



THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

COASTAL RESEARCH

ANNUAL REPORT
2024



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A message from the
**ASSOCIATE VICE
PRESIDENT FOR RESEARCH**



DR. LEILA HAMDAN
Associate Vice President
for Research

USM's coastal research portfolio is the product of the hard work of our research centers and academic divisions. These are places where our work, ideas and innovations are focused, directed and achieved. These coastal units at USM have grown in number through our history and have been molded by time, technology and the needs of society. The core of all of this is people, what they value and who they serve. Through the hard work of USM's coastal research team, we are able to support and protect the coastal environments we rely on for our future well-being and create opportunity in ocean science and the blue economy across the Mississippi Gulf Coast.

Our work shapes the lives of students, creates opportunity for meaningful careers and is injected with the perspectives of our state, federal, industry and community partners. We reflect on a successful year of solution-driven research and look ahead to continued growth and development.

HANCOCK COUNTY

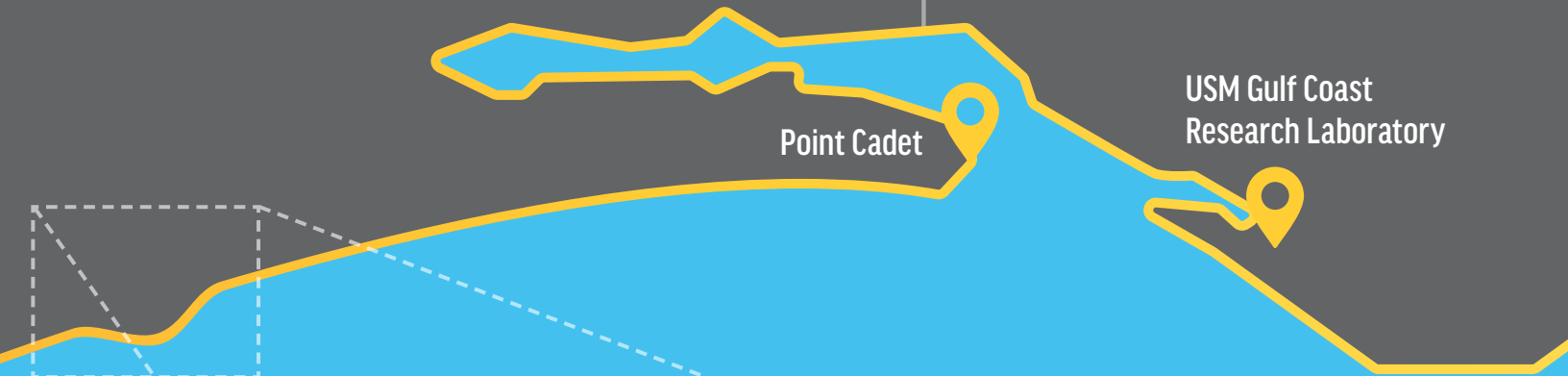
 John C. Stennis
Space Center

USM Gulf Park
Campus 

GULF OF MEXICO

HARRISON COUNTY

JACKSON COUNTY



Point Cadet

USM Gulf Coast
Research Laboratory



Gulf & Ship Island
Building

USM Marine
Research Center

Roger F. Wicker
Center for Ocean
Enterprise

SIGNATURE MOMENTS



Research Day Celebrates Achievements in Scholarship and Creativity

Faculty, staff, and students at USM participated in various research, scholarship and creative activities at the annual USM Research Day in November at the Marine Education Center (MEC). The event showcased dynamic insights into marine science, hydrography, forensic science and health, living up to USM's Carnegie R1 research university ranking.

The gathering brought together staff from all USM campuses for a day-long event. Presentations and interactive activities allowed attendees to explore concepts beyond their areas of study and experience for the love of research and community.

