

LUMCON

FY 2022 ANNUAL REPORT



CONNECT | ENRICH | TRANSFORM

EXECUTIVE DIRECTOR'S MESSAGE

The past year (fiscal year 2022) has been a notable and eventful one for LUMCON and the entire region. The year began with great promise as COVID restrictions eased enough to allow us to bring the 2021 cohort of Research Experiences for Undergraduates (REU) interns to Cocodrie to complete the second half of their internship at the Marine Center after spending the first five weeks working remotely. This marked the first time we were able to have students in residence for an extended period since the summer of 2019. This seemed to indicate a light at the end of the tunnel we had been in since the beginning of the COVID pandemic in spring 2020. We even started to schedule more in-person activities for the fall 2021 and into spring 2022.

That promise of a return to pre-pandemic normalcy turned out to be short-lived as less than two months later we found ourselves bracing for what would become one of the most devastating hurricanes in history. Like so many in our community we first needed to make sure everyone was safe and healthy, afterwards, we assessed what was needed to allow everyone to have proper shelter and resources for living their lives. The outpouring of support shown across our entire community was inspiring. As LUMCON staff were putting our personal lives back together we were simultaneously able to assess the damages to Marine Center, pick up the pieces, and move forward with recovery with the help and support of friends

As you will read later in this report, recovery has taken longer than initially expected but the tremendous efforts and determination of all LUMCON employees and support of our friends have not only allowed us to get back to operations but in many ways have made us stronger. LUMCON has experienced multiple hurricanes since the Marine Center was built in Cocodrie and the resilience of its staff continues to be inspiring to all of us that have the opportunity to work in this special location. I think that the past year marks a new era for our institution and how we will continue to redefine ourselves and all that we provide to our partners and community. We were determined to offer a full in-person summer program for the first time since 2019 despite the extensive, on-going repairs and low staff numbers. Through the amazing efforts of our staff we were able to do just that despite repairs to the dormitories being completed just before the arrival of the first students and not yet having a fully operational kitchen. We were able to host our 10-week NSF-funded REU program, a new residential graduate fellowship program, a new 6-week STEM Prep program, a teacher professional development workshop, and two one-week residential summer camps for high school students. Our research faculty were able to maintain an impressive level of productivity despite the challenges of compromised facilities for much of the year. A great example of the creativity employed to get research done involved renting multiple RVs to provide housing for a collaborative team of researchers from ULL, LSU, VIMS, and LUMCON while our dormitories were not available so they could complete offshore work on the *R/V Acadiana*.

The events and challenges of the past few years has only increased my confidence in what the future holds for LUMCON and the broader consortium. As we move into FY23, LUMCON is looking forward to an era where we seek to recommit to the idea that LUMCON can serve as a hub for collaborative efforts among consortium members, federal/state agency partnerships, and community stakeholders.

Sincerely,



Brian J. Roberts

Interim Executive Director



CONNECT

Consortium Highlights

In FY22, LUMCON's consortium activities continue to expand despite the challenges presented by Hurricane Ida impacts and on-going repairs and evolving constraints resulting from the continuing COVID pandemic. LUMCON provided new educational opportunities and expanded research collaborations while still providing vessels, facilities, locations, and resources to consortium institutions.

LUMCON is strongly committed to creating and maintaining an academic pipeline made up of accessible, low cost, high-quality, and relevant opportunities in marine science and other STEM disciplines for Louisiana students. With this goal in mind, LUMCON developed a new program known as STEM Prep which was offered for the first time in 2022. 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 basic 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 **Baton Rouge Community College, River Parishes Community College, Dillard University, Southeastern Louisiana University, University of Louisiana Lafayette, and Louisiana Tech University** in 2022. 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 REU and STEM Prep students visit UNO to collaborate with graduate students on research tasks for the Archer Lab.

We were able to offer our semester courses in fall (Oceans and Society) and spring (Changing Coastal Oceans) despite still grappling with many challenges, with field trips being virtual as a result of pandemic restrictions and ongoing repairs to the facilities. Students from **University of Louisiana Lafayette, Nicholls State University, and University of New Orleans** participated in Oceans & Society often dealing with their own uncertainties through Hurricane Ida. Thirty eight students from **LSU-Shreveport, Nicholls State University, University of Louisiana Lafayette, Northwestern State University, Tulane University, and University of New Orleans** participated in Changing Coastal Oceans making it one of the largest



classes in the history of the course. Our REU cohorts included interns from consortium institutions during both the summers of 2021 (**University of New Orleans**) and 2022 (**University of New Orleans, Nicholls State University** and **Grambling State University**). Finally, one of the two participants in our new graduate student in residence program is enrolled at **University of New Orleans**.

Throughout FY22 LUMCON continued to strengthen existing relationships and develop new relationships with members of our consortium. A memorandum of understanding (MOU) finalized between LUMCON and the **University of Louisiana at Monroe (ULM)** will allow for expanded animal research at the DeFelice Marine Center with Institutional Animal Care and Use Committee approvals overseen by ULM. 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 FY22 on the construction of LUMCON's new facility on this campus as well as the finalization of design and securing of funding for LUMCON's other projects (Marine Operations Center and vessel slip / bulkhead projects). This partnership has also focused on the development of a potential Marine Technician training program and possibility of establishing a Maritime Academy for Louisiana on the campus. 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 FY22 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, Tulane University, and/or Louisiana Tech**). LUMCON faculty published a total of 15 peer-reviewed publications in FY22 that included co-authors from consortium member institutions (**University of Louisiana Lafayette, Louisiana State University, LSU Ag Center, University of New Orleans, Nicholls State University, Tulane University, and/or Louisiana Tech**). 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 FY22, LUMCON faculty directly supervised a total of 7 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.



ENRICH

LUMCON Education and Outreach (E&O) had many successes in fiscal year 2022. Program staff focused on building access to marine science education through creating pipelines. Providing mentorship, access, and ensuring the continued success of students in marine science has never been more important. At this moment, Louisiana communities are experiencing substantial environmental changes due to land loss and climate change. The impacts are complex, bring unprecedented challenges, and require a dedication to advancing the scientific understanding of Louisiana coastal and marine environments. LUMCON understands that only by investing in the success and retention of its students in marine science can Louisiana ensure a future where our communities are more environmentally literate, resilient, and able to innovate to become leaders in a changing world. LUMCON continued its long legacy of cultivating and defining student potential by creating opportunities for



learners at all academic career stages. E&O program opportunities are innovative since it is strongly tied to LUMCON's core value of integrating research programs with education programs in non-traditional ways. This integration combines the best of both programs at the Marine Center. These experiences are tailored to a student's individual perspective and increase student potential by providing work experience, increase skill-sets, and help students build peer and professional support networks.

In FY22, education staff supported the need to provide access to all groups, especially those underrepresented in marine science; brought back in-person programs, continued to invest funding and resources into education infrastructure; and developed more digital content and programs. The program continued to evolve and adapt to the continued absence of in-person visits and activities in early FY22. Since the start of the pandemic, LUMCON E&O had put a lot of effort towards building a digital presence, which placed the programs at an advantage in the aftermath of Hurricane Ida. The lessons learned after the hurricane provided more insight into future planning as LUMCON continues to excel at in-person programming and a significant presence in the digital realm. By identifying gaps in content and using LUMCON's incredible ability to integrate research programs and education programs LUMCON achieved its goal to remove barriers to innovative marine science education programming.

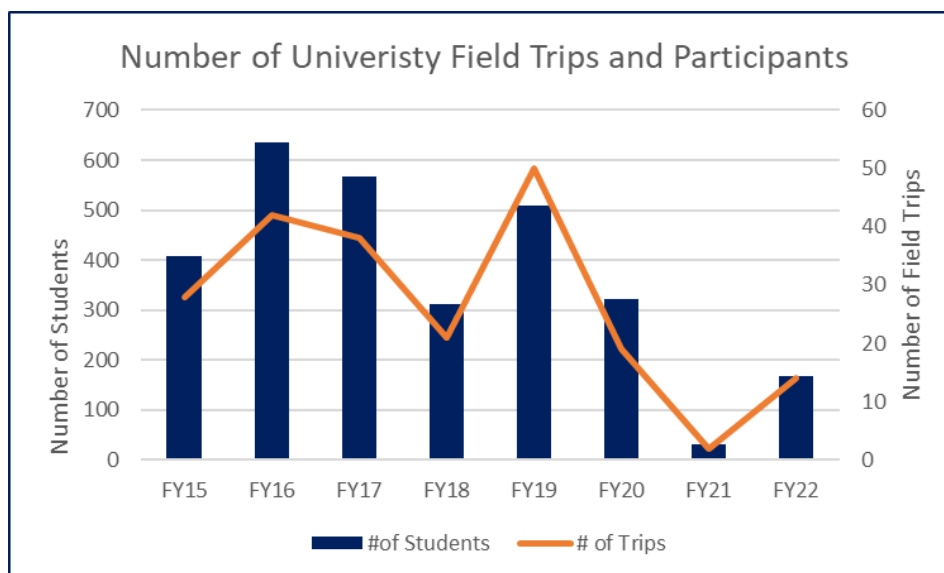
University Education

During FY 22 LUMCON had great success in the continuation of online semester courses, engaging with students informally using digital platforms, reinstating in-person university education activities, and providing popular and new summer activities. The return of in-person activities was met with



enthusiasm by consortium members and LUMCON staff. The demand of consortium and non-consortium faculty members for LUMCON services in FY22 is a good indicator that hands-on experiential learning opportunities continue to be, perhaps are even more, vital to training students from all academic levels. As LUMCON members continue to meet the needs of students in this post-pandemic era we remain dedicated to assisting them to train the next generation of professionals.

Field trips: In the spring of 2022, E&O staff were able to host field trips activities on a limited basis for our consortium member faculty. The ability to schedule LUMCON programs, facilities, vessels, and education staff support was well received by many faculty members who have been eager to return to the Marine Center after two years of no access. The table below shows the number of field trips and student participants over the last eight fiscal years. In both cases, the higher numbers seen in FY 16, 17, and 19 represent years when the E&O programs were fully staffed with trained educators. FY20 numbers represent only the numbers from July 19 to March of 2020. FY 22 reflects the number with only one education staff member.



Semester Courses: LUMCON semester courses were offered to consortium member students. LUMCON semester courses are offered every semester to students that attend institutions that have an established MOU with LUMCON. The MOUs with consortium members make it possible for LUMCON to receive tuition from the students' home institutions. This funding allowed LUMCON to reinvest into the program in order to continue to offer courses and provide resources for those classes. In FY22, LUMCON had 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. Descriptions of the courses offered in FY22 are provided below.

The Ocean and Society (Fall 2021): This course covered current ocean-related topics and issues and the science behind them. Throughout the class, faculty gave students a better understanding of how science is used to develop sound management plans, conservation programs, and socioeconomic decisions to address the current challenges facing the world's oceans and seas and the societies that depend upon them. Lectures and discussions explored the science behind some of the most current ocean issues, such as animal and human

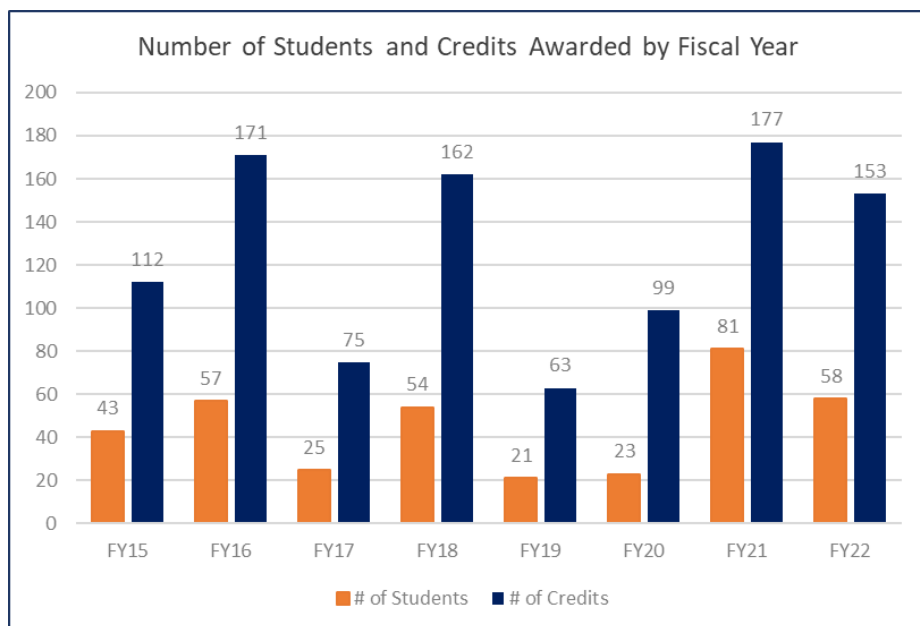


interactions, natural resources, biomedicines, protection from erosion and flooding of coastal zones, noise pollution, and environmental change.

