JULY 2022 - JUNE 2023

LUMCON

ANNUAL REPORT

FY 2023

LOUISIANA UNIVERSITIES MARINE CONSORTIUM
LUMCON

CONNECT | ENRICH | TRANSFORM

EXECUTIVE DIRECTOR'S MESSAGE

I was humbled and honored to be appointed the executive director and chief scientist of LUMCON at the January 2023 Board of Regents meeting in Baton Rouge. My predecessors have built a strong tradition of collaboration, community engagement, and increased access to coastal and marine science research and education. The amazing staff of LUMCON and strong support of the Board of Regents give me great optimism for the future of LUMCON and science research and education in Louisiana. I am thankful for everyone's continued support as I transitioned into this role. I look forward to working with the LUMCON staff, the Board of Regents, our consortium institutions and partners to continue our mission so the organization and coastal and marine science research and education programs in Louisiana can be as great as I know they can be.

LUMCON remains strong, adaptable, resilient, and dedicated to its mission. This past year LUMCON focused on building stronger and deeper ties to its consortium members, as well as, building new and exciting relationships that signify Louisiana as a leader in coastal and marine science innovation and collaboration. These growing partnerships are already strengthening Louisiana's network of research and education partners working towards shared goals important to developing a skilled workforce that meet the needs of the future, and providing the research assets and expertise necessary to successfully compete for research and education funding that bring prestige to Louisiana and the region.

LUMCON reached several significant milestones in FY23. In April 2023, LUMCON held a State of the Consortium meeting in Baton Rouge that was attended by over 30 consortium institutions. This was the first step in deepening the relationships of the consortium members by redefining the structure of the consortium and establishing a new model which increases the opportunities for members to engage with each other and the organization. In June 2023, LUMCON was selected as the state agency to manage Louisiana's first National Estuarine Research Reserve (NERR). LUMCON will not only bring its own expertise and extensive resources, but also engage diverse university partners from all Louisiana systems of higher education as well as local, state, and federal partners, and local communities and organizations to support research, education, and conservation efforts within the Atchafalaya River System. LUMCON also had several new collaborative accomplishments during FY23 in both research and education & outreach programs.

In FY24, LUMCON will be opening a state-of-the-art facility as the first of several new projects on the Houma Maritime Campus it shares with Fletcher Technical Community College in the center of Terrebonne Parish's maritime industry. This marks a significant growth of an organization that has built a legacy of great accomplishments in marine science research and education from its DeFelice Marine Center in Cocodrie. LUMCON will continue to operate from the Marine Center as it is the premier living laboratory for the region and state. The expansion into Houma will help LUMCON realize new ways to support and achieve its mission to promote, facilitate, and conduct research and education collaborations among Louisiana's universities in marine and coastal sciences relevant to the sustainability of the coastal and marine environments of the Gulf of Mexico.

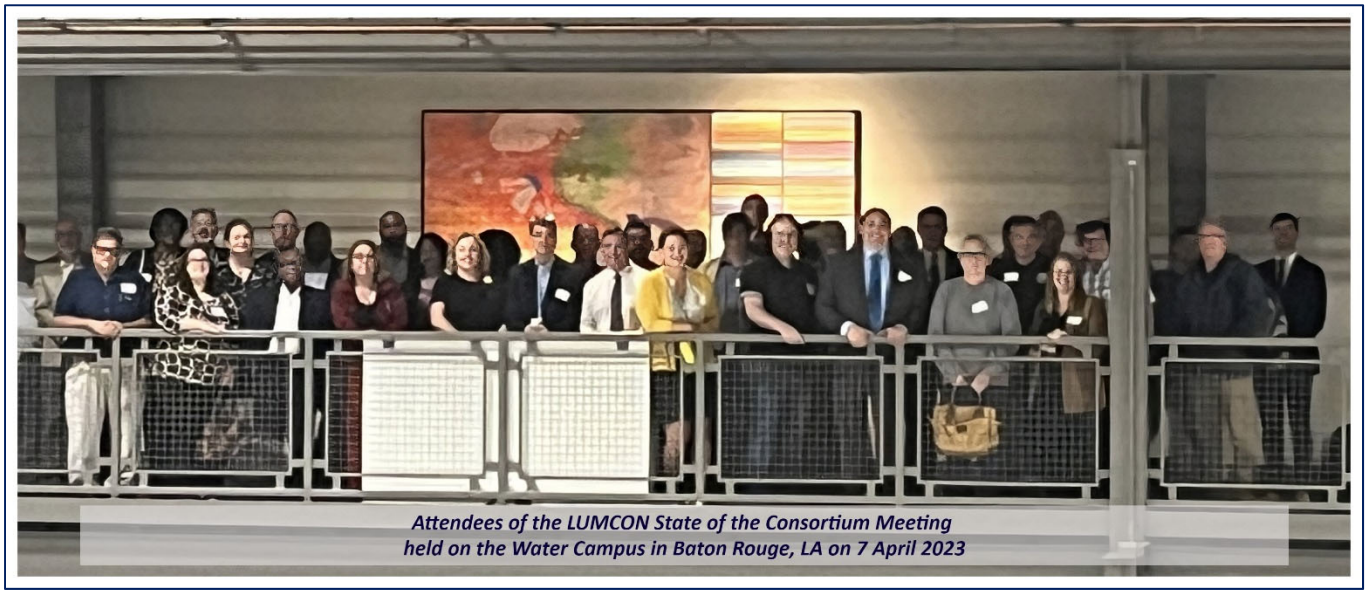
Sincerely,

Brian J. Roberts, Executive Director and Chief Scientist

CONNECT

Consortium Highlights

LUMCON was established in statute in 1979 (R.S. 17:3451) as a consortium "with the primary function of conducting research and promoting education in the marine sciences and marine technology, particularly where related to coastal resources and the impact of energy related industries on these energy related industries". From its foundation, LUMCON has acted as a consortium of higher education institutions, operating from its "campus", as required in statute, at the DeFelice Marine Center in Cocodrie with a mission to promote, facilitate, and conduct research and education collaborations among Louisiana's universities in marine and coastal sciences relevant to the sustainability of coastal and marine environments of the Gulf of Mexico. As the hub and facilitator of a consortial group currently including more than 40 partners at every educational level, from technical to doctoral studies (including members of the **Louisiana State University System**, **University of Louisiana System**, **Southern University System**, **Louisiana Community and Technical College System**, and **Louisiana Association of Independent Colleges and Universities**). One of LUMCON's primary goals in FY23 was to focus on the consortium. To aid in achieving this goal, LUMCON hosted a State of the Consortium meeting at the Water Campus in Baton Rouge, LA on 7 April 2023. We are thankful to the Coastal Protection and Restoration Authority and the LSU Center for River Studies for hosting our meeting which brought together representatives from over 30 consortium member institutions for this productive meeting. The agenda was focused on discussing the role that LUMCON plays as both a facility and a consortium highlighting that the collaborations amongst all member institutions makes coastal and marine science research and education stronger throughout the state. This initial gathering generated numerous ideas that will be built upon moving forward in future State of the Consortium meetings as well as contributing to LUMCON's next strategic plan that will be developed during FY24.



Attendees of the LUMCON State of the Consortium Meeting held on the Water Campus in Baton Rouge, LA on 7 April 2023

LUMCON is strongly committed to helping our consortium members create and maintain an academic pipeline for maritime careers. That is why LUMCON strives to offer accessible, low cost, high-quality, and relevant opportunities in marine science and other STEM disciplines for Louisiana students. One way to meet this goal was the creation of a summer program specifically focused on providing access to meaningful experiential programs for undergraduate students. The STEM Prep program is designed to offer relevant and experiential opportunities for freshman or sophomore-level students that are underrepresented and currently enrolled in a Louisiana institution. STEM Prep is not an independent project-based program. Instead, participation offers students the opportunity to learn transferable lab and field research skills through work experience, field trips, and skill development workshops while becoming immersed in a professional STEM career setting early in their academic careers. By leveraging the relationships with our consortium members, LUMCON was able to attract and select a group of talented and dedicated students from **River Parishes Community College** and **University of Louisiana Lafayette** in 2023. The STEM Prep program highlights LUMCON's expertise as a place-based education program and our commitment to the full integration of the science and education programs in non-traditional ways to ensure the success of the students that participated.

LUMCON consortium member institutions organized by system.

LUMCON semester courses in fall (Oceans and Society) and spring (Changing Coastal Oceans) remain in demand by students from across consortium member institutions. By being able to offer a class to students regardless of what school they attend, LUMCON is able to offer highly specialized marine science content and leverage the expertise of the LUMCON faculty. Fourteen students from **University of Louisiana Lafayette**, **Nicholls State University**, and **University of New Orleans** participated in Oceans & Society in fall 2022. Forty-one students from **LSU-Shreveport**, **Nicholls State University**, **University of Louisiana Lafayette**, and **University of New Orleans** participated in Changing Coastal Oceans in spring 2023 setting the record as the most registered students in the history of the course. Our REU cohorts for the fiscal year included Louisiana students from the **University of New Orleans, Nicholls State University** and **Grambling State University**.

Throughout FY23 LUMCON continued to strengthen existing relationships and develop new relationships with members of our consortium. LUMCON continues to partner with the **University of Louisiana at Monroe (ULM)** for Institutional Animal Care and Use allowing for animal use research and education activities being overseen by ULM with LUMCON providing expertise to aid the IACUC program. This past year LUMCON focused on establishing and building closer collaborations with Community Colleges. Many of the efforts have resulted in greater participation of our community college students in LUMCON education and outreach programs (see above), collaborations in research programs between faculty members, and the development of programs that will further the advancement of Louisiana's workforce. LUMCON continues to have a strong and growing partnership with **Fletcher Technical Community College (FTCC)**. Fletcher and LUMCON co-chair the Board of Regents Maritime Task Force. Much of this effort is focused on the development of the maritime campus in Houma, LA. As described later in this report, significant progress was made during FY23 on the construction of LUMCON's new Blue Works facility which will open its doors in fall 2023. The construction of a vessel slip and bulkhead on the maritime campus will begin early in FY 24 and request for bids for the new Marine Operations Center should be released later in FY24 with the projects estimated to be completed by summer 2024 and spring 2025, respectively. LUMCON continues to work with Fletcher and other members of the **Louisiana Community and Technical College System (LCTCS)** to identify new opportunities to redefine how LUMCON can engage with more of our members to realize the full potential of the consortium.

LUMCON faculty continued to excel at establishing collaborative research programs with many of our consortium members. LUMCON faculty had a total of 16 funded research grants that either continued or began in FY23 that included collaborations with scientists from consortium member institutions (**Louisiana State University**, **LSU Ag Center**, **University of Louisiana Lafayette**, **University of New Orleans**, **Nicholls State University**, and/or **Tulane University**). LUMCON faculty published a total of 7 peer-reviewed publications in FY23 that included co-authors from consortium member institutions (**University of Louisiana Lafayette**, **Louisiana State University**, and/or **LSU Ag Center**). Additionally, LUMCON faculty collaborated on numerous unfunded and/or pilot research projects and on the development of proposals with collaborators from these same institutions as well as other institutions within the consortium (details in sections below). During FY23, LUMCON faculty directly supervised a total of 10 graduate students at **University of Louisiana Lafayette**, **Louisiana State University**, **LSU Ag Center**, and **University of New Orleans**. Graduate students from **University of Louisiana Lafayette**, **Louisiana State University**, **University of New Orleans**, **Tulane University**, and **Nicholls State University** all conducted research on LUMCON's DeFelice Marine Center grounds and/or used it as a base of operations for conducting their research.