Renewal of NOAA Ocean Exploration Cooperative Institute

USM continued its collaboration with other members of the Ocean Exploration Cooperative Institute (OECI), including the University of Rhode Island, Woods Hole Oceanographic Institution, the University of New Hampshire and the Ocean Exploration Trust, and received word of another five-year renewal. The core activities of the OECI are training the next generation of ocean explorers while using innovative new technologies to explore the ocean. This dynamic collaboration highlights USM's leadership in research and will extend the successful partnership with NOAA, supporting the growing blue economy workforce.



U.S. Army Engineer Research and Development Center (ERDC) Partners with USM for Oyster Reef Restoration

USM and ERDC have partnered to assess oyster reef recovery and restoration efforts developed to aid in oyster population recovery. Additionally, the project evaluates whether the creation of oyster reefs impacts the critical habitat use by Gulf sturgeon, a federally protected species. The next phase involves USM's Gulf Coast Research Laboratory seeking a contractor to augment multiple one-acre oyster reef plots with limestone gravel substrate enhancements in the spring-summer of 2025.



Center for Fisheries Research and Development (CFRD) Partners with Costa Marlin Fly Project

CFRD partnered with the Costa Marlin Fly Project in a film involving Dr. Jim Franks, senior research scientist, and Jeremy Higgs, CFRD assistant director, that was featured in the F3T: Fly Fishing Film Tour. The project took place off Magdalena Bay, Baja California Sur, Mexico, as a Community X Conservation Project to understand and examine striped marlin caught on the fly. Researchers aimed to better understand the fishery's impact on striped marlin and how to protect its population. The film documents the successful deployment of 15 satellite tags within 24 hours. GCRL hosted 1 of 300 showings of the world-wide film tour across North America.





Navy Meteorology and Oceanography Command Partners with USM

In a significant step toward advancing naval capabilities, the commander of Naval Meteorology and Oceanography Command (CNMOC) partnered with USM through a Cooperative Research and Development Agreement (CRADA). This collaboration leverages cutting-edge uncrewed systems platforms, sensors and advances in generative artificial intelligence to address challenges in naval meteorology and oceanography, aiming to enhance the Department of Defense’s operational efficiency and technological capabilities. This builds upon the long-time educational partnership between CNMOC and USM.

Gulf Blue Navigator Cohort Fuels MS Gulf Coast’s Innovation Economy



The Mississippi Gulf Coast, known as the “Innovation Gateway to the Gulf of Mexico,” leverages the Gulf Blue Navigator (GBN) program to accelerate the revenue

timeline for late-stage startups. The 2024 GBN Cohort included six startup companies: Mythos AI, LeVanta Tech, BLUEiQ, Seasats Inc., V2 Forensics and Oscilla Power. These companies have registered to do business in Mississippi and are members of the Gulf Blue coworking space in Gulfport. The four-month program provides unique access to USM’s partners, capabilities and resources, focusing on uncrewed systems.

USM’s Gulf and Caribbean Research Journal Provides Publication Opportunities

For 63 years, the Gulf and Caribbean Research journal has published peer-reviewed research. Under the guidance of editors Dr. Mark S. Peterson and Nancy Brown-Peterson, the journal receives submissions from around the globe. Since 2019, a partnership with the Dauphin Island Sea Lab has allowed undergraduates to publish their work, significantly enhancing the journal’s reach and impact.



USM Receives Funding for Marine Aquaculture Demonstration Center

Governor Tate Reeves announced funding through the Gulf of Mexico Energy Security Act (GOMESA) to USM's Thad Cochran Marine Aquaculture Center (TCMAC), totaling \$3,163,823. The three-year program aims to develop, diversify and expand small-to-medium-scale aquaculture businesses, ensuring a stable supply of safe, healthy, local seafood. The project will create a demonstration center, provide mentoring and business advice, support technology transfer and offer workforce training.



MBRACE Welcomes New Science Fellow

The Mississippi-based RESTORE Act Center of Excellence (MBRACE) is excited to welcome Dr. Ashlynn Smith, a Florida native, to collaborate on Gulf Coast research and restoration. Selected as a Science Policy Fellow by the National Academies' Gulf Research Program, Dr. Smith will work with USM and three Mississippi research universities over a one-year fellowship. Her goal is to continue researching Gulf Coast ecosystem restoration.