Applying to Graduate School in the Natural Sciences (Fall 2021): In 2021, LUMCON faculty member Dr. Stephanie Archer developed a course to help students establish a plan and start the process of applying to graduate school. The course's goal was to demystify the graduate application process and provide students with the confidence and tools necessary to find and be admitted to the perfect graduate program. Unfortunately, the course did not meet enrollment requirements. However, LUMCON still believes there is a need for this type of opportunity within Louisiana's student population and will further investigate how and where to offer the course in the future.

Changing Coastal Oceans (Spring 2022): The Changing Coastal Oceans course went through an extensive reorganization in the spring of 2021. The module-based structure was well received by students and allowed instructors to focus more heavily on current issues facing our coastal oceans. The course focuses on changing coastal oceans from the perspective of human activities including direct and indirect human influences on coastal ecosystems and resources. Lectures in this course explain the effects of human activities on the chemistry, biology, geology, ecology and ecosystem structure and function within coastal marine environments.

The graph below shows the number of registered students and credits awarded by fiscal year for the last eight fiscal years.



Summer Programs

LUMCON was able to host a full summer program in FY22. The programs offered at the Marine Center consisted of the REU program and two new programs. Below is a summary of each program.



The LUMCON REU program was once again funded by the National Science Foundation. The goal of the LUMCON REU site is to provide stimulating, challenging, and lasting research experiences for a highly qualified, diverse cohort of undergraduate student participants from throughout the United States. In meeting this goal, specific objectives of the LUMCON REU program are to 1) expose students to a variety of research settings and disciplines of coastal and marine science, 2) facilitate the design, implementation and completion of individual, independent research projects, 3) train students in basic research skills in oral and written scientific presentation skills, 4) expose participants to the diversity of career paths that exist in science as well as a diverse ensemble of role models, 5) teach participants about the linkages between scientific research and ecosystem management, and 6) develop a cohort of future scientists through a common research experience and opportunities for both formal and informal exchange and communication between students and between students and mentors. Below is a list of the 2021 and 2022 cohorts and their affiliated universities.

2021 REU Students			
Name	Institution	Presentation Title	Mentor
Olivia Aguiar	University of Massachusetts Dartmouth	"Temporal Dynamics on Snail Density and Species Composition in a Louisiana Salt Marsh"	Roberts
Alexa Labossiere	SUNY ESF	"The Influence of a Warming Arctic on the Relationship Between Terrestrial and Marine Productivity"	Bowles
Thalia Lockett	University of New Orleans	"Measuring How Fish Calls Contribute to the Sound Pressure Level on the Lions Bay Sponge Reef"	Archer
Veronica Morales-Rodriguez	University of Puerto Rico-Aguadilla	"Morganza-to-the-Gulf Levee Impacts on Storm Surge for Places Outside the Levee System"	Kolker
Thomas Phillips	University of California-Davis	"The Response of <i>Uca longisignalis</i> to Oiling Under Controlled Conditions"	Roberts
Victoria Silverman	University of San Francisco	"Dissolved Organic Matter Optical Property Data Analysis: Informing Ecosystem Understanding"	D'Andrilli
Ta Tam	University of Washington	"Fish Calling Behaviors in Glass Sponge Reef Ecosystems"	Archer



2021 REU Students. From Left to Right: Thomas Phillips, Veronica Morales-Rodriguez, Ta Tam, Thalia Lockett, Olivia Aguiar, Victoria Silverman, and Alexa Labossiere



2022 REU Students			
Name	Institution	Presentation Title	Mentor
Jacob Badcock	Eckerd College	"Order and Chaos: A Study On Deep-Sea Wood-Fall Communities"	McClain
Haley Crawford	University of South Florida	"Organic matter in oyster reef habitats"	Archer
Kelli Davis	Grambling State University	"Trap priority effects create biases in assessments of marsh fish communities"	Roberts
Alexa Himel	Nicholls State University	"Assessing Floridian mantatee body condition during an unexpected mortality event using drone-based photogrammetry"	Rieucan
Margo Boucetta	University of New Orleans	"Benthic infaunal community dynamics in coastal Louisiana"	McClain
Nicole Lyons	University of Miami	"The contribution of archaea and bacteria to nitrification in sulfide-rich marsh sediment"	Bowles
Collin Serigne	Tufts University	"Effects of dredging operations on nutrient fluxes from Ship Shoal sediments"	Roberts
Tessa Crouch	University of California-San Diego	"Influence of organic matter chemical composition, nutrient abundance, and temperature on carbon mineralization rates by polar microbial communities"	D'Andrilli



2022 Graduate Student Fellows (GF) and REU students: From Left to Right: Yanila Salas-Ortiz (GF), Ruth Wright (GF), Nicole Lyons, Tessa Crouch, Alexa Himel, Kelli Davis, Haley Crawford, Collin Serigne, Jacob Badcock, Margo Boucetta





2022 STEM Prep Class: From Left to Right: April Peralez, Catherine Paille, Anthony Brooks-Ervin, Abhi Mehrotra, Cassidy Husson, Vance Melmoth, Brianna Jordan

The new summer opportunities focused on serving students that are from populations that are traditionally underrepresented in marine science. These new programs were made possible through the support of the Louisiana Board of Regents, and the continued contributions of partners and donors. Both programs provided students with important experiences at critical transitional phases of their academic careers.

The STEM Prep program is designed to fill a gap in the pipeline for students that are traditionally underrepresented in marine science or other STEM disciplines to begin a successful academic and professional career. Students that participate in the STEM Prep program contribute to the success of summer research and education activities at the Marine Center. They become members of a vibrant community of LUMCON faculty and staff, graduate students, visiting scientists, summer interns, and younger students and K12 teachers. By becoming immersed in the scientific and educational community at the Marine Center students make notable contributions to the research programs with impacts that range from local to global significance. During STEM Prep students meet and establish relationships with mentors, advisors, references, or possible future employers to assist and support them as they navigate through their academic paths. The goal of this program is to empower, stimulate, challenge, and support a diverse cohort of undergraduate students through work experience in a working marine lab setting. The following objectives are how the STEM Prep program accomplishes its goal: 1) provide participating students with a variety of experiences by working with a mentor faculty member and their teams to accomplish research goals of the lab; 2) train students through a series of workshops that help students acquire and practice a variety of skills that are commonly used in research settings; 3) expose students to the diversity of academic and career paths within marine and coastal science; 4) facilitate a sense of belonging in the STEM disciplines among students that are traditionally underrepresented in marine and coastal science; 5) create a deep personal connection to the coastal environments of Louisiana for students; 6) develop a solid foundation of peer and professional support between STEM Prep students, mentors, research staff, graduate students, and educators.

This six-week residential program was hosted from May 30 to July 6. In 2022 seven students were hosted. Below is a list of the students that participated in the inaugural 2022 program.



Name	Institution	Mentor
Abhi Mehrotra	Baton Rouge Community College	Archer
Anthony Brooks-Ervin	Dillard University	McClain
April Peralez	River Parishes Community College	Roberts
Brianna Jordan	University of Louisiana at Lafayette	Rieucan
Cassidy Husson	Louisiana Tech University	Bowles
Catherine Paille	Southeastern Louisiana University	Roberts
Vance Melmoth	Louisiana Tech University	Archer

The Graduate Student Fellowship program was designed to aid graduate students that are within populations that are traditionally underrepresented in marine science. This fellowship provides a graduate student with the opportunity to complete a summer in residence at LUMCON where they will take advantage of LUMCON's unique location and facilities and opportunities to work with LUMCON scientists to complete research that will contribute to their thesis/dissertation. Participants spend 10 consecutive weeks in residence at LUMCON during which they complete a research project that will contribute to their academic goals. LUMCON fellows are provided with office space and are sponsored by a LUMCON faculty member who provide logistic support, local knowledge, laboratory space, and mentorship/collaboration. In the summer of 2022 LUMCON was able to host two graduate students. LUMCON was able to support an additional student through the STEM Prep program. This additional graduate student took on the added responsibility of becoming a graduate mentor for the STEM Prep students. Below are the names and research goals of the FY 22 graduate fellows.

- Ruth Wright, University of North Carolina at Charlotte** completed a comparative study conducted at the Baruch Marine Field Laboratory in Georgetown, SC, and LUMCON in Cocodrie, LA. The research goal was to determine if the behavior exhibited by females during incubation helps to regulate temperature and thus the rate of embryo development, allowing for synchronization between spawning and highest high tides. The objectives of the study were (1) to determine if habitat (shaded/exposed) and burrow depth influences the rate of embryonic development and (2) evaluate how different temperature patterns, driven by different tidal systems, influence the timing of larval release.
- Yanila Salas-Ortiz, University of New Orleans** completed a project that characterized anthropogenic contaminants present in aquatic environments after extreme weather events and their impact on ecological health and resilience in Southeastern Louisiana after Hurricane Ida. The objective of the research was to determine whether the unremoved hurricane debris from local bayous is releasing contaminants like heavy metals and PAHs into the environment, which could have devastating effects on Louisiana's fragile ecosystem because they can accumulate in the water and sediments affecting the aquatic food web.

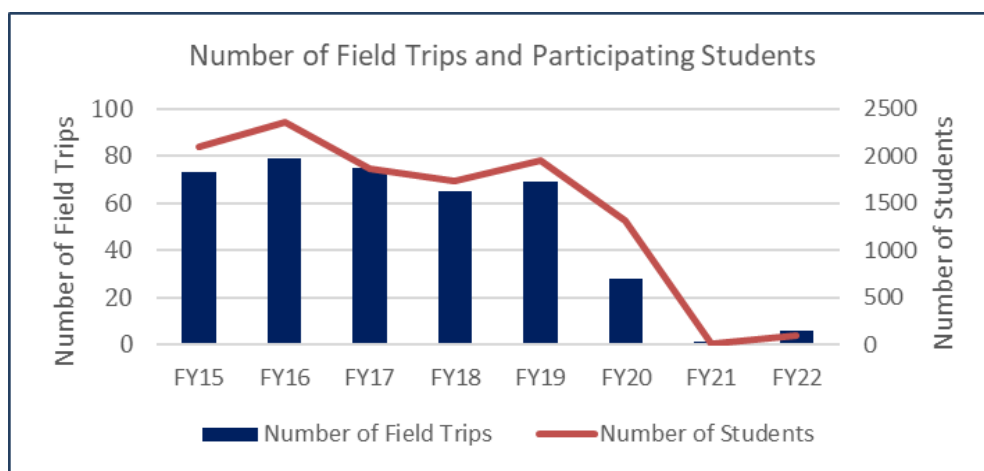


K-12 Education

LUMCON E&O used the funding to expand its digital programs. Equipment purchased in FY22 allows learners to experience “place” from distant locations meaning LUMCON can now bring the coast and the Gulf of Mexico to anyone, no matter where they are located. Staff also received funding for a new online program called the “White Boot Explorers Club” which will allow students a chance to engage with Louisiana specific marine science content and offer opportunities to engage with LUMCON faculty and staff. Additional funding will allow for members of the club to visit the Marine Center for in-person workshops and field experiences. To enhance the digital content that was developed during the pandemic, LUMCON E&O staff produced a series of documents that align the activities and materials to Louisiana State K12 science standards.

