THE UNIVERSITY OF SOUTHERN MISSISSIPPI

SCHOOL OF OCEAN SCIENCE AND ENGINEERING

ANNUAL REPORT

2020

GULF COAST RESEARCH LABORATORY

JOHN C. STENNIS SPACE CENTER

MARINE RESEARCH CENTER

TABLE OF CONTENTS

JOE GRIFFITT
DIRECTOR

DEAR FRIENDS,

I'm pleased to present the 2020 Annual Report for the School of Ocean Science and Engineering (SOSE). Here you can see an overview of all the great work that we accomplished in the past year, under very challenging conditions. I hope you will take a few minutes to read through this document to get a full sense of all the wonderful things we did in SOSE over the last year and take a moment to celebrate the incredible work and dedication that this represents.

2020 was certainly a most unusual year for all of us across the globe, and the faculty, staff, and students of SOSE were no exception. Late in 2019, we first started hearing reports about a new virus spreading rapidly halfway across the world, but there was no immediate need for alarm. When the calendar turned to a new year, though, it became apparent that SARS-CoV-2, the virus responsible for causing COVID-19, was going to be taking an awful lot of our attention. As the virus spread across the planet, the scale and magnitude of what we were facing started to become clear. What was perhaps the greatest public health crisis since the AIDS pandemic of the 1980s and 1990s shaped every aspect of our lives, professional and personal, over the last year. Suddenly we were teaching classes from the kitchen table while helping our children go to school virtually; writing papers and proposals while helping neighbors and relatives go to the grocery store; and trying to figure out how to safely work and live in the new reality of the pandemic.

While the virus spread throughout the world, the U.S., and our communities, SOSE scientists and staff were faced with the need to revise the way in which we lived, worked, taught classes, trained students, and conducted research. We rapidly implemented safety protocols that allowed us to continue some operations while prioritizing efforts to keep our families, friends, and colleagues safe. Classes moved mostly online, labs were operating at reduced capacity, and travel was restricted, but we were still working, learning, and teaching.

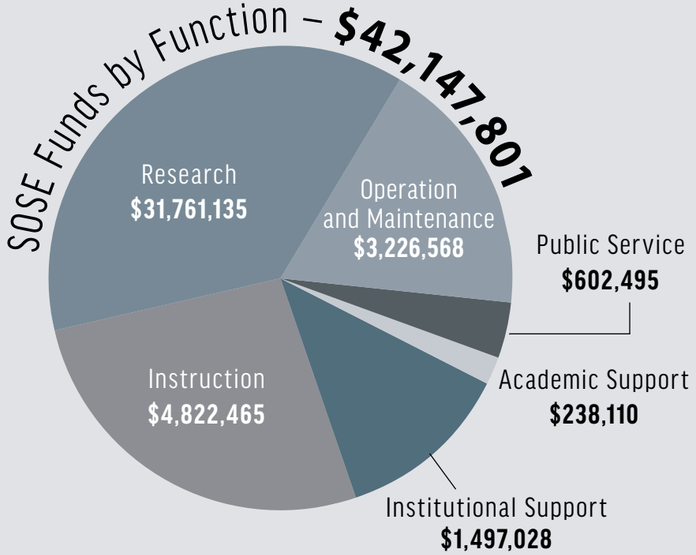
It was not all bad news in 2020. Even under the shadow of COVID-19 many good and positive things happened in SOSE last year. The keel laying ceremony for the new National Science Foundation Regional Class Research Vessel, the R/V *Gilbert R Mason* was held on April 16. This vessel, slated for arrival in 2023, will represent a tremendous advance in the research that our scientists and colleagues can conduct in the Gulf of Mexico. The Mississippi Based RESTORE Act Center of Excellence (MBRACE) awarded $2.75 million dollars to regional researchers to understand the interactions between water quality and oyster reef sustainability. Our Hydrographic Science program, one of only two in the country, continued to grow in enrollment and graduation. SOSE scientists authored 79 publications, submitted 77 proposals, and received more than $16 million in external funding over the course of 2020. While we are always a highly active school by any measure, the fact that we were able to maintain this level of productivity speaks to how dedicated the scientists in SOSE are at understanding the marine environment and the interactions between people and the sea.

Later in 2020, USM announced the next phase of the coastal refocusing, aimed at strengthening our presence and activities on the coast around the three pillars of Understanding the Ocean and Coasts, Improving Coastal Resilience, and Supporting the Blue Economy. As part of this refocusing, the Gulf Coast Research Laboratory and the research centers that had previously been housed within SOSE were placed under a new administrative structure headed by the newly appointed associate vice president for research for Coastal Operations, Dr. Kelly Lucas. Dr. Lucas has served as the director of the Thad Cochran Marine Aquaculture Center, so she is very familiar with USM Coastal Operations and SOSE.

While the names may have changed slightly, all the people, expertise, and passion that made USM the leader for marine research in the Gulf of Mexico are still here, and the School of Ocean Science and Engineering is proud to fulfill its role in making that presence bigger, better, and stronger.

Southern Miss To The Top!

FINANCIALS



Where can we be found?

GULF COAST RESEARCH LABORATORY

Research and academics at GCRL's 275-acre site 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* 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 Building. 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 Uncrewed 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.