\$5M Grant Awarded for Oyster Research and Water Quality

USM scientists will engage in transformative projects funded through MBRACE to monitor water quality and conduct oyster research along the Gulf Coast. Partnering on a \$5M grant, USM, along with Mississippi State University, Jackson State University, and the University of Mississippi, will focus on understanding coastal ecosystems' natural effects. The research aims to provide valuable data for future restoration projects.





Center for Fisheries Research and Development



Scientists at the Center for Fisheries Research and Development conduct research that informs resource management. The Center works with state, federal and community partners to ensure we understand scientific fishery needs and focus our research efforts on how we can promote sustainable fisheries and habitats.

JILL HENDON, Director

Research Highlights

- CFRD began underwater video survey efforts through collaboration in the Southeast Area Monitoring and Assessment Program. This project works with other Gulf of Mexico state partners to conduct stationary video recordings at Gulf sites with structure or relief. CFRD scientists then analyze the video to document species assemblages and fish life stages.
- Twenty eight cobia were tagged off of Naples, Florida, in hopes of monitoring northern migration pathways. This is a collaborative project with GSMFC, USGS, FFWCC, MSDMR.
- Five sailfish were tagged off of Palm Beach, Florida, to determine behavior patterns and movements. This was a collaborative effort with the Billfish Foundation.
- CFRD is working to determine spawning dynamics of cobia in Florida Peninsula waters to help fill data gaps identified in the latest stock assessment. This is a collaborative project with the FFWCC.

2024 Total External Funding
\$712,822

Hosted 3 interns:

- Keandra Brown of Alcorn State University
- Jamia Eaves of Tuskegee University
- Madison Estep of Bowling Green State University

Outreach / Recognitions

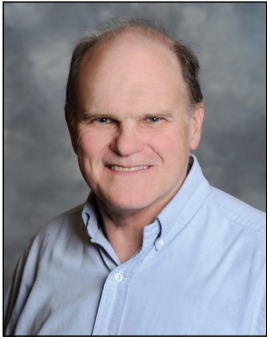
- Contributed to 29 professional presentations and four publications
- Participated in 32 outreach events



STAFF - 16 full-time, 4 part-time
GRADUATE STUDENTS SUPPORTED - 4 , ACTIVE GRANTS - 12

STAFF - 5 | GRADUATE STUDENTS - 1 | GRANT PROPOSALS - 9 | ACTIVE GRANTS - 4

Gulf Coast Geospatial Center



The Gulf Coast Geospatial Center (GCGC) works with federal, state, academic and commercial partners in research, development and applications of precise geospatial data, remote sensing and computational tools and models. This enhances the understanding of relative sea-level rise and its impacts, coastal change over time and nature-human dynamics in the coastal system.

DR. GREG CARTER, Director

2024 Total
External Funding
\$633,995

Research Highlights

In 2024, the GCGC conducted research investigating coastal ecosystems and geomorphology, natural coastal hazards, and geospatial and geodetic data, tools, and models, while maintaining critical infrastructure needed to enhance the National Spatial Reference System (NSRS) and provide precise geospatial positioning capabilities across Mississippi.

- Topographic surveys, salinity monitoring, bathymetric data collection and image analysis are in progress to characterize estuarine elevation thresholds and quantify estuarine habitat change over time in three Mississippi estuaries. Staff conducted field surveys and monitored salinity-logging stations.
- Quarterly dune morphology and vegetation monitoring were conducted in collaboration with US-ACE-ERDC at Henderson Point in Pass Christian, Mississippi using terrestrial LiDAR, high-resolution multispectral UAS imagery and precise leveling surveys.

The project will improve understanding of the impacts of beach grooming regimes on beach dune volume, accretion and vegetation change over time.