LUMCON's long track record in Education and Outreach that spans from pre-K to gray continues to benefit the consortium with several continuing and new initiatives highlighting that role. LUMCON's E&O programs will be playing an integral part in the workforce development program of a new five year National Academies of Sciences Gulf Research Program grant focused on the Mississippi River Delta co-led by **Louisiana State University** and **Tulane University** that includes collaborations with **Southern University of Baton Rouge**, **Xavier University of New Orleans**, **Grambling State University**, **Dillard University**, **University of Louisiana at Lafayette**, and the **Water Institute of the Gulf** as well as out of state institutions Jackson State University, Alcorn State University, University of Southern Mississippi, University of Central Florida, and the College of William and Mary. LUMCON also plays a similar role as a contributor to the NSF Engines proposal led by **Louisiana State University** which has a goal to support energy transition and decarbonization through technology and talent development across the state's industrial corridor. We are also incredibly excited about the expansion of our role in serving this

collaborative efforts that benefit coastal and marine research and education in the state. We anticipate that we will be able to better serve the consortium as well as the state as a whole by expanding our expertise in engineering and technology-focused research within the state, contributing to redefining the workforce, and helping to lead the way into new and exciting scientific research that benefits us locally, nationally and globally with the opening of our new facility on the Houma Maritime Campus in FY24. We hope that this facility will become a cornerstone for the community as a place to come together to have important discussions addressing the compelling questions and challenges we will face in the future.

LUMCON continued to expand its partnerships both within and outside of the consortium throughout FY23. One of these partnerships that developed in FY23 was a collaboration with the **Tulane ByWater Institute**, Greater New Orleans Foundation, Greater New Orleans, Inc, the City of New Orleans Office of Resilience and Sustainability, the **University of New Orleans Center for Hazards Assessment, Response & Technology (UNO-CHART)**, and Waggonner & Ball Architects in the development of the Urban Water @ 10 program. Urban Water @ 10 will launch in July 2023 to activate regional stakeholders to examine the achievements and lessons learned in the ten years since the release of the Greater New Orleans Urban Water Plan in November 2013 and develop recommendations to inform and advance the next decade of Urban Water Plan implementation.

Throughout FY23, LUMCON partnered with the Atchafalaya National Heritage Area, Audubon Delta, The Nature Conservancy, Louisiana Sea Grant, University of Louisiana at Lafayette, Louisiana State University, Nicholls State University, United States Geological Survey, Barataria-Terrebonne National Estuary Program, Restore and Retreat, Inc., Boy Scouts of America, St. Mary EXCEL, the Atchafalaya River Basin Restoration & Enhancement Task Force, Louisiana Department of Wildlife and Fisheries (LDWF), and municipalities within the Atchafalaya basin in the development of a proposal for the Atchafalaya Basin being selected as Louisiana's nomination to the National Oceanographic and Atmospheric Administration to be the newest addition to the National Estuarine Research Reserve (NERR) System. The NERR system is a network of 30 coastal sites designated to protect and study estuarine systems. The reserves represent a partnership program between NOAA and the coastal states with NOAA providing funding and national guidance and each site being managed on a daily basis by a lead state agency with input from local partners. LUMCON is very excited that it was chosen as the state agency tasked with managing the Atchafalaya NERR upon designation. "The Atchafalaya Basin, highlighting all of the habitats found within the state and serving as a model for how the state and other deltaic systems are formed, is a truly unique addition to the NERR system," said LUMCON's Executive Director and Chief Scientist Brian Roberts at the time of the announcement. "LUMCON is thrilled that the preferred site has been approved and the Consortium and member institutions are excited to work with partners at the local, state, and federal levels to develop and manage what will be a highlight of the national NERR system." LUMCON looks forward to working with the Coastal Protection and Restoration Authority, NOAA, and other Louisiana partners to completing the designation process during FY24.

ENRICH

LUMCON Education & Outreach Program remains committed to supporting and empowering current and future marine scientists and ocean-literate citizens. LUMCON is uniquely positioned to provide experiences that are pivotal to creating a diverse community that is prepared to face Louisiana's current and future environmental challenges. Through strong collaborations and a legacy of successful education and outreach efforts, LUMCON will continue to equip learners with an understanding of our coast and the world's oceans. LUMCON's E&O program has distinguished itself in the ability to cultivate and support the potential of students by creating opportunities for people at all academic stages and interests. The program continues to be unique and to redefine non-formal marine science education through the integration of research and education programs in non-traditional ways. LUMCON blurs the line between the education and research programs by getting learners involved in the active research data collection so their contributions play a significant role in what we know about our coastal systems and communities. The program continues to be unique and strives to redefine non-formal marine science education through the integration of research and education programs in non-traditional ways. LUMCON blurs the lines between these programs by involving learners in the collection of research data. This allows their contributions to play a significant role in what we know about our coastal systems and communities. This type of integration results in activities that invest in learners, ensuring a future where their communities are more environmentally literate, resilient, innovative, and where these students emerge as leaders and environmental advocates in a changing world.

In FY23 the program continued its focus on building access to marine science education through creating pipelines and pathways for learners that are meaningful, diverse, welcoming, and personal. New programs and initiatives are designed to help increase diversity in STEM education, value life experiences and perspectives of learners, focus on mentorship and skills training among learners, and address longstanding financial barriers to marine science and STEM education. There was a resurgence of learners participating in field trip programs at the Marine Center in FY23. Collaborations between faculty and marine educators resulted in grant funding for summer camps, teacher workshops (to be held in FY24), and increased digital programming. Continued efforts to secure funding for programming meant LUMCON was able to maintain low costs so that financial barriers were reduced or eliminated. The hiring of an additional educator in FY23 allowed LUMCON to extend its reach to more learners by allowing larger groups to participate in programs, with more frequency.

Program Highlights for FY23

Summer Programs

Louisiana's student population is diverse, knowledgeable, and passionately dedicated to the broader community and the environment. LUMCON's E&O program values the potential and life experience of each student and strives to make sure there are no barriers to student success within marine science and other STEM disciplines. In the past, LUMCON summer program had been the cornerstone for immersive experiences in Louisiana's coastal environments for undergraduate students. The growing access to marine science courses on campuses, the changing preferences and needs of students, and the shifting skills required within the STEM workforce resulted in a depleted demand for "traditional"

summer courses in recent years. This inspired LUMCON to pivot away from the typical summer course model and create a new version of a summer semester model that facilitates student success academically, professionally, and personally, especially for groups that are underserved and underrepresented in Marine Science.

This new summer program model is designed to develop student knowledge and skills for a future in the marine sciences or other STEM disciplines instead of focusing on providing general knowledge of a marine science topic through traditional classroom, lab, and field work. Instead, LUMCON seeks to educate summer students through active participation in research, professional development, and skill-building workshops at the Marine Center. Each LUMCON summer activity helps students to excel through the application of their existing plus new knowledge and skills.

"You guys took in a city boy and changed his perspective, you also reminded me that even though I may have limitations placed on me that doesn't mean I have to stop there. Thanks for everything!"
– Marco Milton, STEM Prep 2023 Student

Adding depth to the program, LUMCON places an emphasis on a multilayered approach to student mentoring. It has been established that near-peer, peer, and formal/informal mentorships are key in ensuring student success as they matriculate through their academic and professional lives. Setting the expectation for and valuing the process of mentorship interaction helps to create a "summer community" in which participants, regardless of role, contribute to the development of each student. Teaching relevant skills and behaviors leads to increasing student confidence, which helps them thrive in their academic and professional lives. Setting this expectation also helps create a new generation of STEM professional that values mentoring, which will helps to increase diversity with STEM into the future.

The new model of the summer semester has generated an upwelling of support particularly from consortium members where students have limited access to marine science and/or research experience opportunities on campus. The new emphasis on skills training and education through hands-on experience provides LUMCON with the ability to more completely invest in each student to ensure success.

Below is a list and brief summary of the summer program activities that occurred in FY23.

- **Graduate Student Fellowship Program** – This program supports the research of a graduate student from an underrepresented group in STEM. This fellowship provides a student with the opportunity to complete a summer in residence at LUMCON where they take advantage of the Marine Center's unique location, facilities, and LUMCON faculty expertise to complete research that will contribute to their thesis/dissertation.

    - **FY23 Fellow – Milena A. Rodriguez Pilco, Texas A&M University at Galveston**
        - Project Title: *Investigating the interactions between viruses and anaerobic microbes (specifically sulfate reducers and methanogens) in sediment from the Northern Gulf of Mexico and how they are linked with biogeochemical processes.*

- **National Science Foundation funded Research for Undergraduates (REU)** – LUMCON's REU Site program provides interdisciplinary research experiences in Louisiana's changing coastal environments. This program has been active since 2011 and is widely known for its innovation and unique approaches to student development and training. Each summer, a cohort of students spend ten weeks at the Marine Center conducting independent research projects with guidance from scientific mentors/mentor teams. The REU program is designed to give students a meaningful, hands-on research experience that takes advantage of state-of-the-art methods and technologies available at LUMCON.

2023 REU Students:
Left to Right - Mikel Vaughan-Coston, Matt Giess, Pluto Wah, Mackenzie Plowman, Samantha Schlegel, Kendall Cosper, Veronica Hill

2023 REU Cohort			
Name	School	Project Title	Mentor
Patricia (Kendall) Cosper	Wofford College	Does diatom sinking behavior change after exposure to turbulence and light?	Du Clos
Matthew Giess	Boston University	Testing Methodology To Observe The Influence of Plant-Mediated Sediment Oxygenation on Salt Marsh Biogeochemistry	Bowles
Veronica Hill	University of Arizona	How are greenhouse gas fluxes altered as marshes are lost and converted into submerged sediments?	Roberts
Mackenzie Plowman	Shenandoah University	Acoustic characterization of feeding events for blue crab (*Callinectes sapidus*)	Archer
Samantha Schlegel	University of Tampa	Heavy metals in Eastern Oysters (*Crassostrea virginica*) and their impact on metabolism and condition	Archer
Mikel Vaughan-Coston	University of Michigan	An ecoacoustic approach to assessing the biodiversity of salt marsh ponds	Archer/Roberts
Pluto Wah	University of San Diego	Behavioral choices of Diamond Killifish (*Fundulus xenicus*)	Roberts

- **STEM Prep** – STEM Prep is a LUMCON summer program that began in 2022. The program fills a gap in providing relevant skill and work experiences for Louisiana students from populations that are underrepresented in STEM who want to either pursue a postgraduate education or enter the workforce in a STEM field. STEM Prep is a six week residential program designed to provide the opportunity for students to experience the responsibilities and culture of a working marine lab, interact with the Marine Center staff and users, directly contribute to vital marine/coastal science research programs, participate in professional development and training workshops, and broaden their knowledge of possible research fields and career opportunities.

In the summer of 2023, LUMCON hosted three STEM Prep students, each representing an underrepresented group seeking degrees in a STEM discipline. Each student received four biology credits from the University of Louisiana at Lafayette and a stipend for their participation. Embracing the multilayered mentorship concept, the STEM Prep students received training in mentorship and took on near-peer mentorship responsibilities during LEAD camp, interacting with the campers and coaching them in skills practice for cast netting, animal husbandry, fish identification, and experimental design. These skills were topics of some of the skills training workshops STEM Prep participated in earlier in the summer. Their mentorship was well received by campers who enjoyed interacting and learning from undergraduate students.