LUMCON E&O programs struggled with limited staffing in FY22, but was still able to continue to develop and create digital content and bring in-person programming back in the spring and summer of 2022.

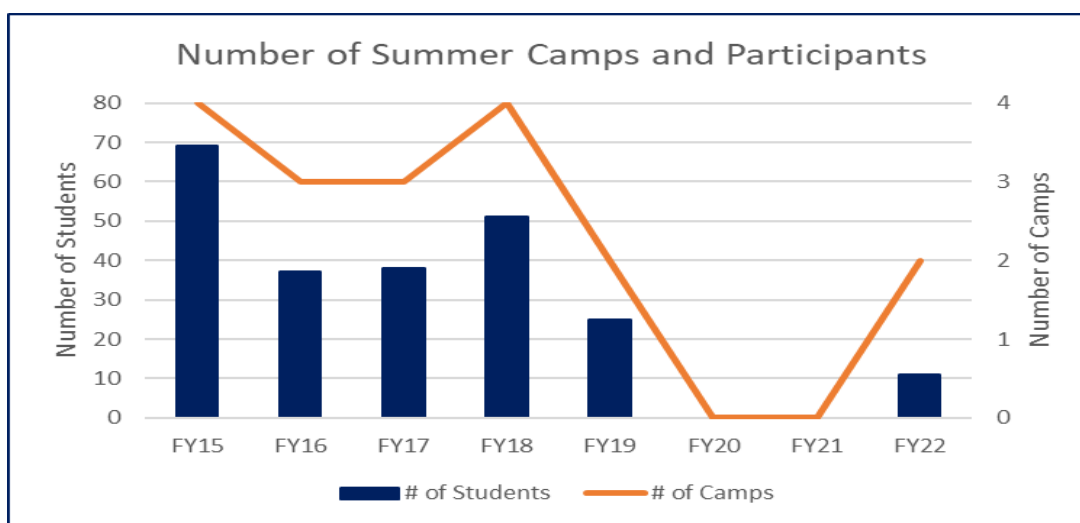
Field Trips: In-person programming was brought back in the later spring of 2022. Programming was somewhat limited to smaller groups that only required single day visits while repairs continued in the residential areas and cafeteria. LUMCON was able to accommodate the first K-12 overnight group since 2020 in June of 2022. The restoration of most accommodations and services allowed LUMCON to resume booking of groups for the 2022-2023 academic year.



Summer Programs: In the summer of 2022 LUMCON staff were able to bring back in-person residential summer programs including two of the most popular summer camps. LUMCON offered the Estuarine Awareness & Discovery Camp in June and the Field Marine Science Camp in July. Both camps highlight the integration of research and education programming. While at the Marine Center, students become part of a dedicated and passionate marine science community and have full access to the assets and resources LUMCON has to get the most immersive marine science experience possible. At LUMCON camps students do science while building personal connections to some of Louisiana's greatest environmental resources. The announcement that LUMCON would once again be offering in-person residential summer camps was well received by the public resulting in a decent number of applicants, although the number was significantly lower than in previous years. Limited education staff, reduced residential and meal service capacity, and the continued concern about COVID infections by parents meant participant numbers were lower than recent years. Both camps were highly successful and provided a renewed sense of enthusiasm among stakeholders for LUMCON summer programming.



Funding for the 2022 Field Marine Science was provided by Chevron. Below is a table showing the number of students impacted by summer camps over the last eight fiscal years.



Images from the 2022 LEAD and FMS camps.

Teacher Professional Development

From H-2-O: From H-2-O is a long-standing teacher professional development workshop rooted in the shared goal of increasing society's awareness and stewardship of Louisiana's water resources and estuarine environments. LUMCON has partnered with the Barataria-Terrebonne National Estuary Program (BTNEP) for more than 20 years to develop and deliver invaluable water quality education through the Bayouside Classroom program (lumcon.edu/bayouside-classroom/). From H-2-O is the



teacher training arm of that effort, instructing educators on how to implement BayouSide Classroom at their schools for students to learn about water quality through field testing and data collection. LUMCON E&O staff, along with its BTNEP project manager, offered From H-2-O as an online training with an in-person opportunity available contingent on COVID restrictions and policies in the summer. A total of 14 teachers received training in FY22.

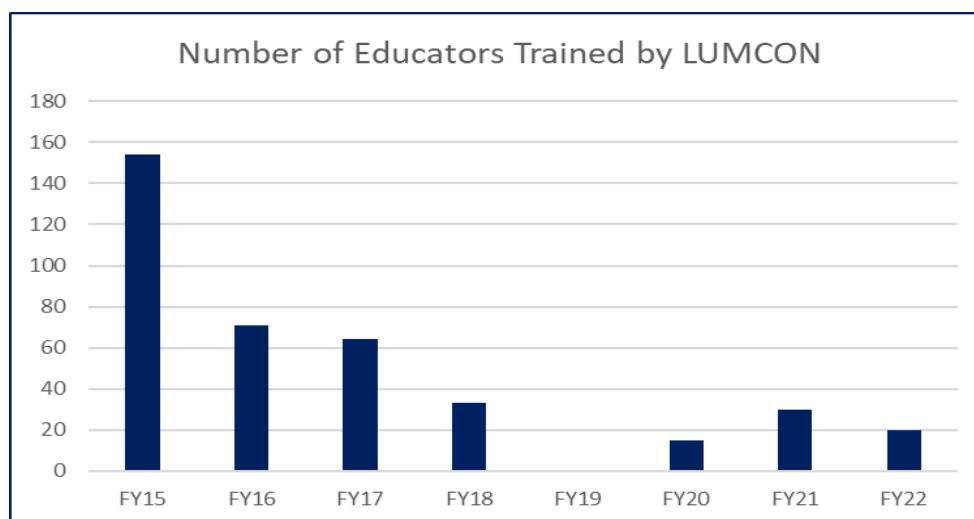
Coding for Marine Science: Through a grant from the Brown Foundation through their Support STEM program, LUMCON was able to host the second Coding for Marine Science teacher professional development workshop in June of FY2022. This workshop is the direct result of a collaboration of LUMCON education staff and a LUMCON faculty member. Together, Dr. Marshall Bowles and Murt Conover developed a workshop that fills a gap related to coding and technology that currently exists in teacher professional development opportunities. The goal of this workshop is to introduce teachers to real world applications of coding in the marine sciences. The teachers also learn that there are many resources that are not traditionally used in the classroom, but with a bit of creativity (and patience) they can get their students to code for applications that are outside standard engineering and robotics applications. The workshop content and activities helped teachers understand for the first time that coding was not as complicated or difficult as they feared. The workshop emphasized and stimulated essential values of STEM education. The workshop provided 1) an opportunity for educators and scientists to be innovative together as a team; 2) firsthand experience in real-world applications of technology in marine science that inspires curiosity and investigation; 3) a chance to take every failure and challenge in stride and try to learn from those; and 4) teachers with resources that will provide their students with new opportunities to build 21st century skills.



Images from the 2022 Coding for Marine Science Workshop. Workshop was a result of a collaboration between E&O staff, Dr. Marshall Bowles, and STEM Prep students.



Below is a table showing the number of teachers participating in training opportunities provided by LUMCON.



Public

The popular online program LUMCON Science Talks were held again in the spring of FY2022. The theme of the 2022 series was marine technology used to advance human understanding of our ocean environments. The series was used as a springboard to introduce the programming and research that will be taking place at LUMCON's new ocean science and technology facility in Houma.

Digital Outreach

LUMCON has been steadily building an online presence through the development of unique and innovative digital outreach assets. Since 2020 LUMCON has had the opportunity to invest in equipment that allows educators to create and deliver high-quality 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, news about LUMCON, and program activities through social media. In fiscal year 2022, LUMCON continued to build on the digital components of the program while bringing back in-person programs.

Online Resources: The resources available on our website are written so they can be used by anyone looking for content rich materials that are focused on Louisiana and specific to the environments around the Marine Center. LUMCON is respected as a provider of place-based and skill-based programs, the development of any digital content needs to reflect the same principles as our in-person programs. Through our online resources we place importance on four ideas: 1) *There is value in amplifying the importance of place.* Following this idea of place, all content produced in 2021 reflected something unique to LUMCON or to Louisiana's marine and coastal environments. E&O staff worked diligently to develop materials that were specifically related to Louisiana's marine and coastal environment; 2) *A gold mine of information.* Over time and through learner activities, E&O programs have generated a vast array of data that can be used toward the creation of digital content. LUMCON used this huge asset to create a unique set of materials for learners at any stage of their academic careers; 3) *Because you can, doesn't mean you should.* LUMCON E&O continued to experiment with technologies, explored new methods, and observed what was being created by others. This information allowed E&O staff to

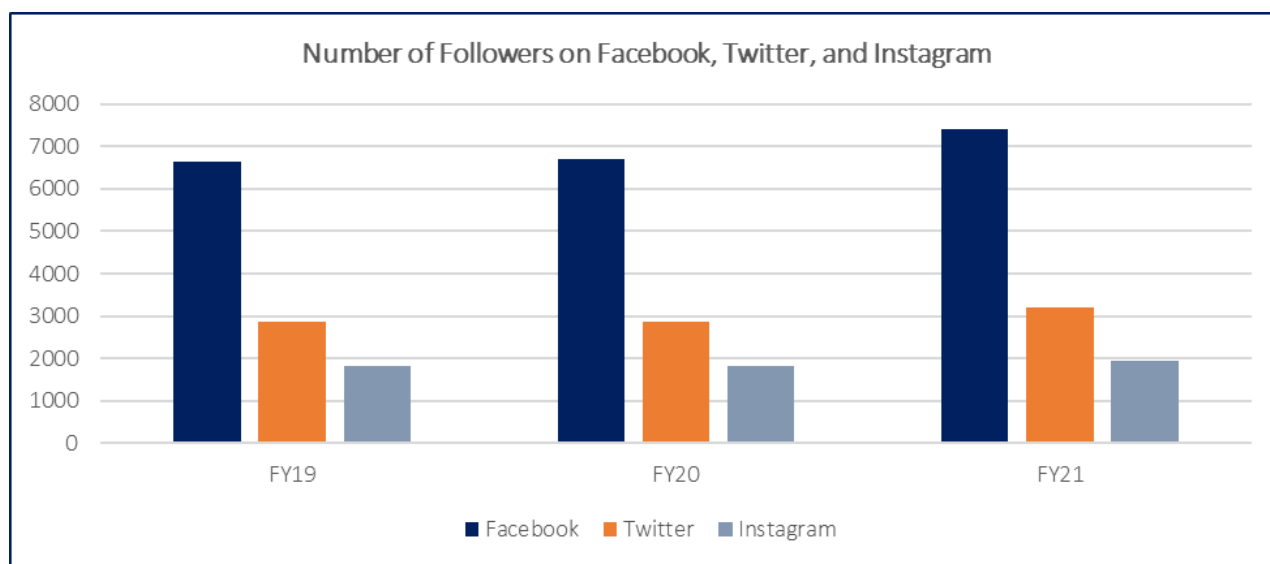


efficiently develop materials, streamline production of materials, and assess what assets and resources were readily available. The result is products that are useful to multiple audiences, interdisciplinary, and accessible; 4) *Include the perspective of others*. In order to align programs and activities with the new Louisiana Science Standards for K-12 teachers, LUMCON contracted the services of a highly qualified educator.

