science career opportunities.

Community Resilience

Through the NOAA B-WET program, the MEC recruited teachers and their students to participate in a curriculum focused on climate change. Working in teams, the students addressed a real-world problem in community resilience. They presented their results to resilience professionals from the Gulf of Mexico Program Office, City of Biloxi, and Grand Bay National Estuarine Research Reserve.

Oil Spill Research Review

Dr. Jessica Kastler co-edited an issue of *Current, The Journal of Marine Education*, sponsored by the Gulf of Mexico Research Initiative (GOMRI), with three co-editors: Katie Fillingham, Sara Beresford, and Teresa Greely. The publication reviewed research resulting from the 2010 oil

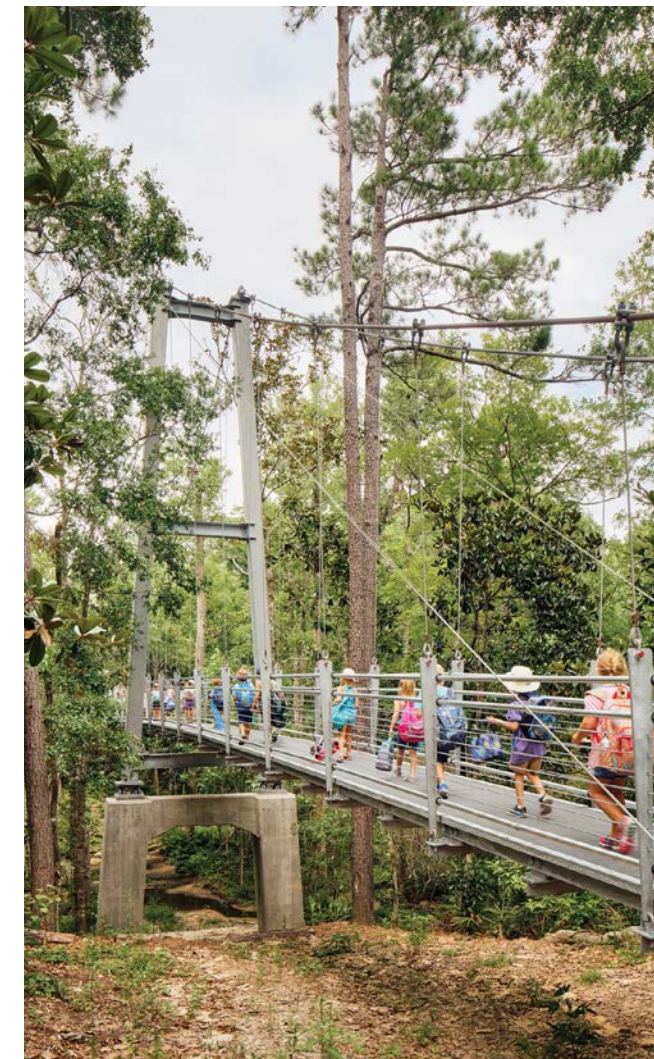
spill to provide high school teachers with science content and examples of how science works in an emergency.

Signage Enhances Trail

The Osprey Point Interpretative Trail was enhanced with signage featuring information about the habitats, plants, archaeological, and hurricane impacts to the coast, making it easier for local and regional visitors to engage in outdoor education.

Communication Fellow

Dani Bailey, Marine Educator, served as Science Communication Fellow aboard the E/V *Nautilus* on an expedition to the Monterey Bay National Marine Sanctuary. MEC staff seized the unique opportunity to engage ocean science students at two coastal high schools. St. Stanislaus and Ocean Springs High School students participated in real-time conversations with Dani about educational and career paths, the discoveries in the octopus garden, and a whale fall, discovered during the cruise.



HYDROGRAPHIC Science Research Center



BRIAN CONNON
HSRC Director

The Hydrographic Science Research Center (HSRC) was established in 2001 to assess emerging trends in hydrography and implement the most promising trends into operational use. The HSRC has provided innovative solutions for hydrographic surveying, precise positioning, water level measurements, sensor development, and novel uses for hydrographic data.



2019 HIGHLIGHTS

NFWF Oyster Reef Mapping

Work continued under a National Fish and Wildlife Foundation grant to monitor changes in oyster reefs using the scattered acoustic signal waveforms from a high-resolution multibeam sonar system to provide estimates of the short- and long-term spatial and temporal acoustic fluctuations of oyster reef acoustic growth signatures.

Hydrographic Conference

HSRC supported a number of events to promote hydrography during the year, including the 17th Biennial U.S. Hydrographic Conference held in Biloxi Miss., March 18–21. The opening ceremony included the hall of fame induction of Ken Barbor, former Director of the HSRC, with accompanying remarks by Brian Connon, current Director HSRC.

Unmanned Systems

In 2019, HSRC, under a Mapping Center grant funded by NOAA's Office of Coast Survey (OCS), conducted a number of experiments with unmanned hydrographic systems to evaluate their potential for operational use.

Autonomous Surface Vessel

USM's Autonomous Surface Vessel (ASV), *Sea Eagle*, was showcased during the U.S. Hydrographic Conference, held in Biloxi, MS. *Sea Eagle* was integrated with a high resolution multibeam sonar system and a high bandwidth radio to demonstrate remote hydrography. Later in the year, *Sea Eagle* was integrated with a different sonar system to a multi-frequency water column data set at the mouth of the Mobile River, Ala. The data shows that this type of system can identify high-frequency and low-frequency internal waves caused by differences in salinity and temperature of the water. In 2020, *Sea Eagle* will be deployed from R/V *Point Sur* for mapping missions in the Gulf of Mexico.