2023 STEM Prep Students: Left to Right – Marco Milton (RPCC), Hallie Blondiau (ULL), Quintin Brakebill (RPCC)*
** Since STEM Prep 2023, Marco Milton, has transferred to UNO and is now seeking a B.S. degree in Chemistry.*

- **Caribbean Marine Ecology** - This course is part of a National Science Foundation-funded project in collaboration with Bentley University and Florida International University. Dr. Stephanie Archer, along with members from the other two institutions, developed a course in which students travel to field sites in the Bahamas to learn about nearshore ecosystems and sampling techniques in field biology, and ultimately help collect and analyze abiotic and biotic samples for the overall project. Over ten days students focused on understanding the ecosystem services provided by terrestrial and aquatic environments endemic to the Caribbean region by exploring the cultural, health, economic, and ecological importance of

Bahamian ecosystems, and learned about the role that humans play in influencing these environments.

2023 Caribbean Marine Ecology Students:
Left to Right – Kelsey Green (UNO), Kameron Barthelemy-Albert (ULL), me, Rebecca Lee (LSU), Ryan Thomas (Tulane)

- **Summer Camps** - LUMCON strives to provide experiences that shape a student's perspective, fuel their passion, and nurture their creativity to ensure that students have the skillset to be more academically and professionally successful. Our camps impact students in transformative ways through personal experiences, building relationships, skills training, and fostering an appreciation for and a connection to marine science and Louisiana's marine ecosystems. At a LUMCON summer camp, students meet potential mentors, advisors, and, possibly, future employers to assist and support them as they become the next generation of scientists and informed leaders. Campers join LUMCON's summer community of undergraduate and graduate interns, LUMCON faculty and staff, and visiting partners. This community is able to give each other support, share their experiences, provide expertise, offer feedback, and help with projects. Through these connections, students broaden their view of what careers are available to STEM professionals and learn the value of mentorship and teamwork. The summer camps get the full benefit of the multilayered approach LUMCON is taking towards mentorship. As in past years, campers from recent years serve as student instructors to aid in some of the day-to-day tasks required to ensure the camp runs smoothly. Student instructors have always been a great asset as mentors and councilors for each new camp cohort. Student instructors also volunteer for LUMCON during other events and program activities. Additionally they serve as ambassadors for LUMCON within their own communities. The students that have served in this capacity have added value to the program by bring their skills, experience, and knowledge to LUMCON programs.

In summer of 2023 LUMCON offered two one week residential summer camps.

- **LUMCON's Estuarine Awareness and Discovery (LEAD) Camp** – A week-long residential camp designed to give high school science-minded students a chance to explore Louisiana's coastal environments as scientists. This camp focuses on providing students with the opportunity to investigate a wide range of marine science topics, practice new scientific methods, and investigate marine science career options.

- **Field Marine Science (FMS) Camp** – A week-long camp giving opportunities for high school students to gain practical and real-world experience in conducting field research in the coastal marshes of south Louisiana. Students design, complete, and present the results from team research projects to answer their own questions about Louisiana's coastal ecosystems. Two 2023 STEM Prep students continued their LUMCON experience by serving as mentors and co-facilitators during FMS camp. Their leadership and support of the campers provided a valuable resource in the camp experience.

Camp participant numbers are starting to rebound to historical numbers now that post-Hurricane Ida repairs have been completed to the residential and cafeteria areas. The continued popularity of and demand for the camps make them a significant part of the LUMCON summer programing.

"LUMCON sparked creativity in me, and helped me finally know what I want to do in life. Thank you for making a place where kids can explore." – Ava, 2023 FMS camper

Online Courses

LUMCON's online semester courses expand access to marine science education to a more diverse student population and facilitate deeper connections with more of our consortium member schools. Using current distance learning tools, online learning environments, and digital collaborative tools, instructors of the courses can engage students across the consortium network. Currently, LUMCON has MOUs with Dillard University, Louisiana State University at Eunice, Louisiana State University at Shreveport, Nicholls State University, Northwestern State University, the University of Louisiana at Lafayette, the University of Louisiana at Monroe, the University of New Orleans, and Tulane University to offer online courses to their students.

- **Ocean & Society 2022** – The Ocean and Society course was designed to help students understand how society interacts and impacts the Ocean through lectures featuring the science behind current ocean issues. Since 2020, the course has taken on a different approach to meet its learning objectives to transform the experience to engage students differently than other online courses. This course covers a broad spectrum of current science and research programs and how information is used to develop sound management plans, conservation programs and socioeconomic decisions to address the current challenges that the Ocean and the society that depends on it are facing. Students are taught

to apply information gathering techniques, evaluate published sources, apply critical thinking and communication skills through weekly discussion sessions about current events in the media related to the Ocean. Because of the speed in which information related to current environmental issues can spread through online media and popular social media platforms, it is becoming increasingly important to teach students not only the science behind events, but to also identify reliable sources of information.

- In FY23 there were 14 students enrolled from the University of Louisiana at Lafayette and the University of New Orleans.

- **Changing Coastal Oceans 2023** – LUMCON has been offering versions of Changing Coastal Oceans for decades. This course offers student the opportunity to explore and learn about Louisiana's coastal ocean and how human activities in the coastal ocean and inland like commercial and recreational fishing, water management, aquaculture, land development, shipping, mineral exploitation, and pollution through runoff and atmospheric deposition have significant ecological effects on coastal environments. Using online technology and learning environments, LUMCON faculty focus on four topic modules and explore what each topic means for the Coastal Ocean from a chemistry, biology, geology, ecology, and ecosystem structure and function perspective. A class discussion at the end of each module provides an opportunity for students to assimilate the information provided by instructors as well as practice skills in communication and active listening to effectively discuss current issues impacting costal environments.
  - In FY23 there were 42 students enrolled from Louisiana State University – Shreveport, the University of Louisiana at Lafayette, and the University of New Orleans.

Field Trip programs

LUMCON makes place-based educational experiences different because our educators focus on engaging with learners in ways that encourage a personal connection to Louisiana's coast and empower them to develop the confidence to be successful and become ocean-literate leaders. LUMCON strives to enrich learners through place-based experiences where marine science and the coastal environment and surrounding wildlife are at the forefront of activities designed to train learners in skills applied throughout marine research and other STEM fields. The benefit of the world-class facility and educational assets makes for exceptional learner experiences.

Fiscal year 2023 was the first full year of field trip programming after a suspension of the programs due to COVID and then limited programming after Hurricane Ida. A rebound this year in the number of scheduled groups are evidence that the field trip programs remain in demand by educators across the state and instructors from consortium member institutions. The number of learners hosted by LUMCON is expected to increase with the addition of more education and outreach staff to be hired in FY24.

Digital Outreach

LUMCON has continued to steadily build an online presence through the development of unique and innovative digital outreach assets. Since 2020, LUMCON has had the opportunity to invest in equipment and software that allows educators to create and deliver high-quality digital content.

This content is delivered to the LUMCON audience in two different ways: first, through the LUMCON website as online content and resources available as downloadable documents; second, audiences receive content and news about LUMCON program activities through social media. In fiscal year 2023 some digital content was created, but because of limitations on E&O staff time most allocation of effort has been placed in updating existing materials and resources to ensure that content was current and relevant and curating the content on the website. LUMCON's social media audience remains consistent with totals from FY22.

Moving Forward

- **Marine Center Programs** – In FY24 additional educators will be hired. More staff will allow programs, especially field trip programs, to rebound to pre-COVID levels. Increasing the skill set and backgrounds of the E&O staff will benefit the programs in Cocodrie, Houma, and also online. Continuing to redefine the "LUMCON experience" to ensure programs remain at the forefront of innovative learning opportunities will be a focus in FY24.

- **Expanding Programs and Staff to the Maritime Campus** – With an expected opening of the new Houma facility in FY24, E&O staff is looking forward to expanding programs to new areas of marine science, bringing a new emphasis on the equipment, technology, and techniques that are used to learn more about our ocean environments. To accommodate the expansion of the programs, LUMCON will hire two additional marine educators. Some program activities have already been created and will move from the Marine Center to the Maritime Campus. Other program activities have been designed and will be refined once the facility opens. In the meantime, program staff are working on offering after school programs, programs to enrich homeschool groups and support parents, teacher professional development workshops, and public events including a lecture series.

- **Digital Content** – In FY 24 a renewed emphasis will be placed on social media. With a bigger E&O staff, there will be more time to develop social media posts and support engagement across LUMCON accounts. E&O staff have been working on creating and developing the White Boot Explorers Club. This is an online program designed to give kids a place to interact with LUMCON online. Learners explore and discover content about Louisiana's unique and diverse costal and marine ecosystems by completing tasks towards being awarded across four levels of certification. Each level consists of various activities that supports STEM education and skill building as it relates to marine science. Through these interactions and activities students will become inspired as the next generation of marine scientists and ocean literate citizen. After completing the levels, learners become fully certified White Boot Explorers and will be issued an official White Boot Explorer ID card. As White Boot Explorers, they will have access to live interactions with LUMCON science staff, faculty, and educators. In addition, Explores will unlock supplementary digital content and be invited to participate in social media take-overs and in-person events at LUMCON's DeFelice Marine Center.

- **Past Student Engagement** – One of the most exciting things that E&O staff do is to find new ways to incorporate past students into programing by creating opportunities for those students to interact with the next group of students. Expanding on the student instructor and mentor initiative, E&O staff are planning to increase opportunities that take advantage of the expertise, experiences, and dedication of students that have participated in LUMCON programs. This engagement could take the form of online presentations or interviews, becoming student instructors/mentors, editors or contributors to digital content resources, and event or activity design. LUMCON has built a large and passionate community of students that want to be involved in supporting future students. By making an effort to reconnect and reengage, these individuals will help past and future students thrive and be successful professionals. To do this, online events will be designed to offer students to connect to LUMCON and also to each other.

Summer 2023 STEM Prep and REU Cohorts on field trip to Barataria Preserve of the Jean Lafitte National Historical Park and Preserve in Marrero, LA.

TRANSFORM

LUMCON Research Faculty

LUMCON faculty had a very active year of research during FY23 with faculty participating in 23 continuing and 10 new grants during the year (see appendix A for details). Research activities by the faculty resulted in 20 scientific publications during the year (see appendix B for details). The faculty also gave 19 invited presentations (see Appendix C for details) and an even larger number of contributed presentations at conferences during FY23. Dr. Kevin DuClos joined the faculty in FY23. Dr. DuClos earned a BS from UCSD and MS and PhD degrees from the University of Maine prior to working as a postdoctoral research associate first at the University of Florida and then at the University of Oregon. He began his tenure at LUMCON working at the Marine Center in Cocodrie but will be relocating his lab to the new Maritime Campus in Houma once it opens in FY24.

Highlights of the research activities of individual faculty members are highlighted in the following section.

Acher Lab Group on a sampling trip.