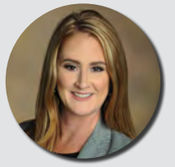
LEADERSHIP TEAM

BRIAN CONNON
DIRECTOR
Hydrographic Science Research Center

JOE GRIFFITT
DIRECTOR
SOSE

JILL HENDON
INTERIM DIRECTOR
Center for Fisheries Research and Development

JESSICA KASTLER
INTERIM DIRECTOR
Marine Education Center



PAM MOELLER
DIRECTOR
External Relations

AMANDA SEYMOUR
DIRECTOR
Finance Administration

RICH DELGADO
COORDINATOR
Unmanned Maritime Systems

LEILA HAMDAN
ASSOCIATE DIRECTOR
SOSE

READ HENDON
ASSOCIATE DIRECTOR
GCRL

KELLY LUCAS
DIRECTOR
Thad Cochran Marine Aquaculture Center

HEATHER RICHEY
DIRECTOR ASSISTANT

JERRY WIGGERT
ASSOCIATE DIRECTOR
SOSE

2020 Highlights

New NOAA Program to Support and Expand Agency's Use of **UNCREWED SYSTEMS**

NOAA is establishing a new Uncrewed Systems Operations Program to support the rapidly expanding use of these systems across the agency. The new program will promote the safe, efficient and economical operation of uncrewed systems (UxS) NOAA uses to collect high-quality environmental data for the agency's science, products and services.

UxS are sensor-equipped vehicles that operate autonomously or are remotely piloted. NOAA currently uses UxS for seafloor and habitat mapping, ocean exploration, marine mammal and fishery stock assessments, emergency response, and at-sea observations that improve forecasting of extreme events, such as harmful algal blooms and hypoxia.

The Uncrewed Systems Operations Program is being established within NOAA's Office of Marine and Aviation Operations (OMAO), which operates, manages, and maintains the agency's fleet of ships and aircraft and oversees NOAA's diving and small boat safety programs. Its services will include training, cybersecurity, acquisition, and other expert support to ensure safe, cost-effective operations across the agency.

The new program will be housed at two locations. The NOAA Aircraft Operations Center in Lakeland, Florida, will continue to support the agency's uncrewed aircraft activities. A new facility being built by the Mississippi State Port Authority in partnership with The University of Southern Mississippi in Gulfport, Mississippi, will support uncrewed maritime systems.

NOAA received $12.7 million from Congress in fiscal year 2020 to improve and expand UxS operations across the agency, including the creation of the new program – a key goal of NOAA's recently released Uncrewed Systems Strategy. The program will also help meet the objectives of the Commercial Engagement Through Ocean Technology Act of 2018, which requires NOAA to coordinate research, assess, and acquire uncrewed marine systems with the U.S. Navy, other federal agencies, industry, and academia.

MBRACE to Award $2.75 million in Funding for **RESEARCH PROJECTS**

The Mississippi Based RESTORE Act Center of Excellence (MBRACE) is awarding $2.75 million for research on water quality and oyster reef sustainability in Mississippi. Four different projects will receive funding through 2022, with The University of Southern Mississippi being the lead institution on two of the projects.

MBRACE is one of six Centers of Excellence Research Grants Programs (CERGP) established in the Gulf of Mexico following the *Deepwater Horizon* oil spill and is designated as the Center of Excellence for Mississippi. The CERGP program allocates $26 million in funds from the RESTORE Act Trust Fund managed by the U.S. Department of the Treasury, through the Mississippi Department of Environmental Quality (MDEQ), to MBRACE to support science, technology, and monitoring within the Gulf of Mexico region.

MBRACE is a consortium of Mississippi's four research universities (Jackson State University, Mississippi State University, The University of Mississippi, and USM, the latter serving as lead institution).

MBRACE
Mississippi Based RESTORE Act Center of Excellence

> "Funding of these projects represents the next step in the growth of MBRACE to provide the state and region with innovative research to guide successful restoration activities and inform management actions."
>
> **DR. READ HENDON**
> *Associate Director, Gulf Coast Research Laboratory and Chair of the MBRACE Executive Steering Committee*

USM's Marine Education Center Named Best in Country for **ARCHITECTURAL DESIGN**

The American Institute of Architects (AIA) recognized the design team of USM's Marine Education Center (MEC), located in Ocean Springs, Mississippi, with one of its highly sought-after Committee on the Environment (COTE) Top Ten Awards. The MEC is the only building in Mississippi to ever receive this designation, which awards 10 outstanding projects each year based on design excellence with environmental performance. This award is designated as one of the industry's best-known programs for recognition of sustainable design excellence.

The COTE Top Ten award establishes USM, specifically the School of Ocean Science and Engineering (SOSE) and the Marine Education Center, as a leader in innovative informal education. The recognition could potentially lead thousands to visit the site where they will learn about SOSE research.

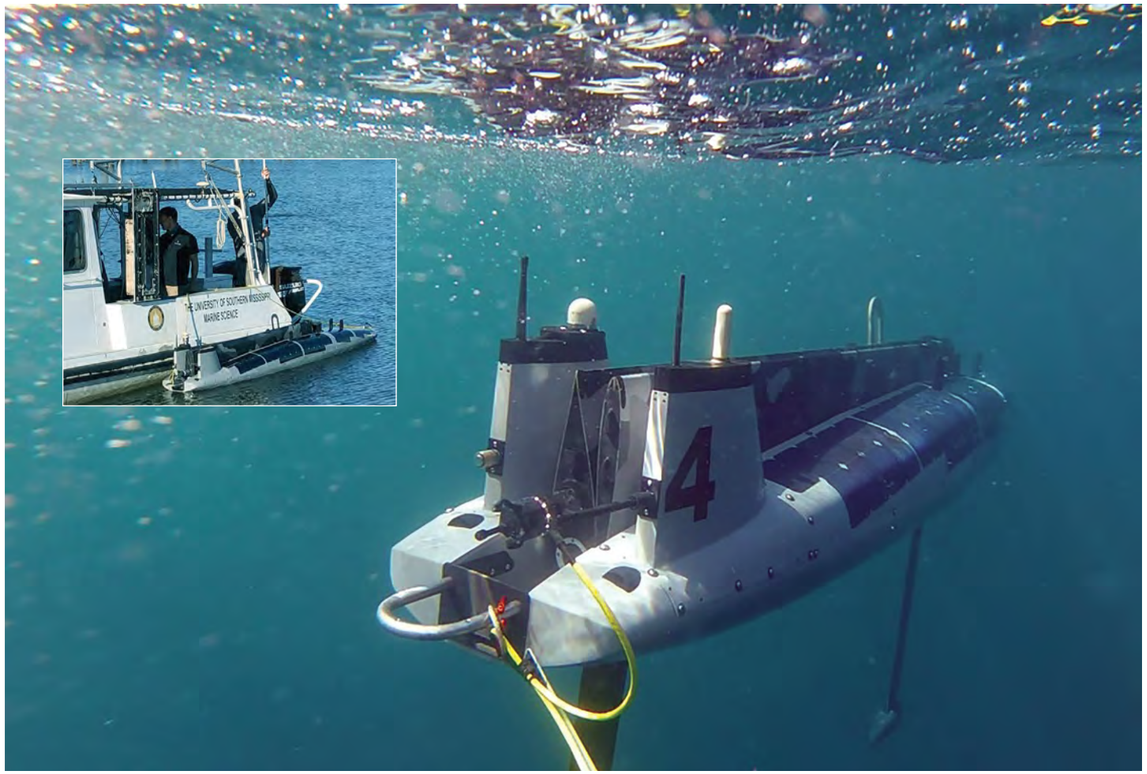
Governor Tate Reeves Announces U.S. Treasury Approves $7.6 Million Grant for **USM OYSTER HATCHERY**