Saildrone

HSRC continued collaboration with industry partner Saildrone, who incorporated a high-resolution, shallow water multibeam sonar system into

one of their unique unmanned, sail-powered vessels. This saildrone, *Surveyor*, was deployed from Gulfport Harbor and conducting two week long cruises into the Gulf of Mexico to conduct hydrographic surveys. Particular attention was paid to the stability of the platform, quality of data, communications, and power management.

After initial success, *Surveyor* returned to Saildrone headquarters in Alameda, Cal. for further testing. A second Saildrone, *Profiler*, was outfitted with a custom winch to lower a sound velocity profile sensor that provides a sound speed profile needed for calibration of the multibeam sonar. The pair of Saildrones conducted successful testing off the California coast in late 2019 and will continue testing in 2020.

The focus of 2020 testing will be on improvements to communications and development of standard operating procedures.

USM presentations and papers by:

- Uchenna Nwankwo, Ph.D. student
- Dr. Anand Hiroji, Assistant Professor
- Johnson Oguntuase, Ph.D. student
- Senam Tsei, graduate student

Lightning round presentations by:

- Brian Connon, Director HSRC
- Jennifer Rhodes, graduate student
- Kandice Gunning, Ph.D. student

Maxim van Norden, Coordinator and Instructor, participated in the student mentoring dinner and arranged for the first ever visit by a high school class to the Conference. Thirty-five students from Bay Waveland High School attended.

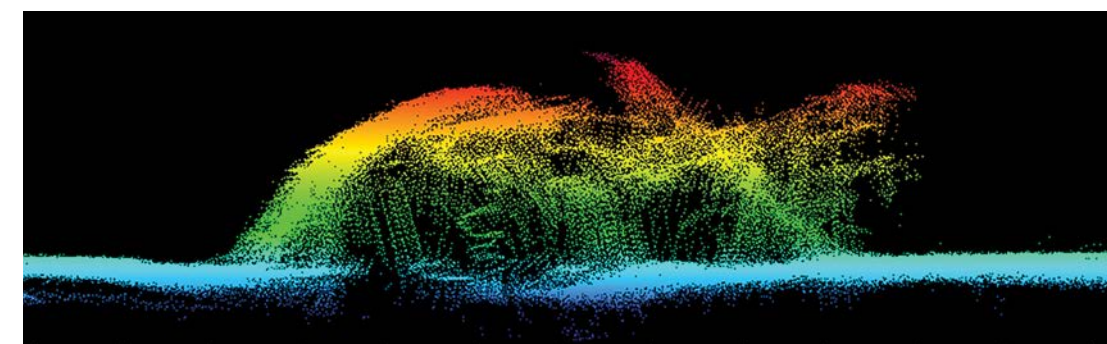
World Hydrography Day at MRC

USM hosted the World Hydrography Day celebration at the Marine Research Center on June 21st. This public event showcased hydrographic technology from USM, government, and industry partners.

Over 250 people were able to view unmanned survey vessels, manned survey launches, underwater survey vehicles, and displays from the Marine Education Center, Thad Cochran Marine Aquaculture Center, and Center for Fisheries Research and Development.

Lunch and Learn at the MRC

The Hydrographic Society of America Southeast Chapter held a "Lunch and Learn" at the Marine Research Center on 20 November. Over 75 attendees, including 17 USM students, spent the day listening to presentations from leading hydrographic software companies and talking with 10 vendors demonstrating their latest technology.



Thad Cochran

MARINE Aquaculture Center



KELLY LUCAS
TCMAC Director

In 2019, TCMAC had 28 staff (23 full time, 4 part time, 1 part-time retired, and 6 graduate students). In 2019, TCMAC PIs wrote or co-wrote eight grant proposals and were awarded four. Of the awarded grants, \$290,026 of the funds came from federal lines and \$2,145,125 came from general funds. TCMAC had 3 active grants in 2019. TCMAC also provided direct support through financial match, facility usage, and resources to 16 federal grants totaling \$1,586,361. Members authored 4 publications, presented 23 presentations and participated in numerous outreach and service activities.

2019 HIGHLIGHTS

Spotted Seatrout (*Cynoscion nebulosus*)

TCMAC continues to partner with Mississippi Department of Marine Resources (MDMR) conservation organizations and local high school aquaculture programs for stock enhancement of spotted sea trout. TCMAC produced over 145 million fertile eggs in 2019 with 1.6 million fertilized eggs transferred to MDMR for pond culture and 200,000 juveniles released into local bays and estuaries. In 2019, research was focused on using spotted seatrout as a test specimen to develop techniques that rapidly detect disease.

Oysters (*Crassostrea virginica*)

Static and High Density recirculating systems were utilized to spawn, hatch, incubate and grow-out oysters in artificial seawater. A total of 74 million eyed diploid larvae was produced and 36 million were

transferred to MDMR for restoration. Nursery systems supported the production of 141,000 seed oysters to incorporate into the broodstock inventory or provide to industry. TCMAC continued to partner with the Department of Coastal Sciences for microbial biome research to examine optimal artificial water conditioning to support the production of larval oyster culture. The design and engineering for renovation and expansion of the oyster hatchery was initiated in 2019. An Amendment of 4 Million in RESTORE Act funding was announced at the MDEQ restoration summit in November for hatchery expansion.