- Peer-reviewed publications in 2024: Amelunke, M., Anderson, C. P., Waldron, M. C. B., Raber, G. T., Carter, G. A. 2024. Influence of Flight Altitude and Surface Characteristics on UAS-LiDAR Ground Height Estimate Accuracy in *Juncus roemerianus* Scheele-Dominated Marshes. *Remote Sensing* 16(2), 384. <https://doi.org/10.3390/rs16020384>.

Critical CORS Infrastructure

The GCGC continues to operate and maintain the statewide network of Global Navigation Satellite Systems (GNSS) Continuously Operating Reference Stations (CORS) allowing for real-time position corrections and the downloading of historical static CORS data from rtn.usm.edu. In 2024, the GCGC expanded its partnership with the Mississippi Department of Transportation, continued to upgrade CORS receivers, increased the disaster resiliency of network servers and provided additional no-cost positioning services to end-users.



Hydrographic Science Research Center



The Hydrographic Science Research Center (HSRC) at USM develops and broadens the applications of hydrography, ocean mapping and navigation technology. It provides research support to address the needs of governmental and commercial clients for information related to coastal and ocean navigation, the ocean floor and ocean processes.

DR. STEPHAN HOWDEN, Director

2024 Total
External Funding
\$639,859

Research Highlights

The HSRC participated in four expeditions in the northern Gulf of Mexico as part of the Mesophotic and Deep Benthic Communities (MDBC) Restoration project. HSRC's Eagle Ray autonomous underwater vehicle was used for two of these cruises for high-resolution mapping of these sensitive communities. Eagle Ray can operate at depths up to 2,000 meters (1.24 miles) deep, mapping the bathymetry and backscatter of the seafloor, the subsurface structure and water column backscatter. USM is in a select group of universities world-wide, and the only university in the Gulf states, with this capability. During expeditions in May and October on USM's R/V *Point Sur*, the Eagle Ray performed high-resolution surveys of the wreckage over the Macondo/Deepwater Horizon wellhead and also mapped mud volcanoes, brine pools and other features. During that expedition, the crew also recovered two U.S. Navy

gliders, worth approximately \$500,000 that were in distress. HSRC's other participation included deploying four benthic landers, two built by the HSRC, from a NOAA ship at depth from 70 to 536 meters. These measure currents, water properties and photosynthetically active radiation (sunlight) for the shallower deployments.

Awards / Recognition

- Dr. Howden was invited to give a presentation at the Meso American and Caribbean Sea Hydrographic Commission meeting on December 2, 2024.
- Dr. Howden serves on the Executive Committee of the Board of Directors for the Gulf of Mexico Coastal Ocean Observing System.

STAFF - 5 | GRADUATE STUDENTS - 3 | GRANT PROPOSALS - 6 | ACTIVE GRANTS - 7





STAFF - 12

| PEOPLE REACHED - 11,131

| PROPOSALS - 5

| ACTIVE GRANTS - 7

Marine Education Center



The Marine Education Center works across The University of Southern Mississippi to engage communities in ocean sciences, promoting careers and fostering community involvement through formal and informal education programs that provide participants with a better understanding of the Gulf of Mexico.

DR. JESSIE KASTLER, Director

2024 Total
External Funding
\$653,647

Research Highlights

Educators engaged 5,855 students, teachers and chaperones in group programs ranging from three hours to five days. Program development prioritized technology-enhanced experiences aboard research vessels, offered at no cost to individual students and small groups.

Educators provided holistic mentoring to 14 undergraduate interns from Tuskegee, Alcorn State and Jackson State universities working with research teams across the Divisions of Marine Science and Coastal Sciences, the centers for Fisheries Research and Development and Ocean Enterprise and the Thad Cochran Marine Aquaculture Center.

Awards/Recognitions

- Dr. Laura Blackmon served on USM Strategic Planning Subcommittee on Philanthropy, Alumni and Community Engagement
- Samantha Capers serves on the board of the Mississippi Environmental Education Alliance
- Samantha Capers participated in the Sea Grant Aquaculture Leadership Academy with 22 extension, engagement and education professionals.

Summer Field Program

Now in its 77th year, the Summer Field Program hosted 71 students from 10 states in June and July, offering nine onsite and online classes. With immersive, extended field experiences, it has a proud tradition of preparing students for influential professional roles.