Governor Tate Reeves announced in August that the U.S. Department of the Treasury has approved a RESTORE Act grant award of $7.62 million for the construction of The University of Southern Mississippi Oyster Hatchery and Research Center, located at USM's Gulf Coast Research Laboratory at Cedar Point in Ocean Springs. The grant is administered by the Mississippi Department of Environmental Quality (MDEQ).

The center in Ocean Springs will support the state's oyster restoration efforts by producing oyster larvae and conducting oyster aquaculture research. The preliminary design includes hatchery and oyster larvae production space, algae (feedstock) cultivation space, a laboratory, and support office space.

The center is currently in the design phase, and it is anticipated that USM will provide approximately $1.2 million in state funding for facility construction costs in addition to the RESTORE Act funding. An additional $4 million in RESTORE Act funding was included in MDEQ's restoration planning for procurement and installation of the aquaculture systems equipment but has not yet been submitted to the U.S Department of the Treasury pending final design.

These funds are part of the RESTORE Act's Direct Component or "Bucket 1." In the RESTORE Act, 35 percent of the total funds are reserved for Bucket 1 projects and are divided equally among the five Gulf Coast states for ecological and economic restoration. Eligible activities include restoration and protection of natural resources; mitigation of damage to natural resources; workforce development and job creation; improvements to state parks; infrastructure projects, including ports; coastal flood protection; and promotion of tourism and Gulf seafood.



Acceptance Testing of the **TRITON AUTONOMOUS MARITIME VEHICLE** Complete

Ocean Aero, Inc. was in Gulfport, Miss., November 4, 2020, delivering the first Triton autonomous maritime vehicle to The University of Southern Mississippi (USM) Marine Research Center (MRC). Ocean Aero is manufacturing six Triton systems for the Department of Homeland Security (DHS) Science and Technology Directorate (S&T) for research and testing to support maritime protection and law enforcement operations. Cherokee Nation Strategic Programs, LLC (CNSP) is the prime contractor to DHS S&T responsible for acquiring the Triton test systems and designing the logistics management process for evaluating, testing, and sustaining the vehicles.

The successful delivery of the first Triton system is a major project accomplishment. Since the system was ordered in early 2020, the Ocean Aero team was able to maintain the production and testing schedule while meeting all COVID-19 safety requirements during manufacturing and delivery. By meeting the first delivery goal in early November, the project stays on schedule with a new Triton unit coming off of the production line every month until the DHS S&T order of six systems is fulfilled in early 2021.

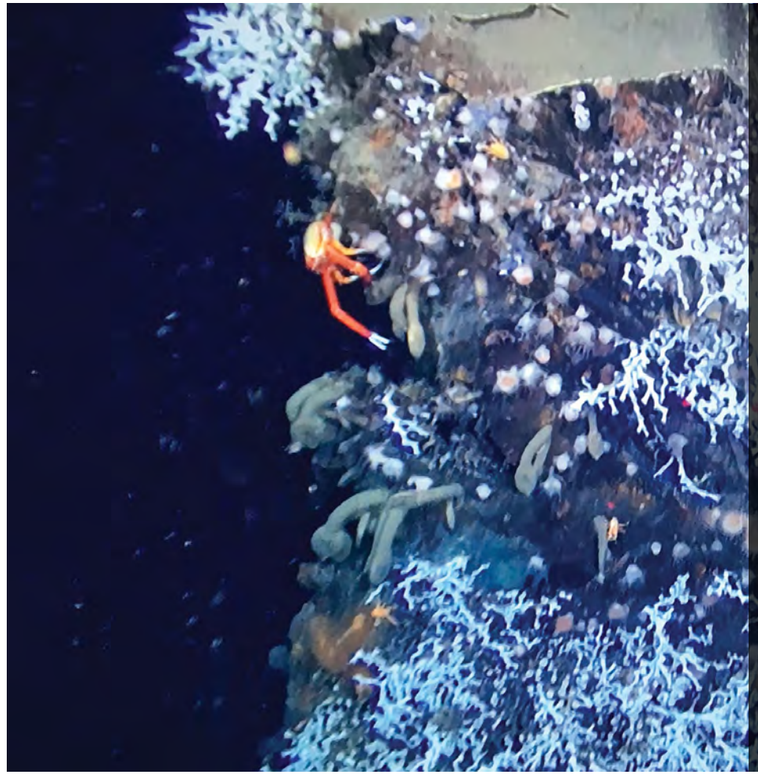
The research team of CNSP, USM, and Ocean Aero designed an Acceptance Test Plan to validate the delivery of the Commercial Off-the-Shelf (COTS) product. This plan used the unique resources of the USM MRC to access testing areas around the Port of Gulfport to put the Triton system through a series of test cases that exercised each of the baseline capabilities of the vehicle. USM facilities provided an ideal location for demonstrating the surface and subsurface features of the Triton system, while also allowing the government team and data collection staff the chance to observe the tests while maintaining proper COVID-19 distancing.