During FY22 there were 439 unique downloads of digital content resources from the LUMCON website. To enhance the usability of the resources by formal K12 educators, LUMCON E&O staff also aligned some of the activities to academic standards. Those were provided as PDF documents on the resource webpage. A total of 45 downloads of those academic standard documents were done from January 2022 – July 1, 2022.

Social Media: Over the years, LUMCON has developed its own voice as an institution and science content provider through the use of social media. Social media continued to play an important role in LUMCON’s efforts to engage the public over this past year. In fact, during Hurricane Ida, social media was a critical means of communicating with the public and staff members that were displaced.

LUMCON’s social media program experienced considerable growth and maturation during FY 22 because of the adaptability of the program and engagement strategies. Audience counts increased across the three major social media platforms and engagement rates rose to a new high for LUMCON even though low staff numbers meant fewer posts were being created.



TRANSFORM

LUMCON Marine Center Faculty

LUMCON faculty had a very active year of research during FY22 with faculty participating in 20 continuing and 15 new grants during the year (see appendix A for details). Research activities by the faculty resulted in 44 scientific publications during the year (see appendix B for details). The faculty also gave 23 invited presentations (and an even larger number of contributed presentations at conferences) during FY22. Highlights of the research activities of individual faculty members are highlighted in the following section.

Junior Faculty:

Dr. Stephanie Archer and the Archer Benthic Ecology Lab had a busy year in FY22. Dr. Archer was part of a team that received funding from NSF to study the role of previous disturbance (i.e., large storms) in driving the response of seagrass ecosystems to multiple stressors. This project also includes funds to develop a 360° virtual reality field course on coastal tropical marine ecosystems – a product that will be available to high school and university students throughout Louisiana within the next year. The Archer Lab also began work on a project to determine if Louisiana’s invasive carp can be used as a source of protein and fat in aquaculture feed products. The Archer Lab also continued work on projects focused on documenting and understanding the drivers of heavy metal contamination in nearshore systems as a result of persistent debris following catastrophic storm events. Dr. Archer also continued the development of passive acoustic methods to monitor coastal ecosystems from Canada to Louisiana, contributed to the understanding of how habitat requirements influence species range shifts with climate change, and worked with BRCC faculty and students to understand the drivers of freshwater Sponge distributions in Louisiana. The Archer Lab hosted several undergraduate students through the REU and STEM Prep Programs. Finally, the Archer Lab welcomed their first graduate student, Finella Campanino, who is working on a project to unravel the linkages between live oyster abundance and patterns in oyster-reef associated biodiversity.

Dr. Marshall Bowles had a very productive 2022 in terms of conducting cutting-edge research, numerous proposal submissions, and mentoring. Within the framework of the Gulf Research Fellowship at the National Academies of Sciences, Engineering, and Medicine, Dr. Bowles used funding to procure a gas chromatograph with multiple detectors, enhancing LUMCON’s (and Louisiana’s) ability to quantify gases relevant to microbial processes. Additionally, Dr. Bowles co-authored four publications in FY2022 and has a book chapter in *The Marine Microbiome*. Dr. Bowles submitted proposals to the American Chemical Society, the LA Board of Regents, the Simons Research Foundation, and multiple National Science Foundation (NSF) proposals. Two NSF proposals were funded in this fiscal year, both of which have collaborators in Louisiana. In addition to serving as a committee member for Kaliope Bousses (University of Pennsylvania) and Owen Clower (LSU), Dr. Bowles strengthened his collaborations within the state by working extensively with Drs. Kanchan Maiti (LSU) and Becky Giorno (Louisiana Tech University) on multiple projects that now have abstracts at international scientific meetings. Dr. Bowles worked closely with REU student Alexa Labossiere on a project focused on the Arctic’s carbon cycle. Dr. Bowles began mentoring an REU student (Nicole Lyons) and a STEM prep student (Cassidy Husson). Finally, Dr. Bowles served the academic community by reviewing manuscripts for diverse journals (*Geobiology* and *Deep Sea Research*) and 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 continues to mentor one undergraduate student, one research scientist, three graduate students, and two postdoctoral research associates funded by the NSF and the Danish Research Council and formed new collaborative teams across LUMCON, UNO, and ULL centering on anthropogenic influences on ecosystem function in Louisiana waters and the Gulf of Mexico. Dr. D’Andrilli published two articles on large-scale understanding of carbon cycling in US freshwater rivers and emergent risks of permafrost thaw with climate change (*Frontiers in Water and Nature Climate change*). Dr. D’Andrilli led projects focusing on determining chemical and biological lability from ultrahigh resolution mass spectrometry data, anthropogenic benthic disturbances, and connections of carbon loads and qualitative influence on river health undergoing large-scale restoration. Dr. D’Andrilli mentored REU student Tessa Crouch (University of California San Diego) on a project measuring newly released materials from Arctic ice sheets and how that compares to Louisiana marine carbon cycling. Dr. D’Andrilli submitted two proposals to the NSF and reviewed manuscripts for Science, Environmental Science & Technology, Environmental Science of Processes & Impacts, and Freshwater Science. Lastly, Dr. D’Andrilli convened a conference session for the American Geophysical Union Fall Meeting, presented oral and poster presentations at international meetings, attended two international workshops for Arctic and humic substances organic matter research, and strengthened collaborations within Louisiana, regionally in the US, and internationally (Denmark, Norway, and Finland).

Dr. Guillaume Rieucan led the Coastal Behavioral Ecology laboratory at LUMCON. His research projects, funded by the Bureau of Ocean Energy Management (BOEM) and the National Fish and Wildlife Foundation, focused on fish and marine mammal behavioral ecology and spanned over south Louisiana, the Gulf of Mexico, Mexico, and the Caribbean Sea. In 2022, Dr. Rieucan received funding from Louisiana Sea Grant to conduct a research project exploring the restoration of ecological functions of salt marsh habitats in South Louisiana. Dr. Rieucan’s laboratory remained the only Gulf of Mexico-based research laboratory equipped with an operational high-resolution imaging sonar. Last year, Dr. Rieucan published six research articles, some of which included undergraduate and graduate students as co-authors, in peer-reviewed scientific journals. Four additional papers have been submitted during this reporting period. Dr. Rieucan also submitted a \$3 million grant proposal to the NFS Rules of Life program with colleagues from Johns Hopkins University, Tufts University and Princeton University. Dr. Rieucan continued his membership on the scientific committees of Caribaea Initiative and the Fundación Internacional para la Naturaleza y la Sustentabilidad. In the aftermath of Hurricane Ida, Dr. Rieucan led the course “Ocean and Society” offered to students across the Consortium and mentored one REU student and one student enrolled in LUMCON’s STEM Preparedness program. He supervised a doctorate student (UNO/LUMCON); still appointed as an adjunct faculty at Nicholls State University, ULL and Northwestern State University; and got appointed as an Editor of ICES Journal of Marine Science and acted as a reviewer for several journals and funding agencies.

Senior Faculty:

Dr. Alex Kolker spent FY22 focused on climate issues. Dr. Kolker led efforts to quantify greenhouse gas and air pollution fluxes across Louisiana and Mississippi over the past 50 years for the Science Advisory Group of Louisiana’s Climate Initiative. He worked closely with researchers from the U.S. Geological Survey and the National Oceanographic and Atmospheric Administration to study sea-level dynamics in the Gulf of Mexico and the impacts of the El Niño-Southern Oscillation on the Mississippi River Plume. Dr. Kolker continued to highlight the local and global significance of climate, coastal, and pollution issues through the media.

Dr. Craig McClain and his research group examined how climate change impacts ecological communities of the Gulf of Mexico. The McClain lab continued pursuing assessment of benthic communities of



Terrebonne Bay, which included ecological shifts that resulted from Hurricane Ida. The research group also continued processing and analyzing wood falls from the NSF-supported project, examining how changes in food supply, due to climate change, will impact ecological structure. Secondary projects included providing statistical consulting services for ecological impacts on beach restoration.

Dr. Brian Roberts continued to serve as the Associate Director of Science at LUMCON throughout FY22. Despite the continued restrictions resulting from COVID and the severe impacts of Hurricane Ida, the Roberts lab had a very productive year, publishing 12 peer-review papers and completing work on several continued and new research projects. These included the following: a large-scale marsh mesocosm oiling experiment begun in 2018; a NOAA RESTORE project focused on the impacts of salinity alterations and marsh creation projects on food webs with new funding from the Climate Adaptation Science Center extending the effort; a project focused on evaluating how Gulf ribbed mussels enhance living shoreline restoration projects (with a new LSU graduate student joining the effort via a Coastal Protection and Restoration Authority fellowship); a project studying assimilation wetlands with colleagues from ULL and Old Dominion; 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. Dr. Roberts was heavily involved in GoMRI-led synthesis activities evaluating the impacts of the Deepwater Horizon oil spill, including leading the overall wetland synthesis effort. Dr. Roberts also served as program director for LUMCON's NSF-funded REU program, which was awarded a new three-year grant in 2022. Finally, Dr. Roberts led the proposal team for the Atchafalaya Basin which was nominated by Governor bel Edwards to be the location for Louisiana's National Estuarine Research Reserve.

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); Blair Hanson, University of Colorado Boulder Civil, Environmental, and Architectural Engineering (D'Andrilli); Adam Quade, University of New Orleans (Rieucan);
- **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 (Rieucan); Granger Hanks, University of Louisiana Lafayette Biology (McClain); Skylar Liner, Louisiana State University (Roberts)
- 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. Jumanah Hamdi, LUMCON (D'Andrilli)

Scientific Infrastructure

Hurricane Ida had severe impacts on the Marine Center and the scientific infrastructure, including damage to downstairs climate-controlled spaces, seawater holding tanks, the walk-in freezer/cooler, and various instrumentation throughout the facility. Despite these setbacks and challenges, FY2022 also saw continued advances in LUMCON's scientific research and experimental infrastructure at the Marine



Center. These improvements took place in several locations throughout the Marine Center facility and grounds and provided benefits to scientists in residence as well as throughout the consortium.

Shared Equipment Room: Usage of the shared equipment room continued to increase throughout FY2022 but was largely limited to LUMCON faculty and staff as a result of the continued pandemic-related restrictions until the summer of 2022 when it was used heavily by one of the graduate student fellows for their project. The room was arranged to provide space for visiting scientists to set up and run gas chromatographs and/or other instrumentation as part of ongoing projects at the Marine Center and that usage ticked up in summer 2022.

Experimental Wet Lab Facilities: There was significant progress in the engineering, design, and expansion of our experimental wet lab and aquaculture facilities during FY2022. These developments, which have been ongoing since 2017, have resulted in the completion of multiple experimental systems with biofiltration and UV disinfection providing the capacity for long-term holding and research with live organisms. Currently, treatment tanks ranging in size from 20 to 150 gallons are operational and available as a resource for scientists and students across consortium institutions. The primary focus in FY2022 was in the downstairs wetlab facilities with significant improvements in the usability of the space for diverse projects (redesign led by Murt Conover) with several of the tank systems and holding tanks used for a 2022 REU intern project.