Dr. Virginia Schweiss, instructor of the SFP Marine Conservation class, offered students an exceptional hands-on learning experience by partnering with the Nature Conservancy and other community groups to create a living shoreline in the Back Bay of Biloxi. After surveying the area, students laid 10,000 pounds of shell to build a reef aimed at restoring habitats and stabilizing the Mississippi Sound's eroded coastlines, which have been devastated by environmental disasters and habitat loss.



Roger F. Wicker Center for Ocean Enterprise



The Roger F. Wicker Center for Ocean Enterprise (RFWCOE) is a global hub for Uncrewed Maritime Systems (UMS), ocean data science, maritime cyber research and training for Mississippi's emerging blue tech workforce. The Center consists of multiple facilities bringing together federal, industry and academic partners, creating a collaborative environment to accelerate the development and launch of new technology in the fast-growing ocean economy.

DR. LEILA HAMDAN, Director and Associate Vice President for Research

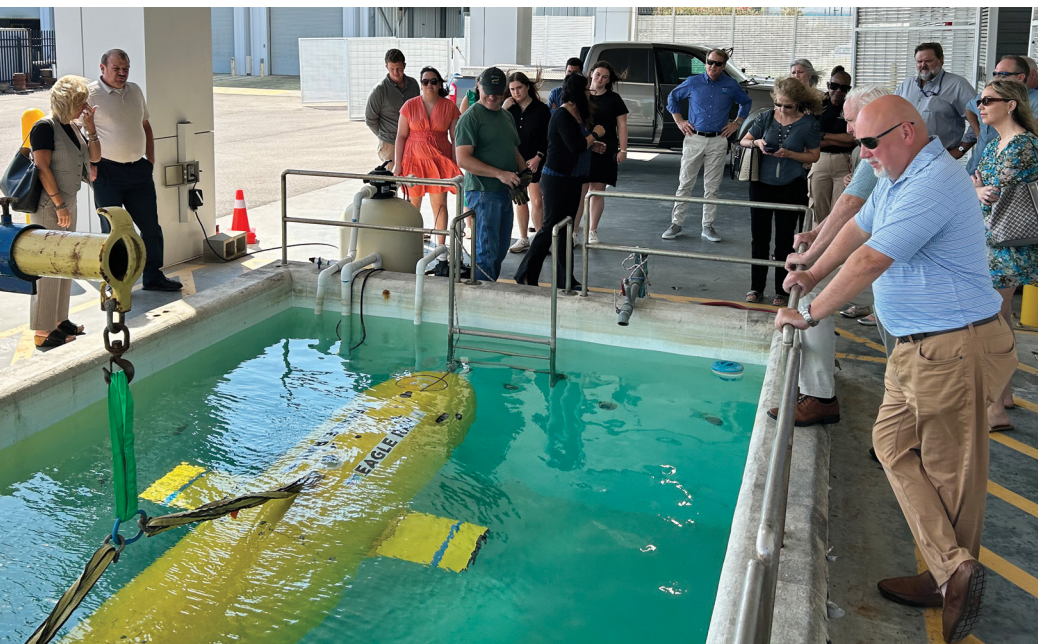
2024 Total External Funding
\$5.2M

Research Highlights

During 2024, staff at the RFWCOE engaged in research spanning detection and awareness of magnetics on the seafloor, to innovative new methods to track development of hypoxia in the Gulf of Mexico. These works are collaborative with federal and state partners, and involve the contributions of scientists spanning disciplines and career stages. The RFWCOE team also supported design, fabrication and testing for members of the Gulf Blue Navigator cohort. The tests were diverse, featuring work with uncrewed surface and subsurface systems, acoustic sensors, collision avoidance and even a flying boat. The RFWCOE team also orchestrated a proof of concept for the U.S. Air Force using an uncrewed SeaTrac boat. In October, 2024, the center welcomed its first tenant, the National Oceanic and Atmospheric Administration's (NOAA) Office of Marine and Aviation's Operations (OMAO). NOAA staff from the Uncrewed Marine Systems Division, National Centers for



Environmental Information, Office of Ocean Exploration and Research and Vessel Operations quickly transitioned to this facility, now bustling with activity. Additional tenants are expected to take occupancy in early 2025.