The CNSP team brings a long history of test and evaluation of uncrewed systems technologies across multiple domains. It was exciting to see the Triton system perform so well and accomplish all of the acceptance tests on the first day of testing. This is a great indication of the long-term results that DHS can expect from this project and the team that is assembled to deliver those results.

R/V *Gilbert R. Mason* KEEL LAYING

On March 3, 2020, a keel laying ceremony was held at the Municipal Auditorium in Houma, La., for USM's Regional Class Research Vessel, R/V *Gilbert R. Mason*. The R/V *Mason* will be operated by the Gulf-Caribbean Oceanographic Consortium led by The University of Southern Mississippi and the Louisiana Universities Marine Consortium (LUMCON). Many of Dr. Gilbert Mason's family members, as well as several dignitaries from both Mississippi and Louisiana, attended the event. Dr. Mason's granddaughter, Aria Mason, the ship's sponsor, provided an inspirational keynote speech. In her speech, Ms. Mason talked of how her grandfather inspired her through his passion for oceanographic research, as well as his work to secure equal access to the Mississippi coast and the sea for all residents.

Ms. Aria Mason's initials are welded in a plate that will be affixed to the keel of R/V *Gilbert R. Mason*.



The Hydrographic Science Research Center scientists and engineers, together with marine science faculty and students, conducted a research cruise onboard R/V *Point Sur*, associated with the NOAA-funded Ocean Exploration Cooperative Institute. High-resolution bathymetric and video data were successfully collected over Mountain Top Bank, confirming the presence of thriving corals and a robust benthic community through use of The Eagle Ray and Mola Mola. In addition, an ocean glider was deployed by the team to provide critical ocean parameters during hurricane season as part of the Integrated Ocean Observing System hurricane glider initiative.

UNIVERSITY VESSELS

USM has a fleet of four research vessels. 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 students, community, and associated marine economy. Note that sea days listed below were impacted by cruise delays or cancellations associated with COVID-19.

MISS PEETSY B

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. The vessel is used primarily by GCRL's Marine Education Center for outreach programs.

SEA DAYS: 9 I OUTREACH: 100% PASSENGERS: 418

R/V *JIM FRANKS*

The R/V *Jim Franks* 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.

SEA DAYS: 29 I RESEARCH: 100% PASSENGERS: 126

R/V *TOMMY MUNRO*

GCRL took delivery of the 97-foot R/V *Tommy Munro* in 1981. The vessel is used primarily for offshore research in the Gulf of Mexico and has been a platform for the Southeast Area Monitoring and Assessment Program (SEAMAP) for decades.

SEA DAYS: 17 I RESEARCH: 100% PASSENGERS: 14

R/V *POINT SUR*

Built in 1980, the R/V *Point Sur* is a 135-foot-long vessel accommodating 16 researchers and technicians and a crew of eight, while housing a 1,110-square-foot deck that includes a primary and wet laboratory.

SEA DAYS: 65 RESEARCH DAYS

DR. LEILA HAMDAN
Associate Director

47 STUDENTS

18 FACULTY

49 STAFF

Division of **COASTAL** Sciences

The faculty members in USM's Division of Coastal Sciences are engaged in research and education that focuses on near- and off-shore environments, aquaculture, ecosystem health, toxicology, social science, and policy. The work of the division in various aspects of the biology and chemistry of coastal and marine systems spans microbes to fisheries.

The Coastal Sciences faculty, widely recognized for their expertise, authored 44 peer-reviewed interdisciplinary publications in 2020 and continue to serve on regional, national, and international councils, advisory panels, and elected positions in professional societies in a variety of leadership and service roles. Faculty and staff in the division continued to strive for excellence in education, research, and service to USM, the scientific community, and society and work collaboratively across the coast. Forty-seven doctoral and master's degree-seeking graduate students collaborated with the faculty on 18 new externally funded awards totaling over $4 million in 2020 alone.

The division welcomed two new faculty members, Dr. Leslie Acton and Dr. Luke Fairbanks, both with expertise in the study of how marine and coastal people, spaces, and resources interact. Their work supports SOSE's goals of creating transdisciplinary knowledge that leads to policies and practices that support healthy coastal communities, economies, and ecosystems.

Because of our commitment to creating access to education and careers in coastal and marine science, faculty, staff, and students in Coastal Sciences collaborated with staff from CFRD on a grant from the USM Foundation to develop a workshop series on improving diversity, equity, inclusion, and retention practices for the school.

Members of Coastal Sciences, spanning students, staff, and faculty, earned recognition from the wider scientific community in a number of ways through 2020.

AWARDS FOR COASTAL SCIENCES MEMBERS

- **DR. ZACK DARNELL**
  Dr. Zack Darnell (Associate Professor) was awarded the Aubrey Keith Lucas and Ella Ginn Lucas Endowment for Faculty Excellence Award and the Butch Oustalet Distinguished Professorship Service Award.

- **DR. LEILA HAMDAN**
  Dr. Leila Hamdan (Associate Professor and Associate Director) was the recipient of the USM Innovation Award for Basic Research.

MS. RACHEL MUGGE
Ms. Rachel Mugge (PhD Student) received the 2020 USM Graduate Assistant of the Year award.

- **DR. KELLY DARNELL**
  Dr. Kelly Darnell (Assistant Research Professor and Director, MBRACE) was awarded $3.68 milliion to support the Mississippi Based RESTORE Act Center of Excellence. Through her leadership, the grant will support Center of Excellence operations for the next two years and provide $2.85 million in research funds for projects addressing oyster sustainability and water quality.