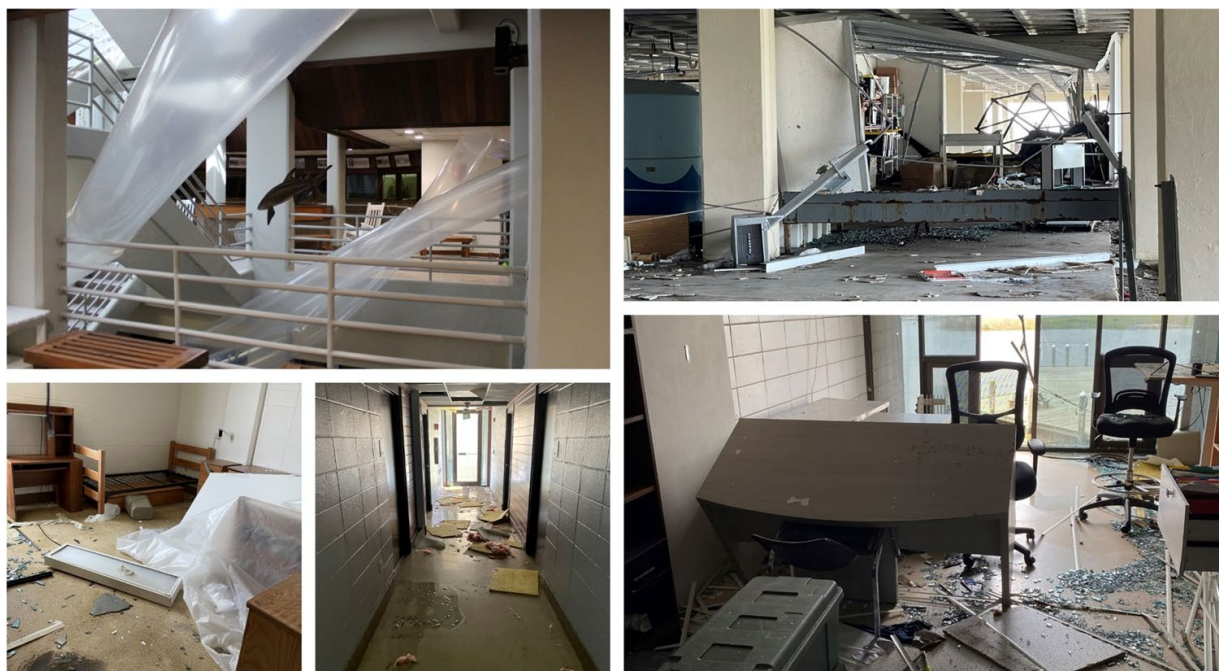
Marsh Mesocosm Facility: LUMCON's marsh mesocosm facility was completed in 2018 on the Marine Center grounds with funding to the Coastal Waters Consortium research team from the Gulf of Mexico Research Initiative. The facility consists of 12 large experimental tanks and smaller paired tidal surge tanks enclosed in a bird-proof netting. Briefly, water is pumped from the bayou adjacent to the Marine Center through two settling tanks and then to the tidal surge tanks. Water is moved between each tidal surge tank and its paired mesocosm via air blowers on each tidal cycle. The facility was designed to conduct a long-term study of impacts of oil exposure on smooth cordgrass (*Spartina alterniflora*) in salt marsh ecosystems. The transplanting of intact sections of marsh containing *S. alterniflora* and soil was completed in 2018. Instrumentation and sampling of baseline conditions began in the same year and continued until oiling, which took place in 2019 with post-oiling sampling continuing through 2021. The facility experienced significant impacts during Hurricane Barry in July 2019, during Hurricane Zeta and several other storms in 2020, and again in 2021 from Hurricane Ida. Despite the numerous disruptions caused by the events of the past few years, the facility and oiling experiment have been successfully maintained and monitored with repairs and upgrades currently underway. The oiling experiment has thus far involved collaborators from LSU and UNO as well as out-of-state collaborators from the Marine Biological Laboratory, Connecticut College, the University of Florida, Florida State University, and the United States Geological Survey. The goal is to track the impacts of oil exposure for multiple years post-oiling. By including control tanks in the design, the facility will continue to allow scientists to address non-oil related questions while the oiling experiment takes place with new funding awarded in FY2023 that will take advantage of those control tanks.



INFRASTRUCTURE

Facilities

Response to the effects of Category 4 Hurricane Ida was the main focus of the Facilities staff in FY 2022. The essential task was to make the grounds operational again as soon as possible. Although it took multiple weeks for normal services (water, electricity, etc.) to be restored in the region, expectations were that the Marine Center needed to be accessible and tolerable for researchers and essential staff to return and continue to do work on-site. Facilities arranged, and then assisted as portable generators, HVAC system, climate mitigation, and potable water were delivered and put into place. Given the extent of destruction in the area, bringing the Marine Center back to functionality amid the ongoing chaos was a proud achievement for the team.



Damage to the Marine Center as a result of Hurricane Ida (August 2021). Top Left: Temporary air circulation; Top Right: Damage to structures beneath a research wing; Bottom (left to right): damages to a dorm room, damage to residential wing hallways, damages to office space

Hurricane Ida Repairs: The damage from the storm was too extensive at LUMCON to adequately enumerate in this report. Here we focus on highlighting the areas most impacted. First, the roofs for both the DeFelice Marine Center and the maintenance building were compromised. Specifically, the section over the dormitories and apartments were especially hard hit. Here, ceilings caved in, wooden wall panels were warped, and underlying sheetrock was ruined. Second, in both wings of the building, damage occurred not only from the roof, but also water, wind and mud entering from broken windows. This also caused damage to walls and ceilings in halls and offices, as well components housed at the Marine Center with many of the offices and spaces rendered unusable for many months. The walk-in cooler and freezer were damaged beyond repair, as was the A/C unit for the observation tower. Third, destruction outside included the exterior lighting and fencing, lab and storage rooms, boardwalks and docks. Over the course of the next ten months, repairs were addressed by Facilities staff, and by



contract work brought in through the State's FP&C team allowing the facility to be used in limited capacity to host groups and programs in the summer 2022.

Renovations: Renovation of the Digital Learning and Visualization Center (DLVC) was completed in early FY 2022. However, hurricane damage impacted the newly finished walls. These were replaced and restored to pre-hurricane condition, allowing the DLVC to be brought back into service. Also, substantial progress was made on renovations to the ground floor Wet Lab for use by Education and Outreach programs as well as resident and visiting researchers. Other renovation work at the Marine Center continued into the new FY, mostly from the extensive hurricane damage.

Repairs and Upgrades: There were multiple repair projects this year that were taken on by the Facilities team directly and indirectly (such as oversight of contract work). This included work on the emergency generators, the Marine Center's HVAC system, boardwalks and dock areas around the facility, and complete replacement of the piping for the ground floor seawater tank system. LED lighting was installed at the Marine Center, both in the building, as well as along the driveway and in parking areas. Finally, the storm shutter conversion project was completed with all shutters deemed operational.

Special Projects: The Facilities team completed the piping of several experimental tank systems in support of faculty projects throughout the Marine Center. The last vestige of the original LUMCON, the temporary Administrative Office trailer adjacent to the boat basin, had to be demolished and hauled away after being destroyed by hurricane winds.

Houma Maritime Campus: Construction at the Houma Maritime Campus progressed significantly in FY22 despite delays induced by Hurricane Ida. Our new Blueworks facility arose from the ground and began taking shape (see images below). By the end of June, concrete and steel structure framing were in place, mechanical piping and systems were installed, and other construction continued apace. Constraints caused by supply chain issues that plagued all industries have slowed construction of the building. Meanwhile, the Marine Operations portion of this project also progressed, with all architectural plans having been finalized, cost estimates presented, and funding acquired. The project awaited contractor bids at the end of June 2022.



Vessels

R/V Pelican: LUMCON's flagship University-National Oceanographic Laboratory System vessel, the *Pelican*, conducted 177 days at sea in FY 2022. The National Science Foundation, Naval Research



Laboratories and National Oceanic and Atmospheric Administration funded 85, 21 and 20 days, respectively. The *Pelican* supported various data collection cruises focused on the physical and chemical environments in the Gulf. The *Pelican* performed over 21 research days in international waters off the coast of Mexico, conducting surveys and science buoy maintenance funded by the U.S. Navy and the National Academy of Sciences. In January of 2022, the *Pelican* conducted NSF funded research for Dr. Cecilia McHugh in Jamaican waters. Her research was in response to the 2021 Haiti earthquakes that happened along the Enriquillo-Plantain Garden fault. Other notable research consisted of hypoxia and ocean acidification research along the Louisiana and Texas coasts. 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 *Point Sur* successfully conducted 177 sea days operating out of the Port in Gulfport, Mississippi. A 28 day cruise conducted by Mark Reiss of the EPA performed sediment profile camera and survey operations at sites around Puerto Rico. This vessel provides critical scientific needs in the Gulf of Mexico and Caribbean Sea.

R/V *Acadiana*: LUMCON's signature education vessel, the *Acadiana*, conducted a total of 87 days at sea in FY 2022. A total of 54 days were spent conducting research while 33 days were education-focused trips.

Small Vessels: In FY2022, LUMCON's small vessel fleet aided researchers in near coastal activities for a total of 198 day trips. Of these, 15 were for education, 180 for research, and 3 for outreach.

R/V *Pelican* Replacement Vessel: A contract was finalized with JMS Naval Architects to produce a Contract Design of a capable research vessel which will replace the R/V *Pelican*. The focus is to design a vessel with equal or slightly increased capabilities to the current *Pelican*. The project kick-off meeting began in late September 2021, which included JMS Naval Architects and LUMCON's Executive Director and Marine Superintendent. Numerous phone conferences and an in-person meeting was held at LUMCON aboard the *Pelican*. A concept design was completed in early December of 2021, and a preliminary design and contract design are to be completed in late 2022. Below are drawings of the current concept design.



R/V *Gilbert R. Mason*: Construction continued on the third vessel in the National Science Foundation regional class research vessel fleet build. Looking forward to FY 2023, welders will work on the panel line assemblies and the main deck assembly of modules 31 and 22. Also, construction will continue on the



centerboard transducer trunk module 125, the stern skag, and the bulbous bow module 21. With delays due to COVID and Hurricane Ida, the vessel is scheduled for delivery by September 2024, with full oceanographic operations starting by the middle of 2025. Below is a schematic of the ship build process of the *Gilbert R. Mason*.



Environmental Monitoring

Maintenance and curation of data was the focus of Environmental Monitoring in FY 2022. The end result of the multi-year Quality Assurance/Quality Control work is a 20-year dataset of up to 10 parameters for use by researchers and the public. Interest in this data continued in 2022, with 31 requests for data, the highest request total since 2016. Following Hurricane Ida, Environmental Monitoring reimplemented sharing real-time data from all LUMCON stations with the Gulf of Mexico Coastal Ocean Observing System (GCOOS). This data was made publicly available on GCOOS's data portal website along with 54 other data partners. The addition of two new water depth sensors at the Marine Center Station assisted in ensuring the quality of data collected. Monitoring also partnered with ULL to eventually deploy a Systea nutrient sensor at LUMCON's dock.

Working with James Peterson of Art Contraptions, Environmental Monitoring made real-time station data available to him. This will be used to influence a piece of transformative art on the Maritime Campus that will be influenced by changes in weather and water data logged at the Marine Center.

Dive Operations

LUMCON Dive Operations continued to support state, regional, and federal entities in FY 2022. Multiple personnel from Louisiana State University and the University of New Orleans utilized the LUMCON Diving Safety Program, which received multiple dive plans from these universities. The U.S. Bureau of Ocean Energy Management (BOEM), located in New Orleans, also took advantage of the Dive Safety Program in FY 2022. This attests to the continued importance of the program within the state of Louisiana. Dive Safety also was in demand by LUMCON staff, and out-of-state (University of Miami). The Dive Safety Program oversaw normal SCUBA as well as deep diving on a number of platforms in-state, as



well as Texas and Florida waters. A Letter of Reciprocity between LUMCON and BOEM allowed for cooperation between Texas A&M Galveston and divers from LSU.

Information Technology

Board of Regents Security Alignment: The Board of Regents requires that all subagencies meet exacting standards for server and IT security, so that there are uniform policies, procedures, and quality control of internet, data storage, and devices throughout the BoR system. To achieve this, LUMCON's Information Technology (IT) department met with Postlethwaite & Netterville (P&N) to begin the process of passing the security audit. By the end of FY 2022, the institution began updating and clarifying several policies related to acceptable internet/computer use, cybersecurity monitoring, data storage, administrative control, and movement of computer systems within the institution.