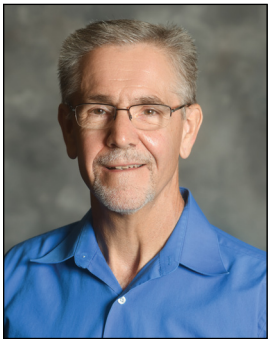
Awards/Recognition

- Dr. Vishwamithra Sunkara, was invited to be a founding committee member of the Association for Uncrewed Vehicle Systems International's Uncrewed Maritime Systems Certification committee.
- A paper by the RFWCOE staff titled, "Potential Field Modeling to Support Machine Learning Applications in Maritime Environments" received the Best Paper Award at the COMSOL, Inc. Conference 2024, showcasing the Center's commitment to high-quality research.
- ON&T magazine recognized RFWCOE's achievements and highlighted its contributions to the blue technology space.



STAFF - 31 | GRADUATE STUDENTS - 8 | GRANT PROPOSALS - 20 | ACTIVE GRANTS - 10

Thad Cochran Marine Aquaculture Center



The Thad Cochran Marine Aquaculture Center is dedicated to advancing marine aquaculture through integrated research and comprehensive educational programs. The staff fosters innovation and technology transfer that addresses industry challenges, enhances professional development and contributes to global food security by promoting sustainable aquaculture. The Center seeks to drive economic growth while ensuring responsible marine resource management.

DR. REGINALD BLAYLOCK, Director

2024 Total
External Funding
\$4,836,937

Research Highlights

The oyster program generated over 100 million eyed diploid larvae, 1.84 million triploid larvae and more than 1 million single set seed oysters for projects with private and government entities. Additionally, over 1/2 million single set oysters and 27.6 million eyed larvae were sold to industry, and 10.2 million eyed larvae and 195,000 seed were transferred to the Mississippi Department of Marine Resources (MDMR) for restoration and aquaculture efforts. The finfish program produced over 50 million sea trout eggs, 15 million red drum eggs and 4 million tripletail eggs from our broodstock populations. More than 34,500 juvenile sea trout from MDMR were grown for release and 3,850 were transferred to local high schools. The program produced 15,000 juvenile tripletail. Agreements with government and/or private entities for future production

of 100,000 red drum juveniles and a broodstock population of southern flounder were achieved. The algae program produced an average of 5.36 trillion live microalgal cells per day. Up to seven species were cultured to varying degrees using batch and/or semi-continuous methods. Additionally, cultivation of the macroalga Graceful Red Weed (*Gracilaria* spp.) was advanced as part of an Integrated Multitrophic Aquaculture project, with successful trials completed within outdoor recirculating aquaculture systems.



Awards/Recognition

- Angelos Apeitos, Dr. Reg Blaylock, Dr. Eric Saillant and Uchechukwu Ohajiudu received the first-place award for their poster “Intensive rearing of Southern Flounder (*Paralichthys lethostigma*) in recirculating systems: Perspectives, status and future challenges” during USM’s Research Day.
- Heather King graduated with a Master’s in Coastal Science under the supervision of Dr. Eric Saillant.
- Dr. Blaylock served as president of the American Society of Parasitologists in 2024 and presided over the 100th anniversary meeting where he gave a Presidential Address entitled “It’s not always about the parasites.”
- Megan Gima is participating in the Gulf Coast Business Council’s Master Leadership Program to develop a white paper on “Creating a Culture of Entrepreneurship.”

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.