The Benthic Ecology Lab of **Dr. Stephanie Archer** had a busy year in FY23. We continued and expanded our work on heavy metal contamination in freshwater and coastal ecosystems with projects focusing on establishing baselines and developing indicators of metal pollution in seagrass beds in The Bahamas (funded by National Georgaphic), oyster reefs in Louisiana, and in Louisiana's freshwater and brackish systems (funded by LDWF). We also continued our work on hurricane impacts to coastal systems by leading a working group of the Hurricane Ecosystem Response Synthesis Research Network and through an NSF funded project on the long-term impacts of hurricanes in seagrass beds. We also continued our work linking underwater sounds to biodiversity as part of the newly funded (NASA) Louisiana Deltaic Estuaries Marine Biodiversity Observatory Network and through a LDWF fellowship awarded to Lab PhD student, Allison Noble, to study the soundscape of Louisiana's nearshore artificial reefs. Finally, we continued our research on drivers of oyster behavior in Louisiana's estuaries through collaborations with researchers at LSU and UNO. We also established a new study abroad field course - Caribbean Marine Ecology. Through this NSF funded course we brought four students, each from a different consortium university (UNO, LSU, Tulane, and ULL), to Abaco, The Bahamas where they learned about coastal marine ecosystems, the services we derive from them, and how we manage them alongside students from two other universities: Bentley University and Florida International University.

Dr. Marshall Bowles had a very productive 2023 in terms of conducting cutting-edge research, numerous proposal submissions, and mentoring. As part of a fellowship from the Advanced Studies Institute in Delmenhorst, Germany Dr. Bowles collaborated with German marine scientists in residence. In May of 2023 Dr. Bowles served as chief scientist on a 10-day Gulf of Mexico research expedition exploring methane fluxes from the seafloor. Dr. Bowles submitted two journal articles in this reporting

period to *Limnology and Oceanography* and *Geobiology*, both as first author. Dr. Bowles submitted proposals to the Brown Foundation and National Science Foundation (NSF) over this reporting period. The Brown proposal was funded for a coding workshop with Murt Conover (LUMCON) as the lead. Two of the current NSF proposals have collaborators in Louisiana and have lead to the hiring of a postdoctoral fellow, Dr. Chequita Brooks, within the Bowles lab. Dr. Bowles continues to serve on the committee of Owen Clower (LSU). Drs. Maiti and Bowles continue to collaborate with his graduate student visiting LUMCON. Dr. Bowles worked closely with REU student Matt Giess on a project focused on plant-microbe interactions in salt marshes. Finally, Dr. Bowles served the academic community by reviewing grant proposals (NSF).

Dr. Juliana D'Andrilli continued her research in carbon cycling and dissolved organic matter (DOM) processing in aquatic and terrestrial environments. Dr. D'Andrilli continued to mentor one undergraduate student, two graduate students, and one postdoctoral research associate funded by the NSF. Dr. D'Andrilli published two research articles and one data product on large-scale understanding of carbon cycling in US freshwater rivers, lakes, soils, litters, and oils across multiple analytical techniques (Aquatic Sciences, Organic Geochemistry, and Environmental Data Initiative). Dr. D'Andrilli led projects focusing on determining chemical and biological lability from ultrahigh resolution mass spectrometry data and connections of carbon loads and qualitative influence on river health undergoing large-scale restoration. Dr. D'Andrilli mentored undergraduate student Tessa Crouch (University of California San Diego) on her previous REU project measuring newly released materials from Arctic ice sheets and how that compares to Louisiana marine carbon cycling in order to prepare her for her first scientific conference oral presentation at the International Humic Substances Society meeting. Dr. D'Andrilli submitted one proposal to the NSF, which was awarded, and reviewed manuscripts for Earth Science Reviews, Biogeosciences, Environmental Science & Technology, and Limnology & Oceanography. Lastly, Dr. D'Andrilli convened a conference session for the American Chemical Society Annual Meeting, presented oral and poster presentations at international meetings, attended two international workshops for organic matter and analytical chemistry research.

Dr. Kevin Du Clos joined LUMCON in January 2023 as the first faculty member based at the new Blue Works facility on the Houma Maritime Campus. His research focuses on the biology and ecology of phytoplankton and on the biomechanics of swimming and other behaviors in a range of marine organisms. Since starting at LUMCON, he was lead author on an article on swimming by colonial cnidarians published in PNAS and co-author on a paper on the deep-sea bivalve *Xylophaga* published in Marine Biodiversity and four additional articles in review (one as lead author). He submitted two collaborative proposals to NSF's BIO-OCE program: one on prey capture by tentaculate ambush predators with Dr. Kelly Sutherland at the University of Oregon and one on the effects of Langmuir circulation on the distributions and trophic interactions of marine plankton with Dr. David Murphy at the University of South Florida. As part of LUMCON's REU and STEM Prep programs in the summer, he mentored two undergraduate students. Marco Milton (STEM Prep) learned methods for collecting, identifying, and maintaining marine phytoplankton and was introduced to image analysis techniques. Marco has since transferred from River Parishes Community College to the University of New Orleans. Kendall Cosper (REU) designed and completed a project to assess the effects of turbulence on the sinking behavior of two diatom species. Kendall will present her work at the Ocean Sciences meeting in New Orleans in February 2024. Dr. Du Clos also assisted in teaching LUMCON's Changing Coastal Oceans course in the spring.

Dr. Alex Kolker spent FY 2023 focused on climate issues both in Louisiana and Morocco. Dr. Kolker's primary research effort was focused on studying the sediment mass and volume balance of land development following the opening of Neptune Pass in work funded by the Coastal Protection and Restoration Authority. Dr. Kolker also co-taught LUMCON's Oceans and Society course in fall 2022. Dr. Kolker continued to highlight the local and global significance of climate, coastal, and pollution issues through the media.

Dr. Guillaume Rieucau is leading the Coastal Behavioral Ecology Laboratory at LUMCON. His research projects, funded by the Bureau of Ocean Energy Management, Environment Protection Agency Louisiana Sea Grant, and the National Fish and Wildlife Foundation, focus on marine animals behavioral ecology and spanned over South Louisiana, the Gulf of Mexico and the Caribbean Sea. Dr. Rieucau is collaborating with in-state, out-of-state and international researchers. Dr. Rieucau continued his collaboration with the Audubon Nature Institute to study swimming behavior of captive fish in fresh and marine water exhibits at the New Orleans Audubon Aquarium of the Americas. In 2023, he was a guest speaker at several academic institutions, gave a series of public seminars and attended national conferences (Society for Integrative and Comparative Biology; American Fisheries Society). Dr. Rieucau's laboratory remains the only Gulf of Mexico-based research laboratory equipped with an operational ARIS high-resolution imaging sonar. During 2023, Dr. Rieucau co-authored four research articles in peer-reviewed scientific journals with 3 articles currently in review. In FY23, Dr. Rieucau was the lead instructor of the course "Ocean & Society" offered to undergraduate students across the Symposium. Dr. Rieucau is a member of the scientific committees of Caribaea Initiative and the Fundación Internacional para la Naturaleza y la Sustentabilidad. He is supervising a Doctorate student (UNO/LUMCON) and a Master student (LUMCON/Univ of Ottawa); still appointed as an adjunct faculty at Nicholls State University and ULL; an Editor of ICES Journal of Marine Science and a reviewer for several journals and funding agencies.

Dr. Rieucau setting up his imaging sonar in the marsh.

Dr. Brian Roberts continued to serve as the Associate Director of Science at LUMCON while taking on the role of Interim Executive Director and then Executive Director and Chief Scientist in FY23. The Roberts lab had a very productive year, publishing several peer-review papers, editing a special issue on Gulf of Mexico estuaries, and completing work on several continued and new research projects. These included the following continuing projects: a large-scale marsh mesocosm oiling experiment begun in 2018; a NOAA RESTORE and Climate Adaptation Science Center funded project focused on the impacts of salinity alterations and marsh creation projects on food webs; a project focused on evaluating how Gulf ribbed mussels enhance living shoreline restoration projects (with a LSU graduate student funded via a Coastal Protection and Restoration Authority fellowship); a project studying assimilation wetlands; a BOEM-funded project examining the impacts of dredging on the ecology of Ship Shoal (which supports two ULL graduate students); a NASA project monitoring and forecasting coastal wetland carbon exchanges both locally and at the national level; and a NSF Sustainable Regional Systems Research Network planning grant led by Tulane focused on water management in the New Orleans region. FY23

also saw the Roberts lab kick off two NSF funded methane-related projects in collaboration with Dr. Bowles: one involved colleagues from LSU and University of Georgia studying methane fluxes from marine sediments with the second involving collaborations with University of Tennessee, University of Kentucky, Rowan University and LSU studying climate change influences methane fluxes from wetlands. The lab also received a three-year extension on the BOEM project studying Ship Shoal as well as a few smaller awards. Dr. Roberts also continued to serve as program director for LUMCON's NSF-funded REU program. Finally, Dr. Roberts led the effort which saw LUMCON chosen to be the state partner for the soon to be designed National Estuarine Research Reserve in the Atchafalaya Basin.

Dr. Roberts preparing soil samples in an oxygen-free glove bag for nitrogen cycling measurements.

Graduate Student and Postdoctoral Research Associate Mentorship

Graduate Students:

- **PhD Students:** Shelby Buckley, University of Colorado Boulder Civil, Environmental, and Architectural Engineering (D'Andrilli); River Dixon, University of Louisiana Lafayette Biology (McClain); Allison Noble, Louisiana State University (Archer); Adam Quade, University of New Orleans (Rieucau); Yanila Salas-Ortiz, University of New Orleans (Archer)

- **MS Students:** Finella Campanino, Louisiana State University (Archer); Alexander Douwes, University of Louisiana Lafayette Biology (Roberts); Emilie Foster, University of Louisiana Lafayette Biology (co-advised by Roberts); Emilie Gagnon, University of Ottawa (Rieucau); Granger Hanks, University of Louisiana Lafayette Biology (McClain); Skylar Liner, Louisiana State University (Roberts); Siyah Yongue, Louisiana State University (Archer)

- LUMCON faculty currently also serve as committee members for several graduate students both within the consortium as well as outside of Louisiana.

Postdoctoral Research Associates: Dr. Chequita Brooks, LUMCON (Bowles); Dr. Stacy Calhoun-Grosch, LUMCON (Roberts); Dr. Jumanah Hamdi, LUMCON (D'Andrilli)

INFRASTUCTURE

Hurricane Ida Repairs: The remaining repairs following Category 4 Hurricane Ida which impacted the Marine Center and broader region in late August 2021 were finally completed during FY 23. These included repairs that allowed us to finish bringing dorms and apartments back on line with finalizing of repairs to windows, ceilings, and walls in the residential wing of the Marine Center. The walk-in cooler and freezer and the A/C unit for the observation tower were replaced also replaced in FY23. Exterior lighting and fencing, lab and storage rooms, boardwalks and docks were also repaired.

Deferred Maintenance Projects: FY 2023 saw both the DeFelice Marine Center and the maintenance building receive new roofs through Deferred Maintenance Projects. LUMCON had two additional deferred maintenance projects (one for the septic tank system and one for the wetlab floor) initiate design in FY23 with both projects scheduled to go out for bid and begin construction in FY24. Moving forward, the Marine Center will soon be able to replace deteriorating and inoperable building mechanical components and upgrade existing building components related to the heating, ventilation, and air conditioning system (HVAC) through deferred maintenance funding initiating in FY24. The project will consist of the replacement of air handling units, fan coil units, and other components that are original to the marine center. The project cost is approximately $2,000,000.