DR. JERRY WIGGERT
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.

109 STUDENTS

18 FACULTY

26 STAFF

The Division of Marine Science faculty, students, and staff made great strides in research in 2020. Just prior to the onset of the pandemic, nearly 30 abstracts were presented by DMS associates at the Ocean Sciences Meeting in San Diego, Calif. (Feb. 16-21). DMS members were also involved in local to global field work at sea.

R/V *Point Sur* was utilized for two campaigns of the Defense Advanced Research Projects Agency (DARPA) "Ocean of Things" program. Between the two cruises, 557 floating ocean sensors were deployed roughly 100 miles offshore from the Mississippi River outlet. The program utilizes low-cost, environmentally friendly, and data intelligent floats that drift for weeks or months at a time as a distributed sensor network to measure ocean temperature, currents, sea state, solar irradiance, GPS health, as well as provide a view of ocean life and vessels. The data from the floats is transmitted daily via Iridium satellite to cloud-based software ashore for data analytic techniques to identify new indicators of ocean dynamics and maritime activity.

AWARDS FOR MARINE SCIENCE MEMBERS

- **ALLIE MOJZIS**
  Allie Mojzis, facility manager for the DMS at Stennis Space Center, was awarded USM's 2019 Gulf Coast Outstanding Staff Award at a virtual Coastal Operations address on August 14, 2020.
- **AMY MOODY**
  Amy Moody was selected for the 2020-21 Marine Science Scholar Fellowship by the DMS faculty and the Graduate School Hall of Fame by the Graduate School.
- **ASHTON JACKSON**
  Hydrographic science student Ashton Jackson was selected to participate in the Ocean Exploration Trust (OET) Science and Engineering Internship in summer 2020.
- **KRISTINA D.A. MOJICA**
  Kristina D.A. Mojica was selected as a faculty fellow in the ACUE Faculty Development Institute at USM for the 2021-22 academic year.
- **LAURA WHITMORE**
  An application by Laura Whitmore, marine science PhD graduate, to the NSF- & NOAA-sponsored Dissertations Symposium in Chemical Oceanography (DISCO) was accepted. This is a biennial symposium of recent PhDs in marine chemistry and is limited to only 25 people.
- **OLADEJI SIYANBOLA** and **AGNO RUBIM DE ASSIS**
  Marine Science PhD student, Oladeji Siyanbola, and master's student (MS, Hydrographic Science), Agno Rubim de Assis, were awarded a 2020 SUT-US Scholarship by the Society for Underwater Technology in the U.S.
- **Drs. Cambazoglu**, **Diercks**, **Griffitt**, **Kastler**, **Wiesenburg**, and **Wiggert** participated as speakers and panelists at the "A salute to the Gulf of Mexico Research Initiative's contribution to the state of science in Mississippi" event. This event honored the Gulf of Mexico Research Initiative (GoMRI) funding science for the past 10 years and so much more—creating partnerships, launching careers, and answering stakeholders' questions about the health of the Gulf of Mexico.

JILL HENDON
Interim Director

CENTER FOR FISHERIES RESEARCH AND DEVELOPMENT

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.

TRIPLETAIL MOVEMENTS

The CFRD, in collaboration with the Gulf States Marine Fisheries Commission, has been researching tripletail movements in the Northern Gulf of Mexico by means of acoustic telemetry. Monitoring seasonal patterns and defining the extent of the northern and southern movements will help us further understand tripletail habitat and the connectivity of the stocks. To date 50 tripletail have been tagged at locations in Mississippi, Florida Bay, and Florida Keys waters. Fish movements are being tracked by deployed acoustic receivers found throughout the northern Gulf.

MISSISSIPPI RED SNAPPER

In 2020, CFRD completed the five-year sampling effort on the USM/MDMR collaborative National Fish and Wildlife Federation/ Mississippi Department of Environmental Quality grant to assess red snapper in Mississippi state waters. Artificial reef sites and Mississippi-managed reef permit areas were fished by vertical longline. All caught fish were assessed for age, growth, reproduction, diet, and trophic stage. This comprehensive analysis will provide vital information on artificial reef ecosystem dynamics in Mississippi waters.

- **Ms. Harriet Perry**, senior research scientist, was awarded the 2020 Lyles-Simpson Award by the Gulf States Marine Fisheries Commission for her contributions to Gulf fisheries over her career. By this honor, her efforts are now recognized among other "fishery giants" of the Gulf.
- CFRD mentored graduate student, **Anna Millender**, was awarded the 1st Place Student Award for her presentation at the 2020 Mississippi Chapter of the American Fisheries Society annual meeting and the Honorable Mention Student Award at the 2020 Southern Division of the American Fisheries Society Annual Meeting.
- **Jeremy Higgs** has become a newly Certified Fisheries Professional, and **Jill Hendon** has been renewed as a Certified Fisheries Professional by the American Fisheries Society.

23 STAFF • 3 GRADUATE STUDENTS SUPPORTED • 14 FUNDED PROJECTS • 13 PUBLICATIONS

BRIAN CONNON
Director

HYDROGRAPHIC SCIENCE RESEARCH CENTER

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.

OYSTER REEF MAPPING

Work was completed 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.

OFFSHORE AQUACULTURE

Surveying and moored current meter measurements were conducted for the finfish aquaculture permitting activity by USM in a partnership with Manna Fish Farms, Inc.

VDATUM

Initial research into validating NOAA's VDatum tool in coastal southeastern Louisiana and southwestern Mississippi culminated in a paper in *Marine Geodesy*.

UNCREWED SYSTEMS

In 2020, research involving uncrewed vessels and aircraft constituted a large part of the activities of the HSRC. Under the Mapping Center grants funded by NOAA's Office of Coast Survey, the *Sea Eagle* was launched and recovered from the R/V *Point Sur* offshore to test 24/7 offshore survey operations and develop procedures for streamlining those operations. Work was done in concert with Saildrone Inc., to improve the capabilities of the Saildrone platform for hydrographic surveying and to prototype an "Arctic-Ready" USV design for USM and NOAA. and an Uncrewed Aircraft System was used to map shallow water bathymetry.