DR. KELLY DARNELL, Director



Highlights:

- In 2024, GCRL moved forward with several initiatives to increase environmental sustainability, including installing water bottle filling stations in academic and research buildings and adding a hybrid vehicle to the motor pool fleet.
- GCRL Director Kelly Darnell was appointed to the Board of the Mississippi Aquarium.
- GCRL's Gunter Library hosted the SAIL/Cyamus Joint Annual Libraries Conference in May 2024, bringing together 40 participants from two International Association of Marine Science Libraries & Information Centers regional groups to discuss education and innovative approaches to supporting research.
- The Impact Factor for the journal *Gulf and Caribbean Research* increased from 1.1 in 2023 to 1.5 in 2024. A journal's Impact Factor indicates the importance of a journal within its field, and this year's increase reflects the importance of *Gulf and Caribbean Research* as the **only** journal on this topic published in the Gulf of Mexico, with 63 years and counting of continuous publication.
- GCRL unveiled a new sign at the entrance to the Halstead campus after the previous sign was damaged during a storm. The new sign was designed by Tall Architects in Ocean Springs, and is a nod to GCRL's mid-century modern style.
- Gunter Library held 10 GCRL Science Cafés in 2024 with a total of 430 in-person and virtual attendees.
- Construction began to expand GCRL's boat launch from a single launch to a double launch with an adjacent pier. Water access is critical for research at GCRL, and the expanded boat launch will greatly improve water access. Construction will be completed in early 2025.
- The Coastal Sciences graduate program continued to thrive during 2024, with 22 masters and 12 doctoral students enrolled at GCRL. Students participated in guided, individualized research as well as formal coursework. The Coastal Sciences graduate program offered 16 courses, with focused topics in aquaculture and botany, coastal ecology and ecosystem processes, fisheries, statistical analysis and research/writing skills.

Miss Peetsy B

Sea Days: 48



University Research Vessels

USM has a fleet of five research vessels. The use of large vessels 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 students, the community, and associated marine economy.

- *Miss Peetsy B* is a 34-foot passenger vessel with a capacity of 34. The vessel is used primarily by GCRL's Marine Education Center for outreach programs.
- *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 maximum capacity of 40 passengers and is equipped for both day cruises and overnight trips.
- *R/V Ken Barbor* is USM's first optimally crewed, fully autonomous vessel, equipped with a state-of-the-art computer vision and autonomous navigation system to facilitate research into vessel autonomy in congested coastal regions.
- *R/V Tommy Munro* 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.
- *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.