Houma Maritime Campus: Construction at the Houma Maritime Campus progressed significantly in FY23. The Blue Works Building approached substantial completion by the end of the fiscal year setting the stage for an anticipated ribbon cutting before the end of calendar year 2023. The boat slip and bulkhead project which will provide a safe harbor for both the RCRV *Gilbert R. Mason* and the replacement for the current RV *Pelican* and rest of LUMCON's vessel fleet was set to go out for bid at the beginning of FY 24 with an anticipated completion date of summer 2024. The design for Marine Operations Center (MOC) building was completed in FY22. The site surcharge for the facility was completed early in FY23. LUMCON was able to get additional funding allocated through capital outlay that will allow the MOC project to be put out for bid late in FY24 will an anticipated completion in FY25.

LUMCON's Blue Works facility on the Houma Maritime Campus.

In FY 24, LUMCON will be requesting the approval from the Louisiana Legislature to consolidate all projects (Blue Works building, Boat slip and bulkhead project, Site Surcharge, and the Marine Operations Center) for the Houma Maritime Campus to ensure efficiencies in finances, project planning, and resources.

Vessels

R/V Pelican: LUMCON's flagship University-National Oceanographic Laboratory System vessel, R/V *Pelican*, conducted 180 operational days in FY 2023. This was similar to the 177 operational days conducted in FY 22. The National Science Foundation, United States Geological Survey, National

Operations on the back deck of the R/V Pelican during a cruise in FY23.

Academy of Sciences and the National Oceanic and Atmospheric Administration funded 55, 17, 10 and 44 days, respectively. R/V Pelican supported various data collection cruises focused on the physical and chemical environments in the Gulf. R/V Pelican performed 17 research days in international waters off the coast of Mexico, conducting surveys and science buoy maintenance funded by the U.S. Navy and National Academy of Sciences. In September of 2022, Dr. Jason Chaytor from the USGS conducted 15 days at sea producing a high-resolution survey of the Mississippi River Delta front mudflow system to evaluate the current surficial extent, event history and impact on seafloor pipelines/platforms of mudflows in delta region. Other notable research consisted of hypoxia and ocean acidification research along the Louisiana and Texas coasts. Scientist from LUMCON, Dr. Marshall Bowles and Dr. Brian Roberts, used the R/V Pelican to study methane efflux from the Mississippi River and its influence to coastal marine sediments. Multiple mooring cruises utilized the vessel and its systems, which include a combination of the vessel's folding knuckle boom crane, multipurpose winch, and stern A-frame to systematically deploy and recover multiple offshore buoys, scientific mooring, and weather stations.

R/V Point Sur: Owned by the University of Southern Mississippi and managed by LUMCON, the R/V *Point Sur* successfully conducted 201 operational days sailing out of Cocodrie and Gulfport, Mississippi. This was an increase from 177 operational days conducted in FY 22.

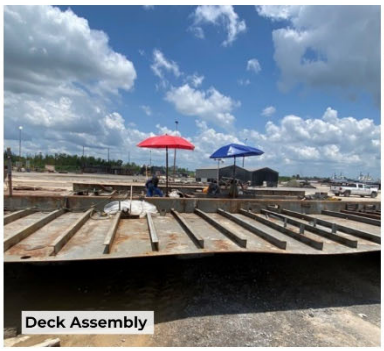
R/V Acadiana: LUMCON's signature education vessel, the R/V *Acadiana*, conducted a total of 46 days at sea in FY 2023. This constituted a decline from the 87 days at sea in FY 22. A total of 24 days were spent conducting research while 22 days were education-focused trips.

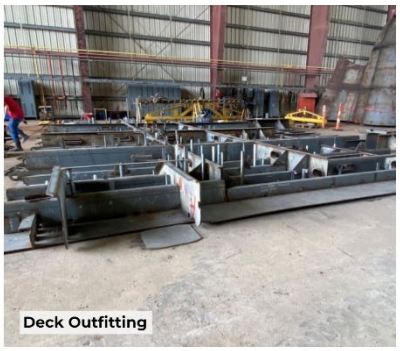
Small Vessels: In FY2023, LUMCON's small vessel fleet aided researchers in near coastal activities for a total of 324 day trips. This was an increase from 198 day trips in FY22. Of these, 113 were for education, 211 for research, and 3 for outreach.

R/V Pelican Replacement Vessel: JMS Naval Architects completed the preliminary and contract design in late 2022 and finalized in early 2023. The focus is to design a vessel with equal or slightly increased capabilities to the current R/V *Pelican*. Numerous phone conferences and an in-person meeting at the International Workboat Shop in New Orleans gave the group time to review the final contract design. A call for shipyards began in the 2nd quarter 2023 preparing for a two-phase bid process including a request for qualifications and cost proposals in FY24.

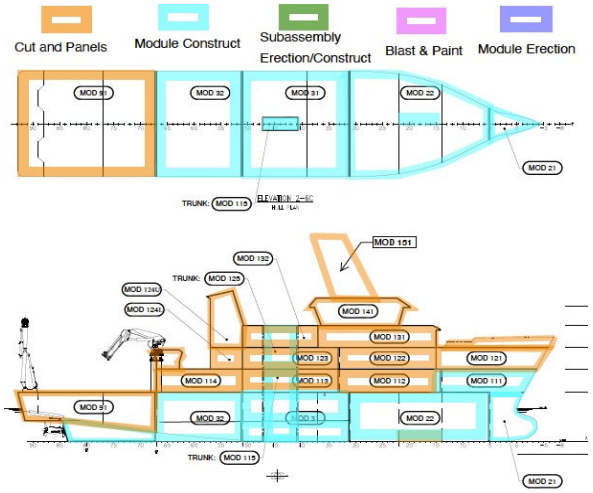
R/V *Gilbert R. Mason*: Construction continues on the third vessel, R/V *Gilbert R Mason*, in the National Science Foundation regional class research vessel fleet build. This vessel will be jointly operated by LUMCON and the University of Southern Mississippi to primarily serve the Gulf of Mexico. Looking forward to FY 2024, welders and fitters are working on cut and panel assembly of modules 91, 111-114, 121-125 and 131,132, 141 and 151. Module construction has been completed of modules 22, 31, 32

and centerboard transducer trunk module 115, the stern skeg, and the bulbous bow module 21. With construction delays due Hurricane Ida, limited labor pools and vendor construction of vessel components, the vessel is scheduled for delivery by May 2026, with full oceanographic operations starting by the middle of 2026.





Below is a rendering and schematic of the ship build process of R/V *Gilbert R. Mason* at the end of FY23.



Environmental Monitoring

Expanding the sensor quality was the focus of Environmental Monitoring in 2023. An additional water height sensor was deployed at the Marine Center to help ensure the quality of our water depth data. Environmental Monitoring has taken part in deployment tests of two new hydrographic instruments to determine if they can hold up to the heavily fouled environment at the weather stations. Monitoring received 21 data requests this year. These requests came from various sources, including the public, federal and state agencies, and universities. Monitoring maintains a partnership with GCOOS who we share our real-time data from all stations. This data is made publicly available on GCOOS's data portal website along with 54 other data partners. Monitoring is partnered with University of Louisiana at Lafayette to maintain a Systea nutrient sensor at LUMCON's dock. The additional sensor has expanded the data complement at LUMCON and is available through GCOOS.

Dive Operations

During FY 2023, the Diving Safety Programs supported dives locally by LUMCON divers working in Terrebonne Bay on oyster studies in near zero visibility conditions, and provided offshore training dives as well as service work for USM buoys and LSU landers. The growing reputation of the R/V *Pelican* as an

available and capable offshore dive platform allowed utilization as a vessel-of-opportunity by EPA and NOAA dive teams to conduct their work. Collaborative work was also conducted through Letters of Reciprocity issued by LUMCON for program divers from LSU and UNO to dive with NOAA and Texas A&M Galveston on reefs within Flower Gardens National Marine Sanctuary as part of a rapid response sponsored by NSF to a viral disease breakout in the reef corals. Scientific diver training for new scientific divers and refresher training of current scientific divers in the LUMCON system was also completed.

Library

Digitization Projects: With the completion of converting historical papers into the Institutional Repository, FY 2023 focused on adding new materials to the assorted digital collections. These included 49 journal reprints, 26 LUMCON faculty publications, and 28 books or reports related to the region. For each digitized item, there is a corresponding searchable, fully cataloged record in the LUMCON library catalog. The initiative to digitize historical slide/photograph collections began in earnest, which started with sorting approximately 800 slides in all, in addition to a trove of photographs and negatives (about 1,200 existing negatives, plus an unknown number of photographs). By the end of June 2023, high resolution .tiff scans, itemized with sortable information, were completed for 592 slides and 565 photographs/film negatives. The majority of scanned images cover the years 1978-1989, which include the establishment of LUMCON, the construction of the DeFelice Marine Center and research vessels, and early operations of the institution under Executive Director Dr. Donald F. Boesch.

LUMCON Data Report Conversion Project: LUMCON Library embarked on a project to convert PDFs of LUMCON Data Reports (1984-1993) into Excel spreadsheet format, for ease of use by future researchers. By the end of FY 2023, work on four of the 21 Data Reports had been completed (460 tabs total). This work will form the basis of a larger project, involving historical ship data, likely to begin in early FY 2025.

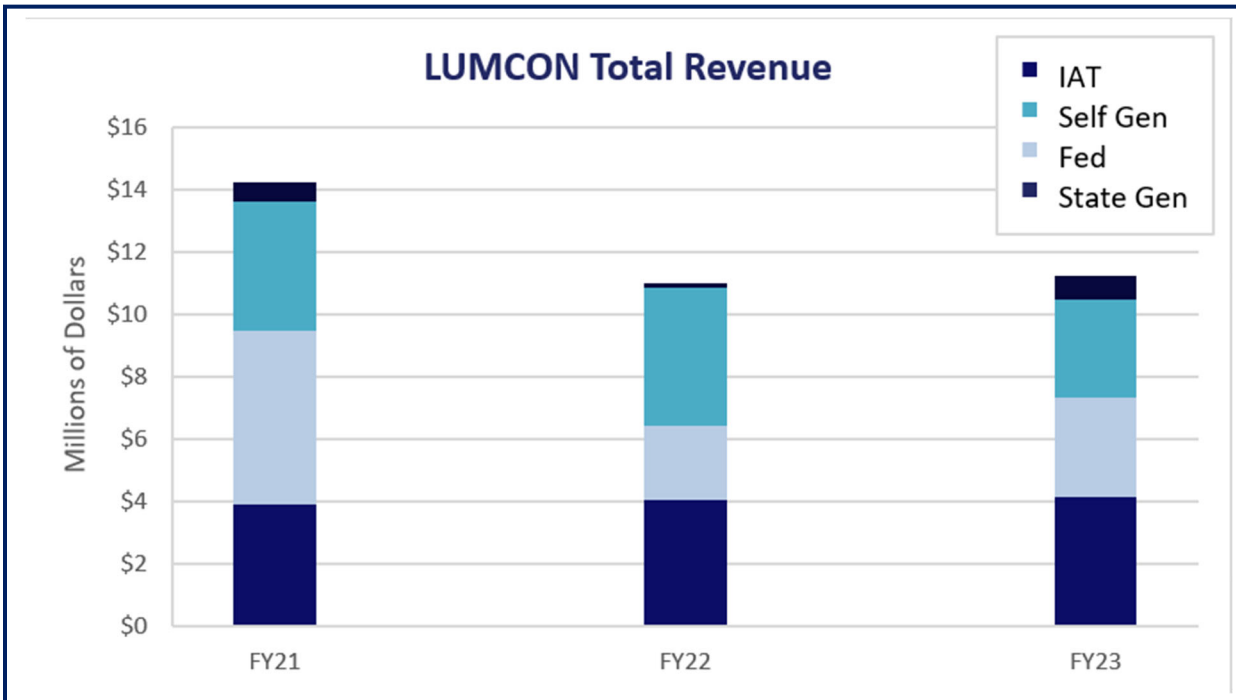
LUMCON research and education programs make significant contributions on what we know about the Louisiana Coast.