The TCMAC oyster hatchery is participating in the Gulf of Mexico Research Consortium SALT (Selection of Aquaculture Lines with improved Traits) to develop genetically improved lines of eastern oyster to support the industry in the Gulf of Mexico. This

Outreach and service activities

TCMAC participated in numerous group tours, ranging in size from 6 people to 100 people. Individual tours to groups of five or less were also provided. The largest tour group was the World Aquaculture Society Conference Tour in March. This organized event was a group tour as part of the annual meeting held in New Orleans and included people from all around the world and international press coverage. TCMAC staff participated in community outreach events including The Peter Anderson Festival and Pathways to possibilities. The staff provided work training programs for the Ocean Springs High School Aquaculture Program year 3 class members and participated in job shadowing for area students.



selected breeding program for oysters is the first of its kind in the Gulf of Mexico. All Gulf states are participating in the five-year funded program through the Gulf States Marine Fisheries Commission with a mix of academic and industry partnerships from each state.

Blue Crab (*Callinectes sapidus*)

Through National Sea Grant funding, USM, North Carolina Sea Grant, Mississippi State University and Carteret Community college in North Carolina worked to transfer hatchery and rearing techniques to North Carolina to support industry development.

Atlantic Croaker (*Micropogonias undulatus*)

Aquaculture production of croaker can help supply the bait market during the times of year when wild collection is difficult. In 2019, research focused on performing a larval culture trials to assess the tolerance of larvae to low salinity. This research was supported by the Mississippi Department of Marine Resources through a Tidelands grant.

Algae (multiple species)

Peak production for the 2019 season reached an average of 8.4 trillion cells a day of microalgae feedstock, which met

production requirements for both oyster larvae and copepods. The mass culture of these seven species were produced using batch cultivation techniques and semi-continuously using large-scale photobioreactor systems.

Gray Snapper (*Lutjanus griseus*)

Broodstock collected in 2018 were conditioned for gamete maturation and induced for spawning in 2019. The maturation and spawning results are encouraging and another trial will be conducted in 2020. TCMAC facilities were utilized to support his federally funded project conducted by the Department of Coastal Sciences.

Tripletail (*Lobotes surinamensis*)

The team achieved successful induction of spawns with high fertility rates. A larval culture trial was completed using the produced embryos and the juveniles are currently being held for future research. Tripletail research has been supported by private, state and federal funds.

Offshore aquaculture

Offshore permitting for a finfish farm in the Gulf of Mexico project continued with a bathymetric survey being completed by USM's Hydrographic Science Research Center as part of Phase 1. Phase 2

was awarded in 2019 to continue with permitting requirements including engineering modeling for the cage structures and Phase 3 was awarded in 2019 to collect red drum for the hatchery. Partners for the offshore farm include: Manna Fish Farms, LLC, University of New Hampshire, University of Mississippi and NOAA, NCCOS. Funding for all three phases is through the Gulf States Marine Fisheries Commission. TCMAC and the Department of Marine Sciences partnered with AI Control Technologies to develop an automated oyster cage depth control system to solve a variety of productivity, safety, and crop protection challenges facing oyster farming operations. Project funding was announced in September through the Mississippi Gulf of Mexico Energy and Security Act program.

Copepods

Copepods are the natural prey items for most larval fish however they are difficult to produce in a biosecure, consistent, and economically viable manner. Research at TCMAC focuses on reducing the bottlenecks associated with copepod production. This Sea Grant funded project includes partners from Virginia Tech, The University of Florida and Reed Mariculture.



CENTER FOR FISHERIES Research and Development



JILL HENDON
CFRD Interim Director

The Center for Fisheries Research and Development (CFRD) at the Gulf Coast Research Laboratory in Ocean Springs, Miss., is part of USM's School of Ocean Science and Engineering. Our scientists develop and conduct research that informs resource management. We work with state, federal, and community partners to ensure that we understand scientific fishery needs and focus our research efforts on how we can promote sustainable fisheries and habitats. Our staff not only conduct the research but also sit on local, regional and federal assessment panels to ensure our data is efficiently transferred to management entities.



2019 HIGHLIGHTS

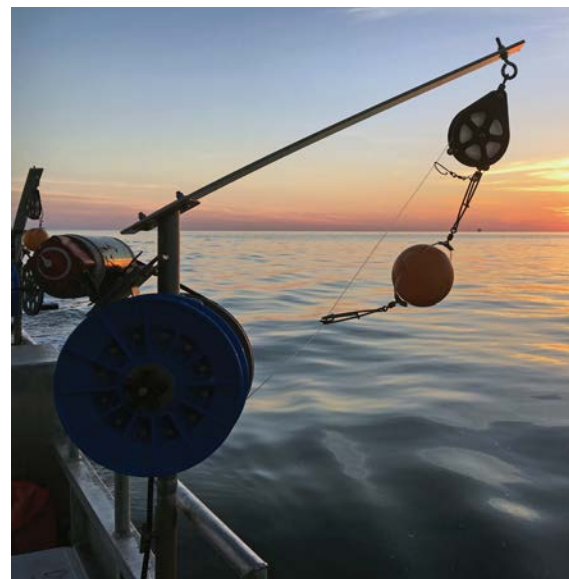
Blue Marlin (*Makaira nigricans*)

CFRD researchers participated in a Blue Marlin satellite tagging effort in the northcentral Gulf of Mexico in collaboration with The Billfish Foundation. This was part of an ongoing research project that includes participation by volunteer sport fishing vessel owners, captains and anglers. The 2019 trip was the second expedition of its kind in the region. To date these efforts have tagged 16 marlin. The data received from these tags will expand scientific knowledge on the ecology and movements of this critically important billfish species.