Security Upgrades: IT implemented multiple Google Workspace security enhancements, such as strong password enforcement and DKIM. Working toward centralized management of LUMCON devices, an MDM solution with Apple Business Manager and device management system were deployed for macOS devices, further bolstering network security. IT also engaged in extensive discussion and planning with vessel ops technicians for network upgrades to be performed on all vessels in FY 2023.

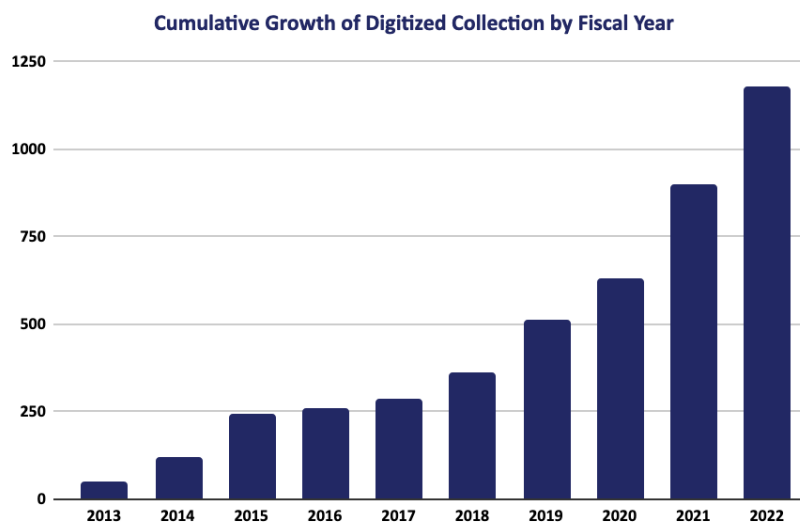
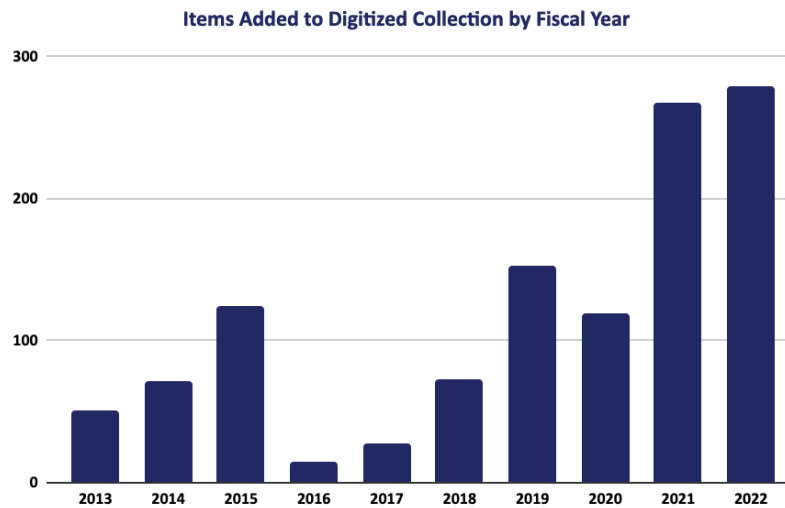
Network Upgrades: IT deployed multiple necessary network upgrades to transition LUMCON to a VOIP phone system, and provided troubleshooting and support for new ESI phones. Multiple upgrades to BTNEP's network infrastructure and increased security procedures were also provided by the IT department. A third ISP (Viasat satellite internet) was deployed for increased internet connectivity redundancy. Working with LUMCON's newly enlisted website administrator (CSR Tech Inc.), IT transferred all websites to be housed externally through the same cloud provider and updated backend systems. All tower stream live streams were consolidated to one YouTube account and hardware running each stream was optimized in an effort to promote less downtime.

Administration: The IT department worked with property control to optimize LUMCON's computer inventory management process. IT also researched hardware and software needed for Blue Works and devised a necessary budget. LUMCON's network infrastructure was fully documented and an official network topology map of the Marine Center was created.

Library

Institutional Repository: The Library continued digitization projects throughout the year, completing the archiving of past published research by LUMCON faculty, while beginning a new project—the scanning of a slide collection related to the first decade of the institution. In FY 2022, 279 papers/reports/book chapters were added to existing collections (LUMCON Institutional Repository, LUMCON Digital Reprint Collection, LUMCON Digital Collections), making it the highest amount of material added in a 12-month period since beginning the project back in 2011. At the end of June, the total number of digitized materials uploaded and available to patrons was 1,179 separate titles. The initiative to digitize historical slide collections began in June 2022, with the purchase of a 1,200 dpi high resolution scanner. By the end of June, 125 slides had been digitized, covering the construction of the Marine Center, the construction of the R/Vs *Acadiana* and *Pelican*, and photographs of early science cruises.





Hurricane Ida: Although the library suffered no immediate damage from Hurricane Ida, the environment in the Marine Center following the storm allowed for the establishment of mold within the bound journal collection. Over the course of time, and several inspections, 246 individual bound journals—or roughly 5% of the collection—showed evidence of mold. These materials were removed from the stacks and cleaned.

Representation: In the summer of 2021, John Conover was selected as Chair of the Houma Maritime Campus Library Subcommittee. This committee will help form the new campus library and guide the success of the campus department. The Committee reported to the Houma Maritime Task force with budget, collection, and personnel recommendations in March 2022.

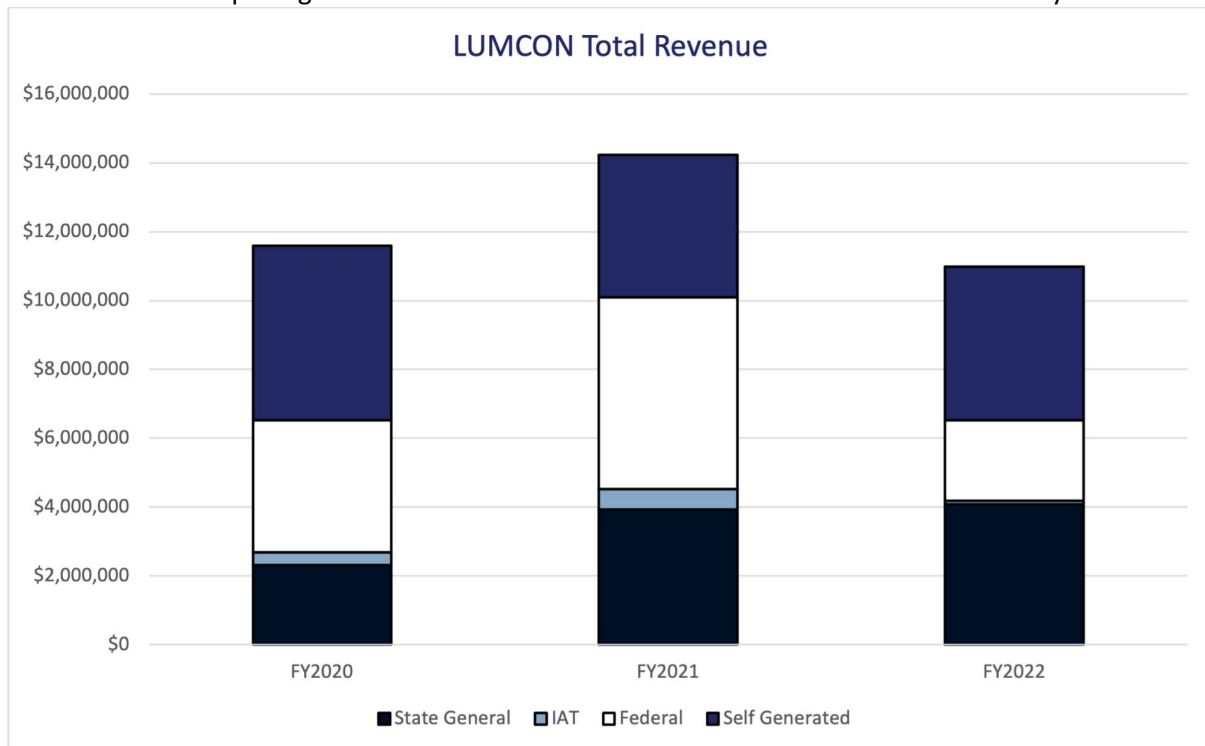


FINANCES AND DEVELOPMENT

Administration, Finance, and Budget

LUMCON's total revenues in FY22 (\$11M) were comparable to FY20 (\$11.6M) but lower than in FY 21 (\$14.2M). The decrease in FY22 is largely a result of a reduction in federal revenues and inter-agency transfers with revenues from state general and self-generated funds remaining similar to last year. The damage sustained as a result of the Hurricane prohibited many research activities from being completed for an extended period. As a result, research expenditures on federally supported projects were lower throughout much of FY22. It is anticipated that federal expenditures will increase in FY23 as research capacity returned to full operability by the end of the fiscal year.

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



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 FY22 (data as of September 1, 2022). 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 FY22, LUMCON research faculty were awarded 15 new research grants that will bring ~\$1.2M in additional funding to LUMCON and BTNEP is set to receive \$900K per year for each of the next 5 years as part of the National Estuary Program Bipartisan Infrastructure Law Funding. Both of these award categories will add to the values in the table for the coming year.



Current Status of LUMCON, Vessel Operations, and BTNEP Grants			
	LUMCON	Vessel Operations	BTNEP
Life of Grant Total	\$6,443,796	\$7,789,669	\$5,553,679
Remaining Funds	\$3,205,787	\$3,605,212	\$3,110,269
Direct Cost Balance	\$2,584,929	\$3,456,991	\$2,772,553
Indirect Cost Balance	\$620,858	\$148,221	\$337,716

In terms of overall size of our staff, we experienced a slight net increase in total personnel in FY22. LUMCON Human Resource processed the hiring of 21 individuals into and separation of 19 individuals from LUMCON/BTNEP from July 1, 2021 through June 30, 2022.

Development

Hurricane Ida and COVID provided a double whammy that reshaped LUMCON's development efforts during the course of the fiscal year. Ida prompted an unprecedented outpouring of support for LUMCON. In Appendix D of this report, you will find the listing of more than 144 donors who have provided financial support for LUMCON in Fy 2022, plus an additional 221 donations from 175 individuals and organizations who responded to a GoFundMe campaign organized by members of the LUMCON Advisory Committee.

Annual Giving: In 2021, LUMCON conducted direct mail appeals in November, 2021 and March, 2022, with email and social media appeals in the days after Hurricane Ida and during the South Louisiana Day of Giving in May, 2022. These solicitations focused on scholarships and academic support, conversion of our distance learning classroom into a new Distance Learning Visualization Center, and repairing and replacing docks and boardwalks damaged during Hurricane Ida. By the end of the fiscal year, annual giving had increased by 176 percent to \$72,912 from 235 donors.

Major Gifts: LUMCON received no donations or pledges of \$100,000 or more during the fiscal year. Despite COVID, there had been in-person conversations with eleven donors about major gift donations in support of Blue Works. All but two of those donors were in the Houma-Bayou area. In the wake of Hurricane Ida, conversations with local prospective donors were put on hold until after the first of the year to allow both the donors and LUMCON to focus on hurricane recovery. We will continue those conversations under new management.

Foundation Support: Charitable donations from foundations increased by 117 percent to \$105,177 in 2021, despite receiving only seven donations. In four of the seven donations, we were unable to use the amount provided by the donor for the purpose it was given due to COVID and Hurricane Ida interruptions. This necessitated additional conversations with the foundation to seek their permission to use the funds for other purposes. Most of the funds diverted from other uses were used to complete the renovation of the Distance Learning Visualization Center (DLVC). These figures do not include donations from two foundations which were returned to the donor when we were unable to provide the programming that had originally been funded.