FINANCES AND DEVELOPMENT

Administration, Finance, and Budget

LUMCON's total revenues in FY23 ($11.2M) were comparable to FY22 ($11M) but lower than in FY21 ($14.2M). Hurricane Ida was in August 2021 (FY22) reducing the federal funds due to the inability to continue federal research and cruises. LUMCON was still in recovery mode in FY23.

Below is a chart depicting the total revenue LUMCON received over the last three fiscal years.



LUMCON Revenue in FY21, FY22, FY23 broken into Interagency Transfers (IAT), Federal funds (Fed), Self-Generated funds (Self Gen), and State General funds (State Gen) categories.

LUMCON's overall budget is highly dependent on grants / funding received in three categories. This include LUMCON grants (mostly generated by research faculty with additional contributions from Education and Outreach programs), vessel operations, and the Barataria-Terrebonne National Estuary Program (BTNEP). The table below breaks down the status of grant funding within each of these categories at the end of FY23 (data as of September 5, 2023). The table includes the total value of grants over the life of the grants, the remaining funds available at the time of compilation, as well as the breakdown of direct and indirect funds at that time. During FY23, LUMCON research faculty were awarded 12 new research grants that will bring ~$1.8M in additional funding to LUMCON.

Current Status of LUMCON, Vessel Operations, and BTNEP Grants			
	LUMCON	**Vessel Operations**	**BTNEP**
Life of Grant Total	$4,686,730	$ 8,015,072	$5,724,783
Remaining Funds	$2,176,204	$1,777,234	$3,799,233
Direct Cost Balance	$1,694,966	$1,546,193	$3,354,317
Indirect Cost Balance	$481,238	$231,040	$444,916

In terms of overall size of our staff, we experienced a slight net decrease in total personnel in FY23. LUMCON Human Resource processed the hiring of 13 individuals into and separation of 19 individuals from LUMCON/BTNEP from July 1, 2022 through June 30, 2023.

Development

LUMCON's fundraising efforts continued to grow and expand in FY2023. After two years which featured a dramatic influx in small donations in response to Hurricane Ida, this year saw an increase in funds raised despite a smaller number of overall donors.

Approximately $141,000 was raised from 72 donors in FY23. The largest segment was represented by donations from foundations, which increased slightly to $110,000 from seven donors, the same as in FY2022. Individuals made contributed the remaining $31,000.

In FY2023, LUMCON was successful in working through the Board of Regents and with the Office of the Governor and the Terrebonne legislative delegation to increase its direct general fund appropriations by $2 million to $4.13 million for FY2024. This was the first increase in the general fund appropriation in over ten years. The legislature also appropriated funds in the capital outlay process to complete the Blue Works facility and continue work on the Maritime Operations Center at the Houma Maritime Campus, and to continue construction on LUMCON's $42 million replacement for the R/V *Pelican*.

In FY2024, Development will begin the process of bringing various representatives from the Houma, Terrebonne, and regional communities to see the new maritime campus and begin to engage with programs offered there. We will be seeking funding to support the new and innovative programs that will be offered on the campus, and partner with potential funders to sponsor those programs. We will also continue to seek funding for new and ongoing programs at the Marine Campus in Cocodrie.

BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM

In FY2023, the BTNEP team, led by Director T. Bradley Keith, continued to focus on programs that comprise the core strengths of the program: improving water quality, focusing on combating invasive species, propagating native plants to aid in the state's coastal restoration efforts, protecting bird species and the habitats they depend on, educating the public on efforts to promote resiliency and sustainability, and improving communications with stakeholders and citizens through the use of social media. Collaboration and cooperation among longtime partners such as LUMCON, CPRA, regional universities, and elected leaders enhances BTNEP's ability to improve ecological and cultural conditions within the expansive estuarine system. Ongoing work in FY2023 is highlighted below.

Improving Water Quality

This project, overseen by senior scientist Andrew Barron has three interconnected components within the Bayou Folse watershed in Lafourche Parish: large-scale water quality and sampling (including inspections of on-site waste disposal systems), the home sewage assistance program (offering financial assistance in upgrading out-of-date home sewage systems, in partnership with the EPA), and establishing best management practices within the watershed (in partnership with Ducks Unlimited). The last of these was initiated in FY23 and an additional water quality technician was hired to assist this initiative. Expansion of this project is expected in FY24. Water Quality Coordinator Siva Nunna assists Barron in all phases of these long-term projects, from regular water sampling through grant reporting.

Invasive Species

In FY23, Invasive Species and Marine Programs Coordinator Michael Massimi worked throughout the estuary in leadership and educational roles to highlight invasive species in the region and engage the public on identification, preservation and protection of native habitats, fauna and flora. BTNEP re-partnered with the Louisiana Department of Wildlife and Fisheries to conduct a derelict crab trap removal program in the estuary. After a hugely successful outcome, BTNEP plans to continue the effort in the years ahead whenever the effort targets the estuary. The year also saw Massimi serve as the co-organizer of a highly successful regional conference on the state of the invasive tree Chinese Tallow (*Triadica sebifera*) that attracted national experts. The conference explored the scourge of the invasive plant in Louisiana, but also its benefits to the domestic bee industry.

Native Plant Production

The BTNEP native plant production program, led by Habitat Restoration Manager Matt Benoit, continues to expand its facilities at the Nicholls State University farm – now undergoing its third expansion in as many years. Expansion and related work included removing large pine trees that threatened the facility, establishing a native tree nursery to sustain seed harvests into the future; rebuilding the greenhouse; improvements to the production areas; securing a soil mixer; and increasing the growing area under shade cloth from 64,000 to 144,400 square feet. Plans for FY24 include construction of a new green house and an onsite office. Work continued on multi-year contracts to deliver tens of thousands of trees ordered by the CPRA for coastal ridge expansion and restoration at its Spanish Pass and Bayou DeCade project sites. Native Plant Nursery coordinator Ashleigh Lambiotte assists Benoit at the ever-growing facility, which can now hold more than 100,000 trees destined for coastal restoration sites.

Protecting Migratory Birds and Habitat

Biological Resources Coordinator Delaina LeBlanc oversaw completion of 40 site surveys as part of an interagency agreement with CPRA to conduct winter shorebird and benthic surveys on East Trinity Island and Belle Pass Headland for the Terrebonne Basin Barrier Island and Beach Nourishment Project. The northern Gulf of Mexico is a key wintering area for Piping Plovers (*Charadrius melodus*) and is designated as critical habitat under the Endangered Species Act. Project permits require post-construction bird surveys for wintering plovers and Red Knots (*Calidris canutus rufa*). Also in 2023, BTNEP completed a new project featuring the highly social and engaging Purple Martin (*Progne subis*). Once found to nest largely in rotted out cavities of dead trees, the eastern population of the Purple Martins have now adapted to and rely on human-made housing for nesting. The project provides Purple Martin housing and educational signage. Wildlife Conservation Coordinator Natalie Waters further expanded her work with Chimney swifts (*Chaetura pelagica*). The Nesting/Roosting Towers and Educational Signage project expanded into Orleans Parish at the University of New Orleans, and Waters worked with City Park in New Orleans for further expansion. The nest towers feature educational signage. At UNO, the project took on a cross curriculum aspect when art students teamed up to paint murals on the towers. Natalie Waters expanded upon a multifaceted pollinator project, with events related to this including a native pollinator plant giveaway featuring milkweeds (genus Asclepias) and other native species, volunteer events at established pollinator gardens, and a native seed packaging event with volunteers from area gardening groups, where volunteers created more than 1,500 native plant seed packets containing more than 100,000 seeds. The packets were used to create seed libraries established by BTNEP at the Houma and Thibodaux public libraries. The seed libraries provide the community access to free seeds and encourages residents to create pollinator habitat at home.

Resiliency and Sustainability

In FY23 BTNEP hired Emily Braud as its new Volunteer and Marine Debris Coordinator after she transferred from the water quality team. Braud continues to manage the EPA's Geauxing Green: Sustainable Festival Planning program which seeks to divert a substantial amount of festival refuse from landfills to recycling or composting facilities. This includes the French Quarter Festival, which draws just under a million visitors annually. Other projects Braud oversaw included a renewed cooperative agreement in partnership with the Louisiana Department of Wildlife and Fisheries to remove and categorize marine debris on Elmer's Island, and the annual Bayou Lafourche cleanup (in coordination with Friends of Bayou Lafourche and the Bayou Lafourche Fresh Water District), which continues to draw attention to BTNEP's longstanding educational and stewardship roles within the region.

Communications

BTNEP continued its communications efforts by expanding its social media footprint under the direction of Communications and Public Affairs coordinator Emily Knobloch Bonvillain. Targeted messages throughout the calendar year included the highly anticipated tidal calendar – a BTNEP staple and favorite of constituents for more than two decades. The year also saw BTNEP update its logo and branding in an effort to honor its past as it leans into the future with a fresher look. One notable project saw BTNEP in a role as a producer with Louisiana Public Broadcasting to create the award-winning documentary, “The Precipice”. The film tells the story of the Pointe-au-Chien Indian Tribe and the valiant struggle to save their land and maintain their culture and language in the face of climate change and their ongoing fight for federal recognition. The film was selected as the documentary film of year by the Louisiana Department of the Humanities and was also nominated for two Emmys. It aired nationally, and several times statewide, and is used to foster discussion in forums across our State and nation.

Each member of the BTNEP staff works to tell the story of our estuary to a variety of audiences. One such successful collaboration saw Andrew Barron, Michael Massimi, Emily Knobloch Bonvillain and T. Bradley Keith all working on a project that established a permanent BTNEP exhibit at the Louisiana Swamp Exhibit at the Audubon Zoo in New Orleans.

LUMCON’s DeFelice Marine Center as seen from local marshes.

Appendix A: LUMCON Grants in FY 2023

Continuing:

Archer SK. Assessing Which, When, and Why Fishes Use Artificial Reefs Through Passive Acoustics and Capture Based Methods, Louisiana Sea Grant's Artificial Reef Research Assistantship Program, 2022-2023, $106,668

Archer SK, Bockus A, Claridge D, Dunn C; "Determining Marine Ecosystem Resilience to Contamination After a Catastrophic Storm Event in Abaco Island, The Bahamas - COVID-19 Supplement", National Geographic Exploration Grant, 2021-2022; $4,995

Archer SK, La Peyre M. Identifying Acoustic Indices of Oyster Reef Health, Louisiana Sea Grant Undergraduate Research Opportunities Program. 2022. $3,000.