Red Snapper (*Lutjanus campechanus*)

2019 marked the fourth year of sampling on our USM/ MDMR collaborative National Fish and Wildlife Federation/ Mississippi Department of Environmental Quality Grant to assess red snapper in our state waters. This project uses vertical longline fishing gear to catch fish at artificial reef sites and Mississippi-managed reef permit zones. All fish are assessed for age, growth, reproduction, diet, and trophic stage. This comprehensive analysis will provide new and vital information on artificial reef ecosystem dynamics in Mississippi and adjacent Gulf waters. More importantly, this research fills a gap in our knowledge of reef fish stocks in these regions. This project will continue through 2020.



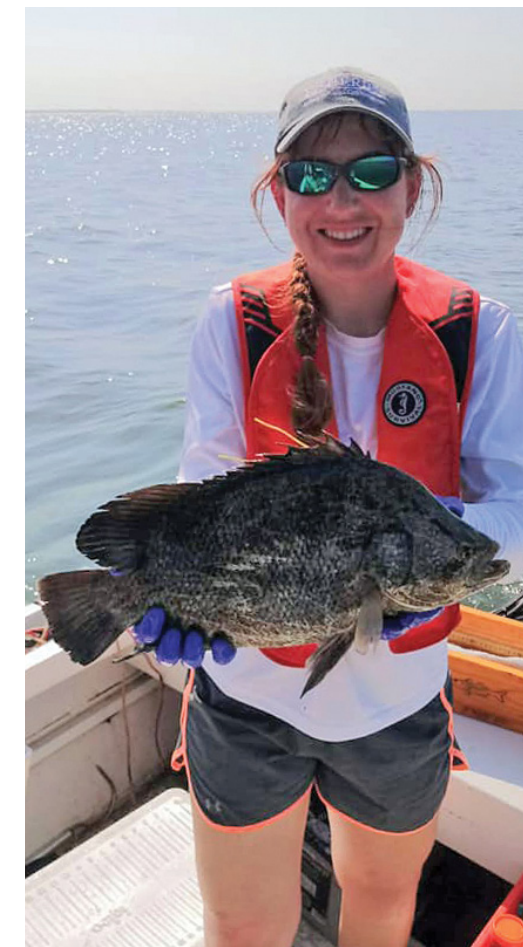
**HARRIET
PERRY**

We are proud to recognize former CFRD Director and current Senior Research Scientist, Harriet Perry, as she received several awards for her distinguished career including:

- **Lifetime Achievement Award** by the Southern Division of the American Fisheries Society
- **Fisheries Conservationist of the Year** by the Mississippi Wildlife Federation
- **President's Fishery Conservation Award** by the American Fisheries Society
- **Second Place Individual Gulf Guardian Award** by the Environmental Protection Agency.

Tripletail (*Lobotes surinamensis*)

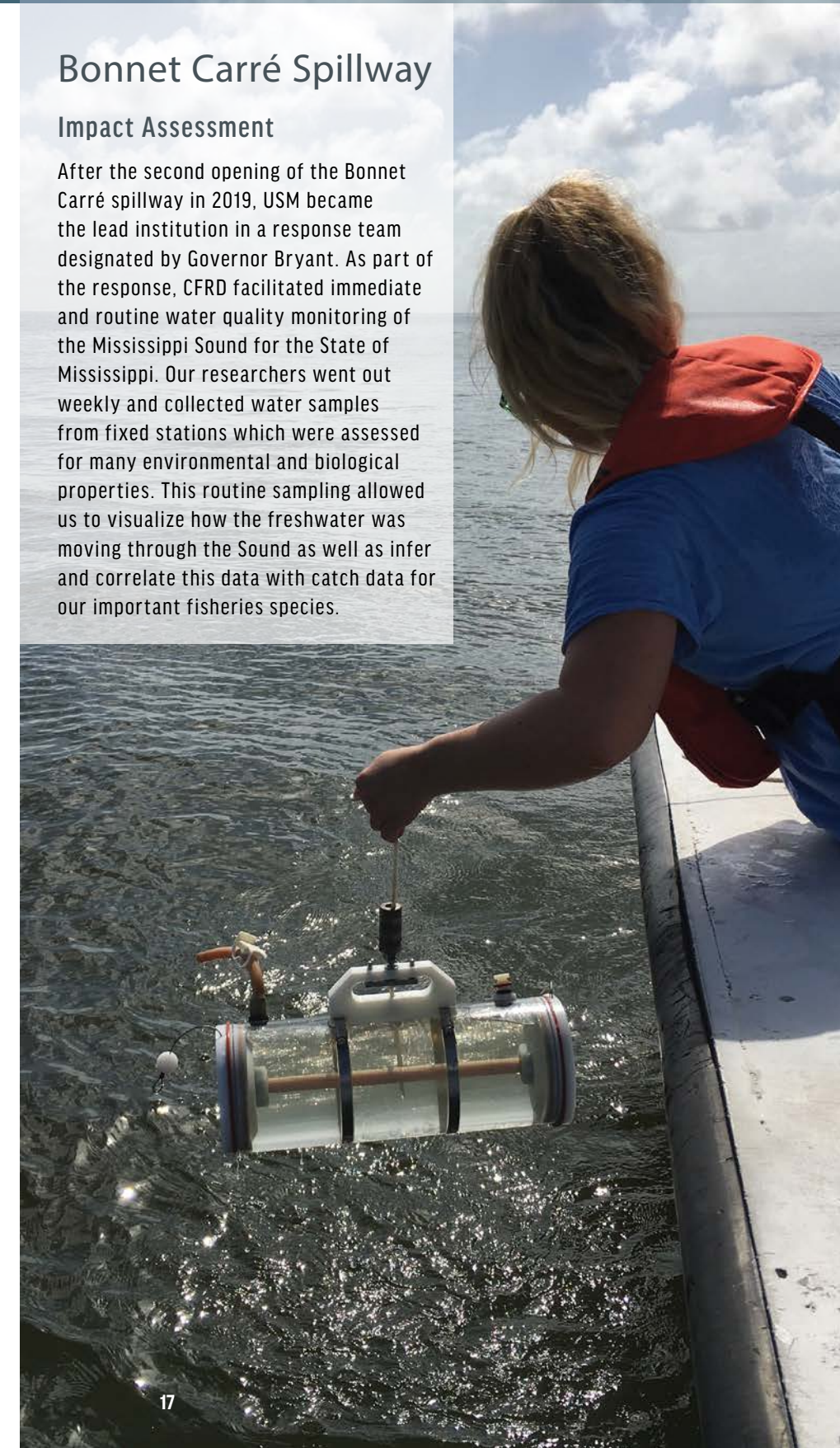
CFRD collaborated with the Gulf States Marine Fisheries Commission to track the migratory movements of Tripletail in the Gulf of Mexico using acoustic telemetry. Tripletail caught in Mississippi coastal waters during summer and the Florida Keys during winter were surgically implanted with an acoustic transmitter. Acoustic receivers positioned throughout the Gulf have the ability to detect the migratory movements of these fish. Using data recorded by those receivers, we hope to determine where each group of Tripletail overwinters and what pathways they use during their migration.