Appropriations: In 2021 and 2022, LUMCON was successful in working with the Office of the Governor, the Board of Regents, and the Terrebonne legislative delegation to assure funding in support of LUMCON's ongoing work during the pandemic and to build for the future. Increased funding was



secured to assure that \$41.9 million is secured to replace the R/V Pelican. Funding was also secured during the course of the year for a new roof for the DeFelice Marine Center in Houma, and at the end of the year, LUMCON filed a capital outlay request for several projects to repair damages from Hurricane Ida and to bolster and fortify the building against storms in the future.

Donor Communications: Although development efforts have been severely curtailed since the onset of the pandemic, we have been able to explore other ways of communicating with stakeholders. Donor visits to the Marine Center were eliminated and in-person visits at other venues were sharply curtailed, but we were able to secure a reduced number of socially-distanced in-person visits with stakeholders. During the course of 2021, the number of people receiving the email newsletter increased 30% to more than 1,500.



BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM



BTNEP activities continued to promote messages of awareness, preservation, and restoration of the Barataria-Terrebonne estuarine system.

Like LUMCON, the team at the Barataria-Terrebonne National Estuary Program (BTNEP) experienced difficulties and recovery from Hurricane Ida. By the end of FY 2022, BTNEP had made significant strides rededicating our core strengths: improving water quality, propagating native plants to aid in the state's coastal restoration efforts, and demonstrating and educating the public on efforts to promote resiliency and sustainability. In doing so, it continued its multifaceted work to protect and preserve the land, water, people, and cultures throughout the 4.2-million acres located between the Mississippi and Atchafalaya Rivers known as the Barataria-Terrebonne National Estuary. Work was done to further strengthen BTNEP's programs and collaboration with LUMCON, the Coastal Protection and Restoration Authority (CPRA), coastal advocacy groups, the universities and community colleges, and elected leaders from the 16 parishes within the estuary.

The BTNEP staff directed roughly 20 projects in collaboration with universities, researchers, advocates, and citizens across the estuary in FY 2022. Below are some highlights of work over the last year in key areas from BTNEP's portfolio.



Improving Water Quality

Andrew Barron, a Senior Scientist, continued to manage and work on the “Water Quality Sampling, On-Site Waste Disposal Systems (OSDS) Inspections and Educational Outreach in the Barataria-Terrebonne Basins” project in the Bayou Fosse watershed. The project’s three phases have been funded annually by the U.S. Environmental Protection Agency (EPA) and the Louisiana Department of Environmental Quality, for a total project cost of \$188,306, with \$112,983 in federal dollars and \$75,323 in matching funds.

Barron also continued working with subcontractor South Central Planning and Development Commission on the “Home Sewage Assistance Program in the Bayou Fosse Watershed, Barataria-Terrebonne National Estuary System” project. This effort is administered through the Barataria-Terrebonne Estuary Foundation with a grant from the EPA's Gulf of Mexico Division for \$426,874. The project aims to pay 244 homeowners, through reimbursement and cost share, to fix malfunctioning home sewage systems. Currently, 112 homeowners have participated in this program.

Barron was recognized in the spring with a “Gulf Guardian” award from the Gulf of Mexico Program with the EPA recognizing his decades of work in protecting Louisiana’s water resources. In addition, the water quality team expanded both its reach and staff in the last year by adding both a new water quality technician, and a new contract with Ducks Unlimited to establish agricultural best management practices within two subwatersheds in the Bayou Fosse watershed. Further expansion is planned into FY 2023.

Native Plant Production

The BTNEP native plant production program, led by Habitat Restoration Coordinator Matt Benoit, continued to build its reputation as a leader in producing and delivering the woody species critical to the state’s successful multi-million-dollar coastal ridge restorations. BTNEP’s expertise has allowed the state to install native plants with the best chance of survival across the coast’s varying salinity profiles. BTNEP worked on multi-year contracts to meet the propagation and growth of native tree seedlings to be able 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. BTNEP hired recent NSU graduate Ashley Lambiotte to assist Benoit at the ever growing facility, which holds more than 125,000 trees destined for coastal restoration sites.

Following Hurricane Ida, a Gulf of Mexico Alliance hurricane recovery grant secured through the Barataria-Terrebonne Estuary Foundation allowed BTNEP to repair and expand its plant propagation facilities at the Nicholls State University farm. This expansion and related repairs will focus on removing large pine trees that threatened the facility and establishing a native tree nursery that will help sustain seed harvests for years to come; rebuilding the storm-damaged greenhouse; improvements to the production areas with cement pads poured for propagation sheds; securing a soil mixer; and more than doubling the growing area under shade cloth, moving from 64,000 to 144,400 square feet.

Resiliency and Sustainability

BTNEP continued to manage the EPA’s Gulf of Mexico Program “Geauxing Green: Sustainable Festival Planning” grant which seeks to divert a substantial amount of festival refuse from landfills to recycling or composting facilities. This year, a full slate of festivals returned including the French Quarter Festival. More than 825,000 people attended this year’s French Quarter Festival, making it the largest free music



festival in the nation. Festival vendors used recyclable and compostable products and festival goers were introduced to composting and recycling at stations designed and funded by a Gulf of Mexico Program grant secured by BTNEP and manned by BTNEP volunteers. The tallies from the four day festival show 38 percent of waste was diverted from the landfills to recycling or composting. The contract in place continues through 2023 with BTNEP seeking to secure another grant. BTNEP reentered into an expanded contract and cooperative agreement with the Louisiana Department of Wildlife and Fisheries (LDWF) to remove and categorize marine debris on Elmer's Island. This cleanup, which was performed multiple times this year, was funded from a RESTORE Act grant through LDWF. The new contract for almost \$150,000 continues through FY 2024.

BTNEP's annual Bayou Lafourche cleanup attracted record participation after being sidelined by the COVID-19 pandemic for two years. Teaming up formally with Friends of Bayou Lafourche and the Bayou Lafourche Fresh Water District ushered in a new era of collaboration between BTNEP and community partners.

Protecting Migratory Birds and Habitat

Louisiana's barrier islands and headland beaches serve many important ecologically, culturally, and economically significant functions. One of the most important ecological functions these beaches provide is serving as a breeding and rearing habitat for many beach-nesting bird species. Since much of this habitat has suffered land loss over time, concerns have grown over the impact these changes may present to beach-nesting birds. Bird surveys documenting population and distribution have been conducted every five years since 2005. BTNEP again conducted bird surveys to contribute to the existing long-term dataset that identifies beach-nesting bird use on Louisiana's coast and to provide decision-makers more specific guidance on conservation needs.

The rufa Red Knot (*Calidris canutus rufa*), federally listed as a threatened species, appears in Louisiana during spring and fall migrations and the winter months (generally September through May). Roughly the size of a robin, this bird species is a long-distance migrant that travels annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the southeastern United States, the northwestern Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. Since 2014, Migratory Birds Coordinator Delaina LeBlanc, in partnership with the Coastal Bend Bays and Estuaries Program of Texas, has collaborated with the U.S. Fish and Wildlife Service (USFWS), the Louisiana Department of Wildlife & Fisheries Natural Heritage Program, United States Geological Survey (USGS), and Audubon Louisiana. BTNEP's projects on the rufa Red Knot provide data to assist in critical habitat designation for the development of a species recovery plan and conservation strategy for the wintering portion of the Red Knot's annual migratory cycle. This research includes, assessing prey item availability, diet, survival rates, and satellite tracking.

In 2022, BTNEP entered 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 (TE-0143) Project. The northern Gulf of Mexico is a key wintering area for Piping Plovers and is designated as critical habitat under the Endangered Species Act (ESA). The State's (TE-0143) project permits require post-construction bird surveys for wintering plovers and Red Knots.

Also in 2022, BTNEP initiated a new project featuring the highly social and engaging Purple Martin. Where these birds once nested 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 and extends to the upper reaches of the Barataria-Terrebonne estuarine system.

Natalie Waters, Wildlife and Habitat Coordinator, expanded the “Chimney Swift Nesting/Roosting Towers and Educational Signage” project into St. Martin Parish which provides a declining migratory bird species with nesting and roosting habitat. The nest towers feature educational signage to inform citizens about the species and what they can do to help.

BTNEP expanded upon a multifaceted pollinator project Ms. Waters started the previous year. In 2022, major events directly related to this included a native pollinator plant giveaway featuring milkweeds and other native species, numerous volunteer events at established pollinator gardens, and a native seed packaging event with volunteers from areal gardening groups. More than two dozen volunteers created 1,200 seed packets containing more than 88,000 seeds. The packets were used to create seed libraries established by BTNEP at the Houma main library and the Thibodaux library. The seed library provides the community access to free native plant seeds and encourages residents to create pollinator habitat within their own backyards. BTNEP plans to replicate the pollinator project throughout the estuary in the coming year.



Appendix A: LUMCON Grants in FY 2022

Continuing:

Archer SK, Bockus AB, Claridge D, Dunn C; "Determining Marine Ecosystem Resilience to Contamination After a Catastrophic Storm Event in Abaco Island, The Bahamas", National Geographic Exploration Grant, 2020-2021; \$29,110

Bowles MW; "Early Career Gulf Research Fellowship", National Academies of Sciences, Engineering and Medicine, 2020-2021; \$75,000

Bowles MW; "A Highly Resolved Spatial Analysis of the Biogeochemistry of a Common Salt Marsh Grass Rhizosphere", Hansewissenschaftskolleg, 2019-2022; €30,000

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)

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

Hopkins B, David S, **Rieucan 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; "Coastal Plant Carbon Initiative: A Collaboration Between LUMCON and Salk", Brown Foundation, \$63,450

McClain CR, **Malbrough J**, **Roberts BJ**; "Collaborative Proposal: Proposal for the Operation of Regional Class Research Vessel #3 in the Gulf of Mexico, Caribbean Sea, and Southwestern Atlantic Ocean", NSF, 2019-2024; \$3,173,061

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**, **Rieucan 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; \$1,999,985

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

Rabalais NN; "Funding for the 2020 and 2021 Shelfwide Hypoxia Cruises", NOAA NCCOS via Northern Gulf Institute, 2020-2022; \$400,000

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; \$75,000



Roberts BJ; "Soil Biogeochemistry of Pacific Coastal Wetlands", USGS Cooperative Agreement G19AC00447, 2019-2021; \$15,000

Roberts BJ, Isch M; "Expanding LUMCON's Incubation Capabilities", Arthur M. Blank Foundation, 2021-2022; \$10,000

Roberts BJ, McClain CR; "REU Site: Interdisciplinary Research Experiences in Changing Coastal Environments", NSF OCE, 2018-2022; \$238,102

Rosario-Ortiz F, **D'Andrilli J**; "Application of Fluorescence Spectroscopy for the Characterization of Dissolved Organic Matter: Disentangling Common Misconceptions and Underlying Chemistry", NSF, 2019-2022; \$329,873 (LUMCON portion \$48,658)

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)

Valett HM, **D'Andrilli J**, Payn RA, DeGrandpre M, Peipoch M; "Long Term Research in Environmental Biology: Collaborative Research: River Ecosystem Responses to Floodplain Restoration", NSF, 2017-2022; \$562,496 (LUMCON portion \$30,500)

Zito PA, Tarr MA, Podgorski DC, Mahon RC, Cox TE, Boyle KS, Poltavets V, Gray DR, **D'Andrilli J**, Midway SR, "MRI: Acquisition of an Inductively Coupled Plasma Triple Quadrupole Mass Spectrometer Instrument for Southeast Louisiana", NSF, 2020-2021; \$490,000 (LUMCON portion \$0)

New:

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 UROP, 2022; \$3,000

Bourgeois R, Bockus A, **Archer SK**, Fontenot Q; "Developing Asian Carp Markets to Increase Harvest", US Fish and Wildlife Service, 2021-2022, \$147,000 (LUMCON portion \$90,705)

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)



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, 2022-2023; \$149,343

Polito MJ, **Archer SK**; "Developing an Invasive Carp-Based Aquaculture Feed to Benefit Louisiana Ecosystems and Economies", Louisiana Sea Grant UROP, 2022; \$2,996

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, 2022-2023; \$119,007 (LUMCON portion \$39,082)

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, 2021-2023; \$299,998 (LUMCON portion \$66,014)

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

Roberts BJ; "Supplement to: REU Site: Interdisciplinary Research Experiences in Changing Coastal Environments", NSF OCE; 2021-2022; \$50,241

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

Robinson K, **Rieucan G**, Nelson, J; "Optimizing Abundance Estimates of Large Jellyfish and the Detection of Predator Interactions Using Drone-Based Imagery", Coypu Foundation, 2021-2022; \$47,909

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 \$80,205)



Appendix B: List of Scientific Publications in FY 2022

Aitali R, Snoussi M, **Kolker AS**, Oujidi B, Mhammdi N. 2022. Effects of land use/land cover changes on carbon storage in North African coastal wetlands. *Journal of Marine Science and Engineering*. 10: 364. doi:10.3390/jmse10030364

Archer SK, English PA, Campanino FM, Layman CA. 2021. Sponges facilitate primary producers in a Bahamas seagrass system. *Marine Biology*. 168(11): 162. doi:10.1007/s00227-021-03977-x

Austermann J, Paxman G, Osterberg E, **D'Andrilli J**, Courville Z, Lewis G, Willis M, Overly T, Schaefer JM, Young N, et al. 2021. White paper 2: scientific priorities for a northwest Greenland traverse. In: Schaefer JM, Albert M, Courville Z, Briner J, editors. U.S. scientific traverses on the Greenland ice sheet: community planning workshop. (publishing information not known) p. 14-22.