A new three-year grant was funded by the NOAA Integrated Ocean Observing System and Office of Technology Transfer to develop the capability for autonomous hypoxia mapping using C-Worker 5 vessels, such as USM's *Sea Eagle*.

DR. JESSICA KASTLER
Interim Director

MARINE EDUCATION CENTER

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.

The Marine Education Center engages members of the public in ocean sciences through field-based, active learning experiences. Participation in K-12 programs was down by nearly 80% to about 2,000, as a result of COVID-19. Most participants visited the MEC before mid-March. The day after the university began working remotely, MEC staff began developing virtual programs, driven largely by existing grants.

While it was unable to host the National Ocean Science Bowl in person, as scheduled on April 15, the MEC hosted a virtual Career Night with 10 ocean scientists for approximately 100 students on teams that won their regional ocean science bowl. Scheduled teacher training for April was adapted to an online format to recognize the 10th anniversary of the *Deepwater Horizon* oil spill and gave participating teachers a robust activity for virtual science instruction. The EPA Gulf of Mexico Program watershed education and Brown Foundation community resilience projects were also adapted for virtual delivery. Each included multi-day teacher training followed by a series of classroom activities, including interaction between students and MEC staff who provided a virtual field cruise aboard the R/V *Jim Franks*.

The MEC offered three weeklong day camps. Backyard Biology (grades 1-6) and Blue Planet Camp (grades 7-12) were offered via Zoom and Facebook Live. The MEC partnered with the Walter Anderson Museum of Art to offer The Art of Marine Science via Zoom. Campers (grades 7-12) explored the role of oysters in both the ecosystem and human communities in this highly interactive camp. Summer camp virtual programming was supported in part by grants from the Mississippi Alabama Sea Grant Consortium, Mississippi Department of Wildlife, Fisheries, and Parks, and continued sponsorship from Pelagic Research Services and Sharkheads.

The architects of the Marine Education Center continued to receive architectural awards in 2020.

DR. KELLY LUCAS
Director

THAD COCHRAN MARINE AQUACULTURE CENTER

The Thad Cochran Marine Aquaculture Center (TCMAC)is an advanced research unit centrally located in the northern Gulf of Mexico in Ocean Springs, Mississippi, at the Gulf Coast Research Laboratory's Cedar Point research site. Our research focuses on alleviating the bottlenecks that constrain the production of marine species. We work with industry, government, and non-profit organizations to advance sustainable aquaculture on land and in coastal and marine environments.

SPOTTED SEA TROUT (*Cynoscion nebulosus*)
The TCMAC continues to partner with Mississippi Department of Marine Resources (MDMR) and conservation organizations for stock enhancement of spotted sea trout. TCMAC produced over 258 million fertile eggs in 2020.

RED DRUM (*Sciaenops ocellatus*)
Phase 3 of a project to permit an offshore aquaculture farm in the Gulf of Mexico involves the collection and domestication of a stock of brood red drum, to provide a sustainable and reliable source of larvae for fingerling production to stock the permitted farm.

OYSTERS (*Crassostrea virginica*)
Over one million oyster seeds were produced for research programs with excess seed being sold to oyster farmers, and 6,000 oyster shells were set with 900,000 oyster spat for the oyster gardening program.

ALGAE (multiple species)
Peak production for the 2020 season reached an average of 4.0 trillion cells a day of live microalgae feedstock, which met production requirements for both oyster larvae and copepods.

BLUE CRAB (*Callinectes sapidus*)
The blue crab team worked to transfer hatchery and rearing techniques to North Carolina to support their new blue crab farming businesses.

OFFSHORE AQUACULTURE
Offshore permitting for a finfish farm in the Gulf of Mexico project proceeded with engineering modeling for the cage structures and expansion of the bathymetric survey area.

COPEPODS (*Acartia tonsa, Parvocalanus crassirostris*)
Experiments testing the effects of salinity and density on the culture performance of *Acartia tonsa* and *Parvocalanus crassirostris* were completed.

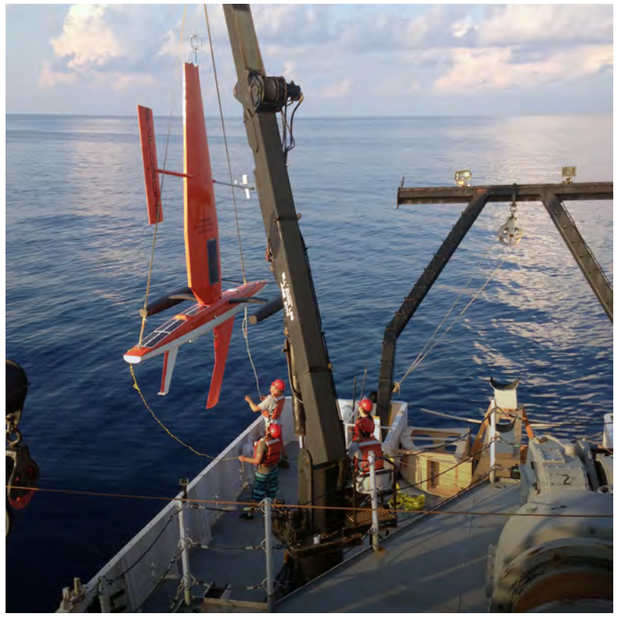
AMYLOODINIUM OCELLATUM
An experiment examining the tolerance of the trophonts of the parasitic dinoflagellate *Amyloodinium ocellatum* to freezing was completed.

UNCREWED MARITIME SYSTEMS PROGRAMS

The Uncrewed Maritime Systems (UMS) certificate program was held for the fourth year in a row beginning in late August 2020.