Bonnet Carré Spillway

Impact Assessment

After the second opening of the Bonnet Carré spillway in 2019, USM became the lead institution in a response team designated by Governor Bryant. As part of the response, CFRD facilitated immediate and routine water quality monitoring of the Mississippi Sound for the State of Mississippi. Our researchers went out weekly and collected water samples from fixed stations which were assessed for many environmental and biological properties. This routine sampling allowed us to visualize how the freshwater was moving through the Sound as well as infer and correlate this data with catch data for our important fisheries species.



UNMANNED Maritime Systems Programs



RICH DELGADO
UMS Coordinator

2019 HIGHLIGHTS

Third Graduating Class of the Unmanned Maritime Systems (UMS) Certificate Program

The University's Division of Marine Science held a graduation ceremony at the Marine Research Center (MRC) for 21 students of the third graduating class of the annual Unmanned Maritime Systems (UMS) Certificate Program. The curriculum is the nation's only university-level undergraduate certificate program, and its third cohort brings the total number of graduates to 63, primarily from Navy and NOAA agencies, but also the first from the U.S. Coast Guard.

Naval Undersea Warfare Center (NUWC) Newport conducts harbor protection technology demonstration at Port of Gulfport

NUWC Newport conducted a demonstration and testing of its Argus counter-unmanned vehicle harbor protection system at the Port of Gulfport. Argus is an expeditionary system that deploys to harbors anywhere in the world to protect Navy high value assets like ships and submarines. The March event partnered USM, Naval Meteorology and Oceanography Command, Naval Research Laboratory Stennis, Naval Oceanographic Office, Naval Oceanography Mine Warfare Center, NOAA National Response Team, the Port of Gulfport, and Mississippi Department of Marine Resources.

USM Joins Undersea Technology Innovation Consortium (UTIC)

The University of Southern Mississippi

successfully joined as an academic member of Undersea Technology Innovation Consortium (UTIC). Membership in this recently formed consortium makes USM eligible to submit proposals and preferentially compete for federal grants in undersea maritime sector technology projects including unmanned systems.

USM hosts Gulf Coast portion of Advanced Naval Technology Exercise 2019

The MRC hosted various operations throughout 2019 for the Navy's Undersea Warfare Center (NUWC) Newport Advanced Naval Technology Exercise (ANTX) 2019. For the second straight year ANTX at MRC has been a key proving ground for new maritime technology where the Navy and various companies demonstrated surface and underwater unmanned vehicle capabilities in the context of operational vignettes for maritime security and defense applications.

Researchers establish Unmanned Systems Testing and Evaluation Area

SOSE deployed three ocean mooring systems seaward of Ship Island, Mississippi, as the first instance of an Unmanned Maritime Systems Training, Testing, and Evaluation area as part of a Naval Research Laboratory grant. The three buoys measure weather, ocean, and acoustic parameters to establish a re-locatable, well-measured "ocean cube" in order to conduct research, training, performance evaluation of numerous unmanned underwater and surface vehicles.



SUMMER Field Program

Since 1947, GCRL has delivered immersive field and laboratory courses through the Summer Field Program (SFP).