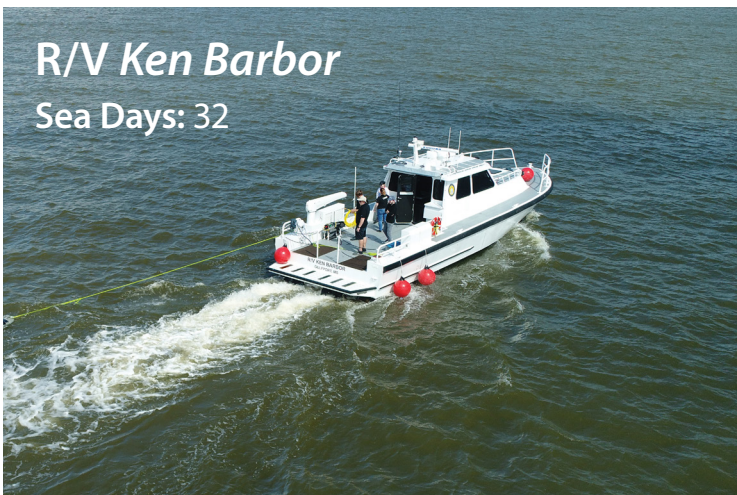
R/V Jim Franks

Sea Days: 72



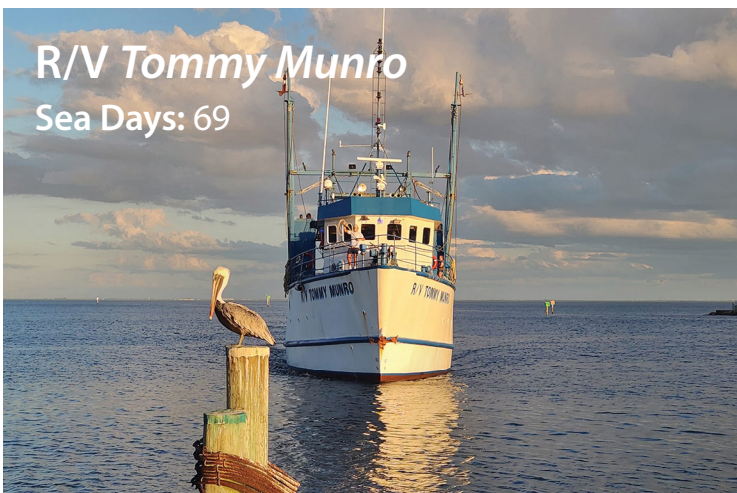
R/V Ken Barbor

Sea Days: 32



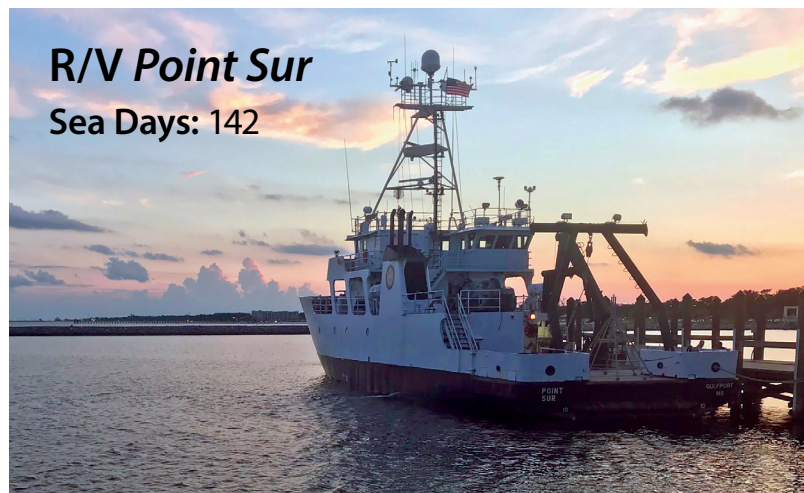
R/V Tommy Munro

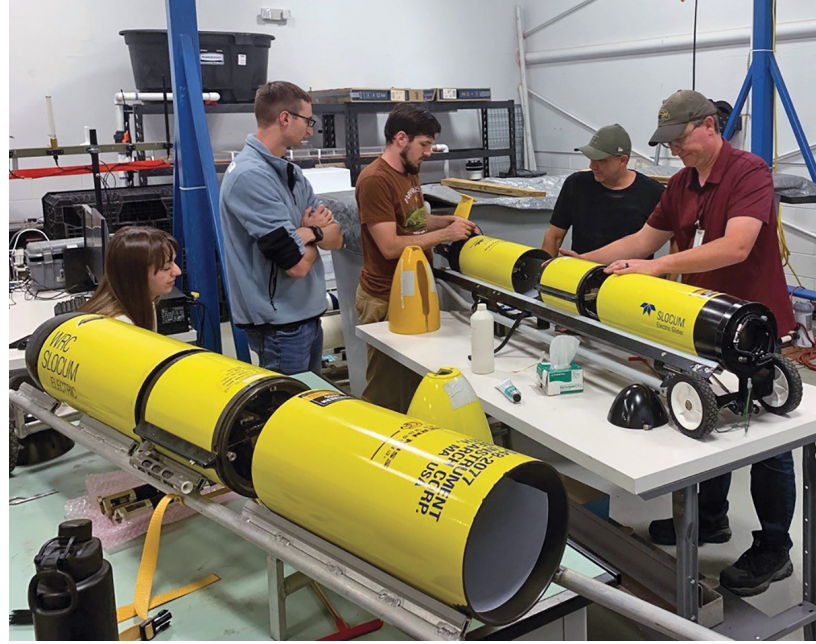
Sea Days: 69



R/V Point Sur

Sea Days: 142





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