The class graduated 15 students in a ceremony while observing COVID-19 guidelines. Graduates, guests, faculty, and speakers maintained a six-foot distance and wore masks. The ceremony was also streamed live via Zoom. Through the UMS Certificate program, students learn foundational material in oceanography and ocean engineering principles related to unmanned undersea and surface vehicles (UUVs and USVs), such as powered vehicles and gliders.

The UMS certificate program is unique in that it is the only one of its kind in the nation.



SUMMER FIELD PROGRAM

Summer Field Program was held entirely virtually in 2020 because of COVID-19 restrictions on campus activities. Instructors and teaching assistants found ways to engage students in field and lab activities virtually through production of video near instructors, adoption of field sites near students, at-home demonstrations, and analysis of datasets from previous years. Tropical Storm Cristobal added excitement during the first week of June, while providing a current dataset and illustration of storm effects on the Mississippi Gulf Coast.

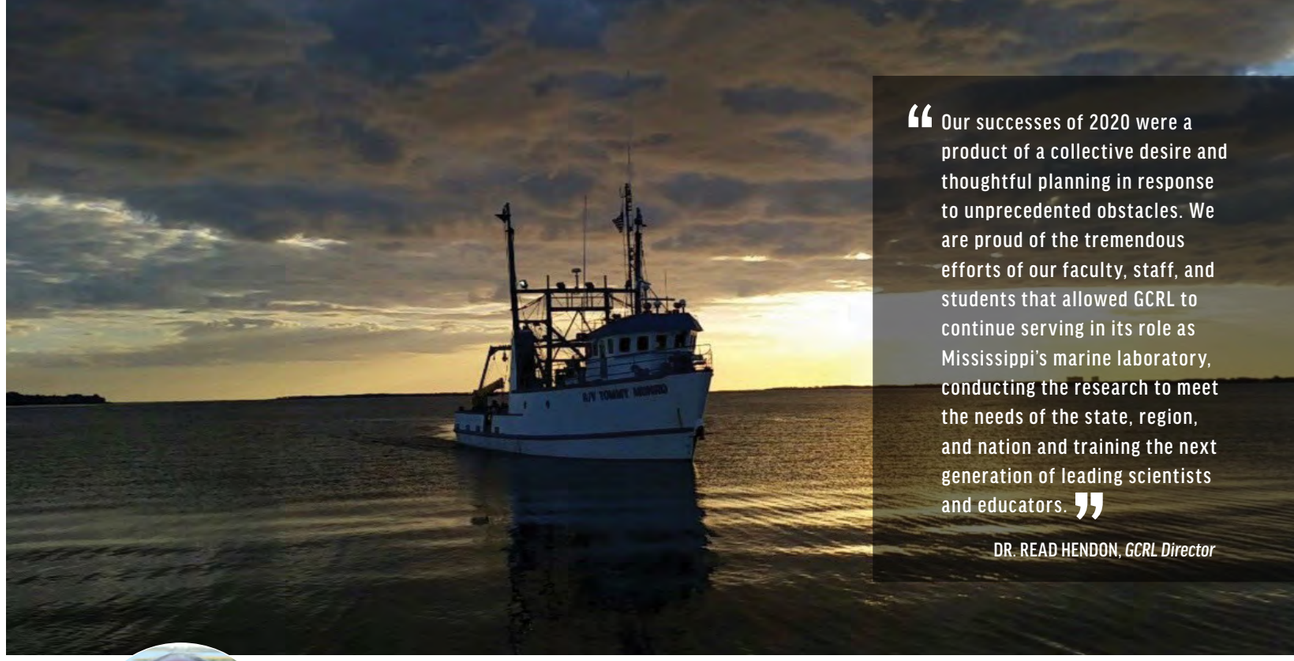
A total of 60 students representing 20 schools earned 498 credit hours in the following courses:

1ST TERM (JUNE)
- Elasmobranch Biology
- Marine Conservation
- Marine Invertebrate Zoology
- Marine Science I – Oceanography

2ND TERM (JULY)
- Marine Animal Behavior
- Marine Ichthyology
- Marine Mammals
- Marine Science II – Marine Biology

Water Level Gauge on Weeks Bayou During 24-hour Data Collection Lab

A Marine Science I - Oceanography instructor collected data hourly during the spring tide in June and sent to students to complete a lab.



> "Our successes of 2020 were a product of a collective desire and thoughtful planning in response to unprecedented obstacles. We are proud of the tremendous efforts of our faculty, staff, and students that allowed GCRL to continue serving in its role as Mississippi's marine laboratory, conducting the research to meet the needs of the state, region, and nation and training the next generation of leading scientists and educators."
>
> DR. READ HENDON, *GCRL Director*

DR. READ HENDON
Director

GULF COAST RESEARCH LABORATORY

The Gulf Coast Research Laboratory (GCRL) is a research and teaching unit of The University of Southern Mississippi dedicated to the advancement of scientific discovery and promotion of academic growth in the fields of marine biology and coastal sciences. The GCRL was established by the Mississippi Legislature in 1948 as the state's designated marine laboratory and was incorporated into The University of Southern Mississippi four decades later.

As was globally experienced in 2020, the COVID-19 pandemic brought numerous challenges to the university and GCRL. Initial impacts to research and academic functions were met with incremental adaptations to mission activities at GCRL, as our faculty, staff, and students adjusted to safely and effectively conducting research, teaching and attending classes, and running day-to-day operations in a mix of virtual and on-site activities. For the first time in decades, college students from across the U.S. could not spend the summer in residence at GCRL participating in field-based Summer Field Program courses. Hundreds of K-12 students were similarly unable to attend Sea Camp at the Marine Education Center, where they would receive hands-on learning about our coastal ecosystem. And routine interactions with the public, through Science Café and other outreach offerings, were shifted to virtual formats.