In 2019, GCRL hosted 91 students from 36 different institutions and 19 states. These students and their instructors faced an unusual challenge. For the first time since its completion in 1931, the Bonnet Carre' Spillway was opened twice in one year to alleviate flooding on the Mississippi River north of New Orleans. The second opening from May 10 to July 27 coincided with SFP classes. Water flowed through Lake Pontchartrain into the Mississippi Sound. Instead of the estuarine gradient students would typically document in their salinity samples, most of the water was nearly fresh. In addition, a Harmful Algal Bloom (HAB) caused closure of all Mississippi beaches and reduced opportunities for

educational cruises within the Sound. However, just as with Hurricane Katrina in 2005 and the Deepwater Horizon Oil Spill in 2010, Summer Field Program instructors adapted and used this event as a teaching opportunity. Field trips shifted to local rivers, the Chandeleur Islands, and waters in Florida and Louisiana not affected by the HAB. The Oceanography class even took a field trip to the Bonnet Carre' Spillway to collect water samples. Students analyzed some of these samples, and returned others to researchers at GCRL for their work monitoring the event. The response of instructors and students highlights the resilience of SFP to changing conditions.



Courses Offered

SUMMER INTERSESSION COURSES

- Barrier Island Ecology, Dr. Christy Philippoff, Mississippi Gulf Coast Community College
- Dolphin and Whale Behavior, Dr. Jeffrey Siegel, Mississippi Gulf Coast Community College
- Coastal Restoration, Dr. Eric Sparks, Mississippi State University

FIRST TERM, JUNE

- Marine Invertebrate Zoology, Dr. Eric Lovely, Arkansas Tech University
- Oceanography, Dr. Jessie Kastler, USM/GCRL
- Shark Biology, Jill Hendon, USM/GCRL
- Marine Conservation, Dr. Ginger Fleer, Texas A&M University - San Antonio

SECOND TERM, JULY

- Marine Animal Behavior, Dr. Ginger Fleer, Texas A&M University - San Antonio
- Marine Biology, Dr. Jesse Filbrun, Eastern New Mexico University
- Marine Ichthyology, Dr. Mike Andres, USM/GCRL
- Marine Mammals, Dr. Peter Adam, Northwest Missouri State University

GULF COAST Research Laboratory



READ HENDON
SOSE Associate Director
for GCRL

The Gulf Coast Research Laboratory (GCRL) was established by the Mississippi Legislature in 1948 to serve as the state's designated marine laboratory and was incorporated into The University of Southern Mississippi four decades later. Through the University and SOSE, the GCRL provides a platform for academic and research excellence in all fields associated with marine and coastal environments. The GCRL is one of the largest marine laboratories in the southeastern United States and provides more than 250,000 square feet of diverse laboratory, teaching, aquaculture and administrative space to support research and academic priorities on the 50-acre Halstead and 224-acre Cedar Point campuses. Large vessel operations for the 97-foot R/V *Tommy Munro* and 60-foot R/V *Jim Franks* are conducted from the GCRL Point Cadet site in Biloxi.



As USM operations at GCRL move forward, many challenges and critical needs remain, but much has been accomplished since the Laboratory's incorporation into the School of Ocean Science and Engineering.

The foreseeable future will bring the addition of a new oyster aquaculture facility to the GCRL Cedar Point campus. This combination of aquaculture, laboratory and office space will be a unique structure designed specifically to support larval production needs for the state's oyster restoration efforts and to support innovative research and graduate student training in the field of marine aquaculture.

The past five years have yielded significant growth and improvements to infrastructure and operations at the GCRL in an effort to increase the quality of support and resources available to USM faculty, staff and students.

A Five-Year Lookback

Rebuilding Finalized after Hurricane Katrina Loss

During the past five years, GCRL has finally fully recovered from the destruction of Hurricane Katrina fifteen years ago, with the completion of the 13,000 square foot Toxicology Building in spring of 2017 (\$4.9M, FEMA and GCRL funds) and completion of the 30,000 square foot Marine Education Center in early 2018 (\$16.1M, FEMA and MDMR funds). Those facilities are now fully operational, conducting cutting-edge marine toxicology research and educating multiple generations of citizens – and our next generation of scientists – about the value of our coastal and marine ecosystems.



Caylor Building Sees Major Renovations

Through support from our legislative delegates, a major \$1.9M renovation to the Caylor Building on the Halstead Campus was completed in 2019 to replace aging mechanical systems and enhance energy-efficiency. The Caylor Building houses the Gunter Library and Mississippi-Alabama Sea Grant Consortium and provides laboratory and classroom space for the Division of Coastal Sciences. Improvements to the Dormitory on Halstead were also able to be accomplished through this R&R project.

Halstead Harbor Water Access

GCRL continues to collaborate with our legislators and local municipal leaders to address issues of mutual interest with regard to water access. Coordination with the City of Ocean Springs is ongoing for a phased project to improve infrastructure at the Halstead harbor in order to provide for public use of the harbor launch for water access. At present, this project is in the planning and funding stage of Phase 2, which will include replacement of the eastern section of the bulkhead and pier. Additionally, dredging needs for vessel access to the GCRL Halstead harbor continue to be discussed with Jackson County in an effort to return the R/V *Jim Franks* to its permanent homeport at the Halstead Campus.

While direct water access and infrastructure is a critical need for a marine laboratory, this proximity can also pose a greater risk to infrastructure from tropical systems and sea level rise. As such, GCRL has undertaken various projects at its Halstead and Point Cadet harbor locations to prevent damage and equipment loss during future storm events. Those preventative

measures have been funded through institutional resources and disaster recovery proceeds from recent tropical storm events. The Halstead and Point Cadet harbor locations comprise the only GCRL sites with infrastructure still actively in use in low-lying areas, as is typically necessary for shore-based vessel support.