Bourgeois R, Bockus A, **Archer SK**, Fontenot Q. Developing Asian Carp Markets to Increase Harvest, US Fish and Wildlife Service, 2021–2023, $147,000 (LUMCON portion $90,705)

Demars B, Karlsen SR, Jackson-Blacke L, **D'Andrilli J**. QUANTOM – QUANTification of Dissolved Organic Matter and the Metabolic Balance in River Networks: Mechanisms and Model Simulations of CO2 Emissions, Norwegian Research Council Program, 2021-2024, NOK 11,912,304 (LUMCON portion $130,000)

Gemmell B, Karp-Boss L, Wheeler G, **Du Clos KT**. Novel imaging, physiology and numerical approaches for understanding biologically mediated, unsteady sinking in marine diatoms, NSF GEO-NERC, 2021–2024, $472,846 (LUMCON portion $102,756).

Haggarty D, Dudas S, Mouy X, **Archer SK**, English P, Juanes F, Halliday W, Gauthie S. Passive Acoustic Methods for Improving the Monitoring of Vulnerable Rocky Reef Fishes, Fisheries and Oceans Canada: Competitive Science Research Fund, 2021-2024; $398,355 CAD (LUMCON portion $0)

Hamdi J. Organic Matter Export, Processes, and Transformations Drive Carbon Cycling Patterns in the Arctic Ocean, NSF Office of Polar Programs Postdoctoral Proposal Fellowship, 2021-2023, $160,000 (Supervisor: Dr. Juliana D'Andrilli, host institution: LUMCON)

Holmquist J, **Roberts BJ**, et al. (8 total PIs). Data-Model Integration for Monitoring and Forecasting Coastal Wetland Carbon Exchanges: Serving Local to National Greenhouse Gas Inventories, NASA CMS, 2019-2023, $1,123,976 (LUMCON portion $160,000)

Hopkins B, David S, **Rieucau G**. Habitat Use and Trophic Ecology of Alligator Gar in Restored Mississippi River Floodplains, National Fish and Wildlife Foundation, 2020-2023; $400,000 (LUMCON portion $109,484)

Kolker AS. Neptune Pass Sediment Mass and Volume Balance An approach to elevate land development, Coastal Protection and Restoration Authority, 2021-2023, $63,233 (LUMCON portion $26,353)

Lewis J, **Roberts BJ**, Ferris MT, Meselhe E, van Bael S. SRS-RN: Hybrid Water Infrastructure and Regional Sustainability - Planning a Convergence Science Approach in Greater New Orleans, NSF Sustainable Regional Systems Research Networks Program Track 2 Planning Grant, 2022-2025, $149,343

Morley JW, Ajemian MJ, **Archer SK**, Baskett M, Ciannelli L, Duffy E, Nelson MW. Ecosystem Mismatch in Fisheries Vulnerability to Climate, Lenfest Ocean Foundation, 2020-2023, $299,335 (LUMCON portion $12,609)

Nelson J, **Roberts BJ**, **Rieucau G**, Xu K, Johnson D. Ecological Function and Recovery of Biological Communities Within Sand Shoal Habitats Within the Gulf of Mexico, Bureau of Ocean Energy Management, 2019-2024, $2,299,985.

Polito MJ, Hooper Bui L, Swenson E, Jenson O, Martin C, **Roberts BJ.** Linking Community and Food-Web Approaches to Restoration: An Ecological Assessment of Created and Natural Marshes Influenced by River Diversions, Northern Gulf Institute, 2022-2024; $119,007 (LUMCON portion $39,082)

Polito M, **Roberts BJ**, **Rabalais NN**, et al. (9 total PIs). Linking Community and Food Web Approaches to Restoration: An Ecological Assessment of Created and Natural Marshes Influenced by River Diversions, NOAA RESTORE, 2017-2023; $2,040,845 (LUMCON portion $429,521)

Polito MJ, Swenson E, Lopez-Duarte P, **Roberts BJ**, **Rabalais NN**, Martin C. Planning for a Fresher Future: Implications of River Management Practices on Saltmarsh Restoration Projects in Coastal Louisiana, USGS South Central Climate Adaptation Science Center, 2021-2024. $299,998 (LUMCON portion $66,014)

Rieucau G. Evaluating Restoration of Ecological Functions of Salt Marsh Habitats Using High-Resolution Imaging Sonar, Louisiana SeaGrant, 2022; $10,000.

Roberts BJ. Can Ribbed Mussels Augment Coastal Restoration Projects in a World of Rising Seas?, Louisiana Sea Grant/LA Coastal Protection and Restoration Authority CSAP Program, 2021-2024, $80,000

Roberts BJ, **Conover JP.** REU Site: Interdisciplinary Research Experiences in Louisiana's Changing Coastal Environments, NSF OCE, 2022-2025, $529,225

Roberts BJ, **Malbrough J.** Collaborative Proposal: Proposal for the Operation of Regional Class Research Vessel #3 in the Gulf of Mexico, Caribbean Sea, and Southwestern Atlantic Ocean, NSF, 2019-2025, $3,173,061

Stedmon CA, Qiao J, Sejr M, Osburn C, **D'Andrilli J**, Granskog M, de Steur L, Dodd P. New Insight on Ocean Circulation and Fate of Organic Carbon in the Arctic Ocean, Danish Research Council, 2019-2023; DKK 6,078,488 (LUMCON portion $10,000)

Stoner EW, **Archer SK**, Whitman ER; "RUI: The Role of Ecological Memory in Nearshore Seagrass Beds Affected by Multiple Stressors", NSF Biological Oceanography, 2021-2024; $676,239 (LUMCON portion $86,496).

New:

Bourgeois R, Bockus A, **Archer SK.** Determining product quality parameters to expand market potential for Louisiana invasive carp", US Fish and Wildlife Service, 2023-2023, $92,513 (LUMCON portion $39,010).

Bowles MW, Roberts BJ, Maiti K, Meile CD. Methane efflux from river influenced coastal marine sediments, National Science Foundation, Division of Ocean Sciences, Chemical Oceanography, 2022

-2025, $1,038,171.

Conover M, Bowles MW. 2024 Coding for Marine Sciences Workshop, Brown Foundation, 2023-2024, $18,125.

DeGrandpe M, **D'Andrilli J**, Payn RA, Peipoch M. Collaborative Research: LTREB Renewal - River ecosystem responses to floodplain restoration, NSF Long Term Research in Environmental Biology, 2023-2028, $599,599 (LUMCON portion $143,000).

Engel AS, **Roberts BJ, Bowles MW**, Schutte CA, Huang H, Justic D, Mariotti G, Yeager K. Methane dynamics across microbe-to-landscape scales in coastal wetlands, National Science Foundation, Frontier Research in Earth Sciences, 2022-2027, $2,949,601 (LUMCON portion $944,902).

Glaspie C, **Archer SK**, Dance M, D'Sa E, Giordano S, Gayanilo F, Klieber K. Louisiana Deltaic Estuaries MBON: Sea level Rise Sentinels, NOAA's Marine Biodiversity Observatory Network, 2023-2028, $1,749,971 (LUMCON portion $425,152).

Lavaud R, **Archer SK**, Callum B, La Peyre J. Continuous measurement of valve movements to monitor grow-out conditions of farmed oysters, Louisiana Sea Grant's Aquaculture Program, 2022-2024; $117,789 (LUMCON portion $5,986).

Roberts BJ, Archer SK. RAPID: Securing the LUMCON natural history collection, a vital Gulf Coast resource, National Science Foundation, Division of Biological Infrastructure, 2022-2024, $199,102.

Roberts BJ, Nelson J, **Rieucau G**, Xu K, Johnson D. Ecological Function and Recovery of Biological Communities within Sand Shoal Habitats within the Gulf of Mexico-extension, Bureau of Ocean Energy Management, 2023-2027, $1,798,596 (LUMCON portion $702,922)

Roberts BJ. Stauffer B. Building a network of nutrient sensing in the northern Gulf of Mexico, Gulf Coast Ocean Observing System, 2022-2024, $75,000.

Appendix B: List of Scientific Publications in FY 2023

Agharroud K, Puddu M, Ivcevic A, Satta A, **Kolker AS**, Snoussi M. 2023. Climate risk assessment of the Tangier-Tetouan-Al Hoceima coastal region (Morocco). Frontiers in Marine Science. 10: 1176350. doi:10.3389/fmars.2023.1176350

Bell KLC, Chow JS, Hope A, Quinzin MC, Cantner KA, Amon DJ, Cramp JE, Rotjan RD, Kamalu L, de Vos A., et al. (including **McClain CR**). 2022. Low-cost, deep-sea imaging and analysis tools for deep-sea exploration: a collaborative design study. Frontiers in Marine Science. 9: 1233. doi:10.3389/fmars.2022.873700

Binder B, **Rieucau G**, Locascio J, Taylor CJ, Boswell KM. 2023. Impact of an anthropogenically mediated environmental disturbance on coastal fish community dynamics. PeerJ. 11: e14888. doi:10.7717/peerj.14888

Bryant SRD, **McClain CR**. 2022. Energetic constraints on body-size niches in a resource-limited marine environment. Biology Letters. 18(8): 20220112. doi:10.1098/rsbl.2022.0112

Bryant SRD, **McClain CR**. 2022. Functional space expansion driven by transitions between energetically advantageous traits in the deep sea. Proceedings of the Royal Society B. 289 (1987): 20221302. doi:10.1098/rspb.2022.1302

Campanino FM, English PA, Layman CA, **Archer SA**. 2023. Sponge presence increases the diversity and abundance of fish and invertebrates in a subtropical seagrass bed. Estuaries and Coasts. 46(4): 1009-1020. doi:10.1007/s12237-023-01186

Chin YP, McKnight DM, **D'Andrilli J**, Brooks N, Cawley K, Guerard J, Perdue EM, Stedmon CA, Tratnyek PG, Westerhoff P, et al. 2023. Identification of next-generation International Humic Substances Society reference materials for advancing the understanding of the role of natural organic matter in the Anthropocene. Aquatic Sciences. 85: 32. doi:10.1007/s00027-022-00923-x

D'Andrilli J, Silverman V, Buckley S, Rosario-Ortiz FL. 2022. Inferring ecosystem function from dissolved organic matter optical properties: a critical review. Environmental Science & Technology. 56(16): 11146−11161. doi:10.1021/acs.est.2c04240

Du Clos KT, Gemmell BJ, Colin SP, Costello JH, Dabiri JO, Sutherland KR. 2022. Distributed propulsion enables fast and efficient swimming modes in physonect siphonophores. Proceedings of the National Academy of Sciences. 119(49): e2202494119. doi:10.1073/pnas.2202494119

Hancock GM, Sancho G, Munch SB, Salinas S. 2023. Effects of daily thermal fluctuations on the Atlantic silverside, a fish with temperature-dependent sex determination. Journal of Fish Biology. 102(5): 1261-1266. doi:10.1111/jfb.15372

Hanson F, Wünsch U, Buckley S, Fischer S, Leresche F, Murphy K, **D'Andrilli J**, Rosario-Ortiz FL. 2022. DOM molecular weight fractionation and fluorescence quantum yield assessment using a coupled in-line SEC optical property system. ACS EST Water. 2(12): 2491-2501. doi:10.1021/acsestwater.2c00318

Howe KL, Seitz KW, Campbell LG, Baker BJ, Thrash JC, **Rabalais NN**, Rogener MK, Joye SB, Mason OU. 2023. Metagenomics and metatranscriptomics reveal broadly distributed, active, novel methanotrophs

in the Gulf of Mexico hypoxic zone and in the marine water column. FEMS Microbiology Ecology. 99(2): fiac153. doi:10.1093/femsec/fiac153

Kenney WF, Shields MR, Bianchi TS, **Kolker AS**, Mohrig D. 2022. Excess 210Pb as an indicator of flood-stage sediments in prograding, Wax Lake Delta, USA. Marine Geology. 453: 106914. doi:10.1016/j.margeo.2022.106914

Keppeler FW, Junker JR, Shaw MJ, Alford SB, Engel AS, Hooper-Bùi LM, Jensen OP, Lamb K, López-Duarte PC, Martin CW et al, including **Roberts BJ**. 2023. Can biodiversity of preexisting and created salt marshes match across scales? An assessment from microbes to predators. Ecosphere. 14(3): e4661. doi:10.1002/ecs2.4461

Kolker AS. 2023. Shifting. In Hofferlin D. Way beyond bigness: the need for a watershed architecture. Novato, (CA): Applied Research and Design Books. p. 239-249.