Two events not associated with the pandemic provided additional challenges in 2020. A fire in the Oceanography Building in late September caused extensive smoke damage inside the facility, resulting in the relocation of all building occupants while remediation and repair work was conducted. One month later, Hurricane Zeta's landfall resulted in additional damage to the Oceanography Building (roof) and impacted marine operations and other facilities at GCRL locations.

Despite these programmatic impacts, lost connections and episodic setbacks, research and associated academic activities at GCRL – in both the field and laboratory – were maintained through the adaptive efforts of our faculty, staff, and students and through the guidance and strong support of the university.

As we move into 2021, GCRL continues to remain poised for growth in the broadest sense. Commencement of construction on the new oyster aquaculture facility at Cedar Point is anticipated by mid-year, and this project will run parallel to plans to improve infrastructure at the Halstead Harbor, as well as continuing efforts to improve existing facilities. Continued growth in research will be achieved internally and externally, as we enhance the collaborations among USM's coastal research units, build and expand programs to meet the scientific needs associated with our dynamic coastal and marine environments, and work with our state, federal, university, private, and community partners to produce research findings which address societal needs. In association with those research programs, GCRL will continue its more than 70 years of dedication to higher education to support and advance our scientific future.

Charting our COASTAL FUTURE

For more than 110 years, The University of Southern Mississippi has delivered high-quality education and research programs that meet the needs of our communities, our state, and our world. And for 73 of those years, our university has included a growing presence on the Mississippi Gulf Coast.

On October 9, 2020, President Rodney Bennett shared the vision, pillars, and initial implementation plan that will no doubt solidify our position as the education and research leader on the Mississippi Gulf Coast

Our vision is for The University of Southern Mississippi's Coastal Operations to be a national leader addressing issues relevant to people in coastal and maritime settings. Three foundational pillars will support this overarching goal and will guide our work to position our academic and research programs along the Coast for even greater distinction and impact:

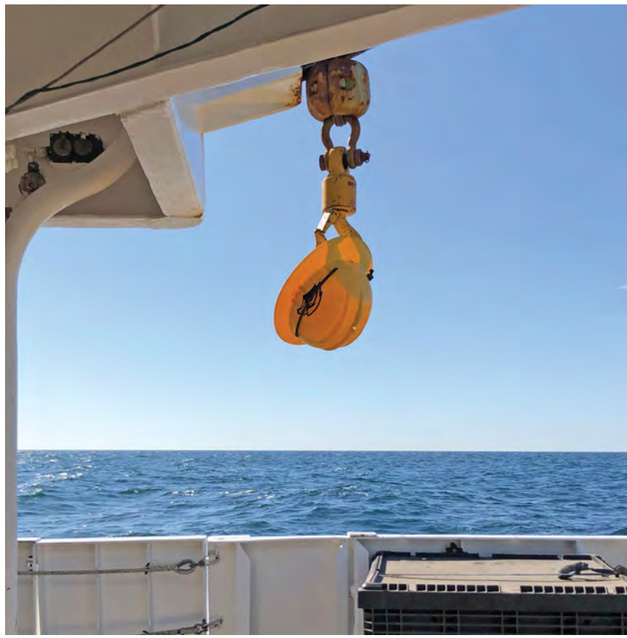
1. Understanding the Ocean and Coasts – which encompasses ocean and coastal ecosystems, from the coastline to the ocean's surface to its deepest depths;
2. Improving Coastal Resilience – which encompasses sustainable community development in the face of hazardous weather events, shifting climate conditions, and associated social, economic, health, and ecological impacts; and,
3. Supporting the Blue Economy – which encompasses the economic conditions and opportunities unique to businesses, industries, and government services that derive economic benefit from ocean and coastal resources.

Organizationally, the university's Coastal Operations will be led by the senior associate vice president for Coastal Operations. This position will be part of the university's senior Leadership Team and will be responsible for the overall planning, coordination, and implementation of our Coastal Operations and initiatives.

Also, a new position of associate vice president for Academic Affairs will oversee all coastal recruitment and advising functions and will manage Academic Affairs programs and initiatives that fall outside of specific academic schools.

Finally, the position of associate vice president for research for Coastal Operations will oversee all coast-based research units and will coordinate all coast-based research functions.

Our focus will be on strengthening existing programs that support local, regional, national, and international demand, and on the development of innovative new academic programs to meet the evolving needs of the coastal maritime sector.



NEW APPOINTMENTS

DR. KELLY LUCAS has been named the associate vice president for research, Coastal Operations.

Lucas has served in that capacity on an interim basis since March of 2020. In her role, Lucas will oversee all coast-based research units and will coordinate all coast-based research functions for the University.

A South Mississippi native, Lucas earned her undergraduate degree (microbiology) from Mississippi State University, her Master of Business Administration degree from the University of Alabama-Birmingham, and her doctorate (coastal sciences) from USM. She worked for USM's Gulf Coast Geospatial Center as a scientist and deputy director from 2008-13 before becoming the chief scientific officer at the Mississippi Department of Marine Resources in 2013. In 2016, she returned to USM as director of the Thad Cochran Marine Aquaculture Center. She will continue to serve in that capacity until a new director is named.

DR. JOSEPH R. (READ) HENDON, longtime marine researcher at The University of Southern Mississippi, has been appointed director of the university's renowned Gulf Coast Research Laboratory.

Hendon has been a research scientist at USM for the past 22 years, serving most of that time in a variety of roles with the Center for Fisheries Research and Development, including as its director. He has most recently served as GCRL associate director.

In his role as GCRL director, Hendon will oversee the day-to-day operations of GCRL and coordinate research activities for GCRL's mission-based units.

A native of Jackson, Miss., Hendon earned his undergraduate degree (1996), his master's degree from (1998), and his doctorate (2013), all from USM.

2020 PUBLICATIONS

SOSE Employees and Students in Bold

CENTER FOR FISHERIES RESEARCH AND DEVELOPMENT

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