GCRL Museum Receives NSF Funding for Upgrades

Another project, enacted through funding awarded by the National Science Foundation, was completed in 2017 to centralize the GCRL Museum's vast fish and invertebrate collection and provide necessary safety upgrades. Incorporation of compactorized shelving allowed for all Museum inventory and space to be reduced from multiple spaces in two buildings to one consolidated area in the Research Building on GCRL Halstead. This project ultimately freed up almost 1,000 square feet of space in the Oceanography Building for future academic and research needs.



RESEARCH Vessels



TIFFANY MCNEESE
*Manager
 Vessel Operations*

The Vessel Operations department at The University of Southern Mississippi acts as a nonprofit support center with the goal to provide additional resources to help aid in research, education, and outreach programs along the Gulf Coast. The use of large vessels at USM enhances and expands the high-quality education and research opportunities the university is able to provide as a leading marine science institution, while providing valuable benefits to our community and associated marine economy.

Miss Peetsy B

CAPTAIN: JOHN WENTWORTH

The *Miss Peetsy B* is a 34-foot passenger vessel with a capacity of 34. The boat was originally donated to The University of Southern Mississippi by Jimmy Buffett and his sisters in honor of their mother, who had a passion for education. The vessel is used primarily by GCRL's Marine Education Center for outreach programs with local schools and summer camps.

Sea Days: 42

Research: 0%

Education: 21.5%

Outreach: 78.5%

2043 passengers

R/V Jim Franks

CAPTAIN: RICHARD BLOCK

The *R/V Jim Franks* is the newest addition to the USM fleet, joining the ranks in early 2016. This vessel is a 60-foot aluminum catamaran designed specifically to meet the needs of USM research and educational platforms. The vessel has a max capacity

of 40 passengers and is equipped for both day cruises and overnight trips. Some of the projects conducted onboard the *R/V Jim Franks* have included long-lining, water quality testing, instrumentation deployment, and surveying of the barrier islands.

Sea Days: 91

Research: 52.7%

Education: 26.3%

Outreach: 21%

1231 passengers

R/V Tommy Munro

CAPTAIN: JOSHUA WHITE

The *R/V Tommy Munro* was a bankruptcy project salvaged from a shipyard in Tampa, FL. After years of the vessel sitting idle and only partially constructed, it was determined that the boat could be completed and put to use at Gulf Coast Research Laboratory. GCRL took delivery of the 97-foot oceanographic research vessel in 1981. Today, the boat is used primarily for offshore research in the Gulf of Mexico, to include trawling surveys, side-scan

work, oceanographic research, seismic research, and much more.

Sea Days: 78

Research: 100%

Education: 0

Outreach: 0

79 passengers

R/V Point Sur

CAPTAIN: NICHOLAS ALLEN

In February 2015, The University of Southern Mississippi purchased the *R/V Point Sur* research vessel from San Jose State University through a \$1 million grant provided by the Mississippi Department of Environmental Quality.

Built in 1980, the 135-foot-long vessel accommodates 13 researchers and technicians and a crew of eight, while housing a 1,110-square-foot deck that includes a primary and wet laboratory. For day cruises, the *R/V Point Sur* has a capacity of 40 researchers. The vessel sports a cruising speed of 9.5 knots and a range of 6,800 nautical miles at 10 knots.

Sea Days: 139

Research Days: 132

Education Days: 7

Sixty-four years of service

The *R/V HERMES*, commissioned in 1955 by Kramer Marine, was taken out of service in 2019 after 64 years on the water with Gulf Coast Research Laboratory.

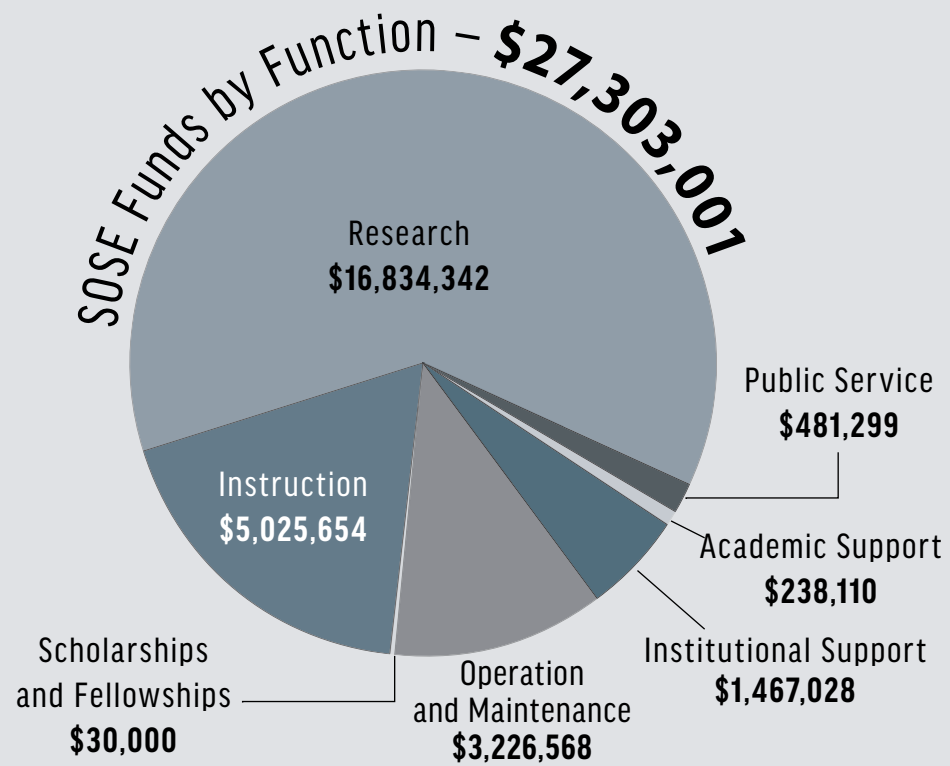


The vessel provided transport for thousands of students and scientists over its lifetime and will be fondly remembered by everyone. A decommissioning ceremony will be held in 2020 to commemorate its many years of service to GCRL.