Martin CW, McDonald AM, Valentine JF, **Roberts BJ**. 2023. Towards relevant ecological experiments and assessments of coastal oil spill effects: insights from the 2010 Deepwater Horizon oil spill. Frontiers in Environmental Science. 10: 1092097. doi:10.3389/fenvs.2022.1092097

Martin CW, López-Duarte PC, Olin JA, **Roberts BJ**. 2023. Editorial: Gulf of Mexico estuaries: ecology of the nearshore and coastal ecosystems impacted by the Deepwater Horizon oil spill. Frontiers in Environmental Science. 11: 1203443. doi:10.3389/fenvs.2023.1203443

McClain CR, Bryant SRD, Hanks G, **Bowles MW**. 2022. Extremophiles in earth's deep seas: a view toward life in exo-oceans. Astrobiology. 22(8): 1009-1028. doi:10.1089/ast.2021.0120

Quiñones-Rivera ZJ, Wissel B, Turner RE, **Rabalais NN**, Justić D, Finlay KP, Milan CS. 2022. Divergent effects of biological and physical processes on dissolved oxygen and dissolved inorganic carbon dynamics on a eutrophied and hypoxic continental shelf. Limnology and Oceanography. 67(11): 2603-2616. doi:10.1002/lno.12225

Voight JR, Heck PR, **Du Clos KT**. 2023. Competition in the deep sea: phylogeny determines destructive impact of wood-boring xylophagaids (Mollusca: Bivalvia). Marine Biodiversity. 53(1): 1. doi:10.1007/s12526-022-01306-z

Appendix C: List of Invited Presentations by LUMCON Faculty in FY2023

Archer SK. Read the room: The importance of context in understanding and managing ecological systems in the Anthropocene. Fisheries and Oceans Canada, Pacific Biological Station's Monthly Seminar Series.

Archer SK. The not so silent world. How animals use sound in the ocean. Louisiana Tech University Biological Sciences Seminar Series

Archer SK. The not so silent world. How animals use sound in the ocean. University of Louisiana Lafayette Biological Sciences Seminar Series

D'Andrill J. Identifying patterns of microbial degradation across the Fram Strait by FT-ICR MS: How does dissolved organic matter, matter? National Institute of Aquatic Resources, Technical University of Denmark, Lyngby, Denmark.

D'Andrilli J. Insights into the interconnection and future of cryosphere and marine aquatic ecosystems from organic matter chemistry in a changing Arctic, School of Geosciences, University of Louisiana at Lafayette.

D'Andrilli J. Insights into the interconnection and future of cryosphere and marine aquatic ecosystems from organic matter chemistry in a changing Arctic, Division of Marine Science at the University of Southern Mississippi, Stennis Space Center.

D'Andrilli J. Advancing biogeochemical interpretations of dissolved organic matter by ultrahigh resolution mass spectrometry, National Institute of Aquatic Resources, Technical University of Denmark, Lyngby, Denmark.

D'Andrilli J. Carbon cycling patterns, connections, and the future of aquatic ecosystems from organic matter chemistry, Departments of Biological Sciences & Chemistry, University of North Texas, Denton, TX.

Du Clos K. Sink or swim: Exploring aquatic locomotion, Dauphin Island Sea Lab.

Du Clos K. Siphonophores: complex, colonial swimmers, Department of Biological Sciences, University of New Orleans.

Rieucau G. Stay in School! Exploring the behavior of marine fishes using advanced technology, Mulberry Elementary School.

Rieucau G. Collective mechanisms in groups living marine organisms, Department of Biological Sciences, Florida Atlantic University.

Rieucau G. Exploring the functions and mechanisms of schooling behavior in marine fishes, The Water School, Florida Gulf Coast University.

Rieucau G. The *Whys* and *Hows* of fish schooling behavior and what we can learn from them, Louisiana Academy of Sciences.

Rieucau G. Social and collective behaviors of marine nektonic species: The *Whys* and *Hows*, Department of Biological Sciences, Old Dominion University.

Roberts BJ. LUMCON: The Heart of Louisiana Marine Science. Barataria-Terrebonne National Estuary Program (BTNEP) Management Conference. November 2022.

Roberts BJ. Ship Shoal benthic primary production responses to dredging depend on dredging depth and time since dredging completion, BOEM Biological Working Group. January 2023.

Roberts BJ. Program Handbooks, Preparing Mentors, and Other REU Logistics. NSF GEO REU Virtual Workshop Series. April 2023.

Roberts BJ. Ship Shoal biological responses to dredging depend on dredging depth and time since dredging completion, LUMCON Summer Seminar Series. June 2023.

Appendix D: Fiscal Year 2023 LUMCON Donors

Abdon Callais Offshore LLC
Robin Daily Achee
Allan Adams
Tiffany Adams
Yvan Alleau
James Ammerman
Suzanne Hollis Apple
Anna Armitage
Arthur M. Blank Family Foundation
Jeanine Ash
Jake Bailey
Santana Banerjee
Galen Bangs
Bayou Community Foundation
Jordon Beckler
Katherine Bell
Mark Benfield
Billy Joseph Bergeron
Jennifer Biddle
William Bisland
Daniel Blell
William Bockus
Donald Boesch
Dale Boger
Mr. & Mrs. Peter D. Boulet
Tim Bourcier
Jenny Bourgeois
Jen Bowen
Michelle Boyland
Rex Boyland
Elizabeth Boyle
John Boyle
Glenny Lee Castagnos Buquet
Chapman H. "Bobby" Burguieres, Jr.
Brett Burk
Sharita Burns
Jarrett Byrnes
Amanda M. Callais
Charles M. Callais
Gavin P. Callais
Bill Campbell
Laura Candler
Vincent A. Cannata
Gordon Cannon
Zoe G. Cardon
Mr. and Mrs. Jim Carlton
Tim Carruthers
Heather Carskaddan
Patrick Cavanaugh
Kim Chafin
Dr. Prosanta Chakrabarty
SueEllen Chastan
Chevron
Chugach Technical Solutions
Hon. Michel H. Claudet
Maddie Coleman
Community Foundation of Acadiana
Johnny Conrad
Gabrielle Corradino
Susan Coutour
Ronadh Cox
Traci Erin Cox
Crimson Gulf/Crescent Midstream
Carla Culpepper
Michael D'Angelo
Mr. and Mrs. Jack Darnell
Abigail Davis
Steven Davis
Kim de Mutsert
Linda Deegan
Dave J. DeFelice, Jr.
Robert W. Dickey
Stefan DiMauro
Scott Doney
Eileen Donovan
Alistair Dove
Sarah Drew
Tara Duffy
Karin T. Eberhardt
Energy Made Visible
Elizabeth Engle
Peter Etnoyer
Emily Farmer
Mary Farmer-Kaiser
John Farrington
Seth Finnegan
Charlotte Fjelkegård
Megan Fork
Gary L. Ganier
Sue Ann Gardner
Simon Geist
Anne Giblin
Peter Girguis
Dianne Greenfield
Heather Griffith
Trishna Gurung
Halimar Shipyard, LLC
Courtney Lynn Hall
Katy Robinson Hall
Leila Hamdan
Torrance Hanley
Amber Hardison
Paul Harnik
Lora Harris
Hilairy Hartnett
Morris P. Hebert
Amy Henry
Luan Heywood
William H. Hidalgo, Sr.
Jennifer Hill
Kristen Honey
Xinping Hu
Matthew Huber
Andrew Huff
Kayla Iacovino
Matt Isch
Paul Jackman
Ryan James
Joe W. and Dorothy Dorsett Brown Foundation
Mary Johnson
Scott Jones
Frank Jordan
David Klinges
Dr. Alexander Kolker

John Kominoski
Stephen Kraft
Julie Kunselman
Gary LaFleur
Susan Lambert
Thomas J. Lanaux
Robert A. LeBlanc
Jerry P. Ledet, Jr.
Jerry Lindig
Alex Lowe
Christopher Lowry
Robert Mahon
Sarah Faye Mahon
Joe Malbrough
Andrew Marron
Kristin Maseman
Christopher Masey
Mary Mather
MBL Ecosystems Center
Scarlett McBrayer
Craig R. McClain
Shawna McCreary
Sara Shields Menard
Harrison Meyer
Allison Mojzis
Jimmy Nelson
John Nelson
Catherine Newman
Jill Olin
Lindsay Olson
Daniel Otis
Gordon Paterson
William Patterson
Charles Pence
Harriet Perry
Petroleum Laboratories, Inc.
James Pierson
Michael Polito
Bennett M. Porche, Sr.
Donald W. Price
Jonathan Prince
Pump Rentals
Nicholas Raio
Deborah Ramsden
Sarah Ramsden
Jonathan Ramsey
Karin Rice
Kameron Richardson
Amanda Richey
Guillaume Rieucau
Eden Robins
Elizabeth Robinson
Kelly N. Robinson
Rebecca Robinson
Kathleen Rodrigue
Dr. Troy Roepke
Richard J. Roth
Gregory Rouse
Andre Royal
Sebastian Ruff
Jennifer Ruppert
Kimberly Ryder
Daniel Saltzberg
Michelle Satterwhite
Joan Sheldon
Amelia Shevenell
Antoinette Sims
Elizabeth Skilton
Taylor Sloey
Dudley J. Smith
Michael D. Smith
Patricia Smith
Susan Smith
Diane Sontheimer
South Louisiana Bank
Sarah Spiegler
Carrie Stansbury
Barbara Stauffer
Beth Stauffer
Kimberly Stauffer
Paula Stott
Renee Styles
Surbo Tubular Services
Martha Sutula
Synergy Bank
Jeremy Thorp
Cameron Thrash
Zachary Topor
Tara Topping
Kaitlyn E. Trahan
Mr. & Mrs. Heinke Trapp, Jr.
Jane Tucker
Hazel Turlington
John Ughrin
United Therapeutics Corporation
Michael Vardano
Rachel Villani
Jodie Harper Waggenspack
Douglas E. Waitz
Alex Wameke
Hongjie Wang
John Wares
Mr. and Mrs. Mark Waskom
Katie Watkins-Brandt
Mr. and Mrs. David Wells
Michael Wetz
John Whiteman
Claire Windecker
Dia Windhoffer
Amy Windsor
Sallie Wood
Keith Wyckoff
Kevin Zelnio
Scott Zengel