Annual Revenue for *Miss Peetsy B*,
R/V Jim Franks and *R/V Tommy Munro*
\$1,126,263

FINANCIALS 2019



LOCATIONS

GULF COAST RESEARCH LABORATORY

Research and academics at GCRL's 275-acre sites focus on coastal ecology, aquatic health, fisheries and fisheries oceanography, marine aquaculture, and outreach and education through the Division of Coastal Sciences, the Center for Fisheries Research and Development, the Marine Education Center, and the Thad Cochran Marine Aquaculture Research Center.

- **HALSTEAD** – This 50-acre site is the original GCRL location on Davis Bayou in Ocean Springs, Mississippi. Numerous academic, research and administrative units are located at this site, including dormitory, dining and classroom facilities supporting the long-running Summer Field Program. The Halstead harbor is home to the *R/V Jim Franks*, *R/V Hermes* and *Miss Peetsy B*, and its boat launch supports small boat research and academic operations.
- **CEDAR POINT** – Cedar Point encompasses 225 acres adjacent to the National Park Service's Gulf Islands National Seashore in eastern Ocean Springs. Within Cedar Point is the new Marine Education Center and Toxicology facility. Situated on 100 acres, the Marine Education Center serves as the education and outreach arm of GCRL and provides an immersion experience for participants in a unique, coastal setting. Research in the \$5 million Toxicology lab focuses on the effects of anthropogenic substances on aquatic or marine species. The researchers focus on three key areas: nanotoxicology, toxicogenomics, and the effects of the *Deepwater Horizon* oil spill.

JOHN C. STENNIS SPACE CENTER

The John C. Stennis Space Center in Hancock County, Mississippi houses the University's Division of Marine Science and the Hydrographic Science Research Center. Division faculty conduct research that spans the global oceans while offering graduate programs in marine science and hydrographic science, and undergraduate programs in marine science and ocean engineering. The division also offers the first Unmanned Maritime Systems Certification in the United States.

POINT CADET

Point Cadet in Biloxi, Mississippi, serves as a teaching and research vessel staging site for the Gulf Coast Research Laboratory and is the homeport of the *R/V Tommy Munro*.

PORT OF GULFPORT

The Port of Gulfport is a 250-acre deepwater port and an inland port facility in Gulfport, Mississippi, and is home to the University's largest research vessel, the *R/V Point Sur*. The Port of Gulfport is also home to the \$12.2-million Marine Research Center (MRC). Located on Highway 90 at the Port's entrance, the Marine Research Center is the centerpiece for a new maritime blue economy in South Mississippi. The MRC provides shoreside support to USM's 135-foot oceanographic research vessel, the *R/V Point Sur*, and to a number of academic and research programs.

LEADERSHIP Team 2019



BRIAN CONNON
DIRECTOR
Hydrographic
Science Research
Center



RICH DELGADO
COORDINATOR
Unmanned
Maritime Systems



JOE GRIFFITT
DIRECTOR
SOSE



LEILA HAMDAN
INTERIM
ASSOCIATE DIRECTOR
SOSE



JILL HENDON
INTERIM DIRECTOR
Center for Fisheries
Research and
Development



READ HENDON
ASSOCIATE
DIRECTOR
GCRL



KELLY LUCAS
DIRECTOR
Thad Cochran
Marine Aquaculture
Center



PAM MOELLER
DIRECTOR
External Relations



**HEATHER
RICHEY**
DIRECTOR
ASSISTANT



AMANDA SEYMOUR
DIRECTOR
Finance
Administration



CHRIS SNYDER
DIRECTOR
Marine Education
Center



JERRY WIGGERT
ASSOCIATE
DIRECTOR
SOSE

2019 PUBLICATIONS

SOSE Employees and Students in Bold

CENTER FOR FISHERIES RESEARCH AND DEVELOPMENT

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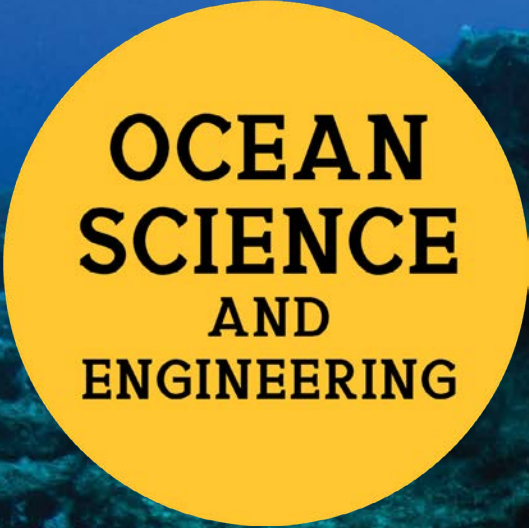
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