Bates AE, Primack RB, Biggar BS, Bird TJ, Clinton ME, Command RJ, Richards C, Shellard M, Gerald NR, Vergara V, et al. (including **Archer SK**). 2021. Global COVID-19 lockdown highlights humans as both threats and custodians of the environment. *Biological Conservation*. 263: 109175. doi:10.1016/j.biocon.2021.109175

Bickley SL, Helms BS, Isenberg D, Feminella JW, **Roberts BJ**, Griffiths NA. 2021. Lack of long-term effects of coarse woody debris dam restoration on ecosystem function and water quality in coastal plain streams. *Freshwater Science*. 40(4): 593-607. doi:10.1086/717325

Borton MA, Collins SM, Graham EB, Garayburu-Caruso VA, Goldman AE, de Melo M, Renteria L, Stegen JC and WHONDORS Crowdsourced Consortium (including **D'Andrilli J**). 2022. It takes a village: using a crowdsourced approach to investigate organic matter composition in global rivers through the lens of ecological theory. *Frontiers in Water*. 4: 870453. doi:10.3389/frwa.2022.870453

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

Castelblanco-Martínez DN, Slone DH, Landeo-Yauri SS, Ramos EA, Alvarez-Alemán A, Attademo FLN, Beck CA, Bonde RK, Butler SM, Cabrias-Contreras LJ, et al. (including **Rieucan G**). 2021. Analysis of body condition indices reveals different ecotypes of the Antillean manatee. *Scientific Reports*. 11: 19451. doi:10.1038/s41598-021-98890-0

Cooke R, Gearty W, Chapman ASA, Dunic J, Edgar GJ, Lefcheck JS, Rilov G, **McClain CR**, Stuart-Smith RD, Lyons SK, et al. 2022. Anthropogenic disruptions to longstanding patterns of trophic-size structure in vertebrates. *Nature Ecology & Evolution*. 6(6): 684-692. doi:10.1038/s41559-022-01726-x

Cooper WT, Chanton JC, **D'Andrilli J**, Hodgkins SB, Podgorski DC, Stenson AC, Tfaily MM, Wilson RM. 2020. A history of molecular level analysis of natural organic matter by FTICR mass spectrometry and the paradigm shift in organic geochemistry. *Mass Spectrometry Reviews*. 41(2): 215–239. doi:10.1002/mas.21663.

D'Andrilli J, McConnell JR. 2021. Polar ice core organic matter signatures reveal past atmospheric carbon composition and spatial trends across ancient and modern timescales. *Journal of Glaciology*. 67(266): 1028-1042. doi:10.1017/jog.2021.51



D'Andrilli J, Peipoch M, Payn RA, DeGrandpre MD, Valett HM. 2021. Collaborative achievements and challenges for our 10-yr river research effort. *Limnology and Oceanography Bulletin*. 30(4): 127-128. doi:10.1002/lob.10465

Dove ADM, Meekan MG, **McClain CR**. 2022. How and why is the whale shark the world's largest fish? In Dove ADM, Pierce SJ, editors. *Whale sharks: biology, ecology, and conservation*. Boca Raton (FL): CRC Press. p. 1-12.

Fredrickson A, **Rieucan G**, Fontenot Q, Lackmann A, David SR. 2022. Non-lethal fin clip model validation for stable isotope analysis of Spotted and Alligator Gar. *Transactions of the American Fisheries Society*. 151(1): 72-80. doi:10.1002/tafs.10331

Grégoire M, Garçon V, Garcia H, Breitburg D, Isensee K, Oschlies A, Telszewski M, Barth A, Bittig HC, Carstensen J, et al. (including **Rabalais NN**). 2021. A global ocean oxygen database and atlas for assessing and predicting deoxygenation and ocean health in the open and coastal ocean. *Frontiers in Marine Science*. 8: 724913. doi:10.3389/fmars.2021.724913

Grow AK, Schutte CA, **Roberts BJ**. 2022. Fiddler crab burrowing increases salt marsh greenhouse gas emissions. *Biogeochemistry*. 158(1): 73–90. doi:10.1007/s10533-021-00886-5.

Hill JM, Hutton B, Steffins K, **Rieucan G**. 2021. Floating along marsh edges: the impact of invasive water hyacinth (*Eichornia crassipes*) on estuarine species assemblages and predation risk. *Journal of Experimental Marine Biology and Ecology*. 544: 151618. doi:10.1016/j.jembe.2021.151618

Ingels J, Amon D, Bernardino AF, Bhadury P, Bik H, Clark MR, Dahlgren T, Jones DOB, **McClain CR**, Nunnally CC, et al. 2021. Abyssal plains. In *The second world ocean assessment: world ocean assessment II*. New York: United Nations p. 453-476.

Jones SF, Schutte CA, **Roberts BJ**, Thorne KM. 2022. Seasonal impoundment management reduces nutrient cycling but not resilience to surface fire in a tidal wetland. *Journal of Environmental Management*. 303: 114153. doi:10.1016/j.jenvman.2021.114153

Joye SB, **Bowles MW**, Ziervogel K. 2022. Marine biogeochemical cycles. In Stal LJ, Cretoius MS, editors. *The marine microbiome*. Cham (SW): Springer. (The microbiomes of humans, animals, plants, and the environment, vol.3). p. 623-671. doi:10.1007/978-3-030-90383-1_15

Justić D, Kourafalou V, Mariotti G, He S, Weisberg R, Androulidakis Y, Barker C, Bracco A, Dzwonkowski B, Hu C, et al. (including **Roberts BJ**). 2022. Transport processes in the Gulf of Mexico along the river-estuary-shelf-ocean continuum: a review of research from the Gulf of Mexico Research Initiative. *Estuaries and Coasts*. 45(3): 621-657. doi:10.1007/s12237-021-01005-1

Keppeler FW, Olin JA, López-Duarte PC, Polito MJ, Hooper-Bùi LM, Taylor SS, **Rabalais NN**, Fodrie FJ, **Roberts BJ**, Turner RE, et al. 2021. Body size, trophic position, and the coupling of different energy pathways across a saltmarsh landscape. *Limnology and Oceanography Letters*. 6(6): 360-368. doi:10.1002/lol2.10212

Kiel Reese B, Sobol MS, **Bowles MW**, Hinrichs KU. 2021. Redefining the subsurface biosphere: Characterization of fungi isolated from energy-limited marine deep subsurface sediment. *Frontiers in Fungal Biology*. 2: 49. doi:10.3389/ffunb.2021.727543



Keogh ME, Törnqvist TE, **Kolker AS**, Erkens G, Bridgeman JG. 2021. Organic matter accretion, shallow subsidence, and river delta sustainability. *Journal of Geophysical Research: Earth Surface*. 126(12): e2021JF006231. doi:10.1029/2021JF006231

Kolker AS, Weathers HD. 2022. Technical report: discharge study at Bayou Tortillon. New Orleans: Restore the Mississippi River Delta. 7 pages.

La Peyre MK, Leblanc Buie SC, Rossi RE, **Roberts BJ**. 2022. Long-term assessments are critical to determining persistence and shoreline protection from oyster reef nature-based coastal defenses. *Ecological Engineering*. 178: 106603. doi:10.1016/j.ecoleng.2022.106603

McDonald AM, Martin CA, **Rieucan G**, **Roberts BJ**. 2022. Prior exposure to weathered oil influences foraging of an ecologically important saltmarsh resident fish. *PeerJ*. 9: e12593 doi:10.7717/peerj.12593

Miner KR, **D'Andrilli J**, Mackelprang R, Edwards A, Malaska MJ, Waldrop MP, Miller CE. 2021. Emergent biogeochemical risks from Arctic permafrost degradation. *Nature Climate Change*. 11(10): 809-819. doi:10.1038/s41558-021-01162-y

Moyo S, Bennadji H, Laguaite D, Pérez-Umphrey AA, Snider AM, Bonisoli-Alquati A, Olin JA, Stouffer PC, Taylor SS, López-Duarte PC, et al. (including **Roberts BJ**). 2021. Stable isotope analyses identify trophic niche partitioning between sympatric terrestrial vertebrates in coastal saltmarshes with differing oiling histories. *PeerJ*. 9: e11392. doi:10.7717/peerj.11392

Munnelly RT, Windecker CC, Reeves DB, **Rieucan G**, Portier RJ, **Chesney EJ**. 2021. Effects of short-duration oil exposure on bay anchovy (*Anchoa mitchilli*) embryos and larvae: mortality, malformation, and foraging. *Aquatic Toxicology*. 237: 105904. doi:10.1016/j.aquatox.2021.105904

O'Regan SM, **Archer SK**, Friesen SK, Hunter KL. 2021. A global assessment of climate change adaptation in marine protected area management plans. *Frontiers in Marine Science*. 8: 1155. doi:10.3389/fmars.2021.711085

Pitcher GC, Aguirre-Velarde A, Breitburg D, Cardiche J, Carstensen J, Conley DJ, Dewitte B, Engel A, Espinoza-Morriberón D, Flores G, et al. (including **Rabalais NN**). 2021. System controls of coastal and open ocean oxygen depletion. *Progress in Oceanography*. 197: 102613. doi:10.1016/j.pocean.2021.102613

Rabalais NN. 2021. Elevating dissolved oxygen--reflections on developing and using long-term data. *Gulf and Caribbean Research*. 32(1): xv-xxiv. doi:10.18785/gcr.3201.09

Ramos EA, Santoya L, Verde J, Walker Z, Castelblanco-Martínez N, Kiszka JJ, **Rieucan G**. 2022. Lords of the rings: mud ring feeding by bottlenose dolphins in a Caribbean estuary revealed from sea, air, and space. *Marine Mammal Science*. 38(1): 364-373. doi:10.1111/mms.12854

Reeves DB, Munnelly R, Riley K, Baltz DM. 2021. Edward J. Chesney 1950-2021. *Gulf and Caribbean Research*. 32(1): 11. doi:10.18785/gcr.3201.11

Roberts BJ, Griffiths NA, Houser JN, Mulholland PJ. 2022. Response of ecosystem metabolism to coarse woody debris additions along a catchment disturbance gradient. *Ecosystems*. 25(4): 828-842. doi:10.1007/s10021-021-00687-9



Rodriguez-Pinto II, **Rieucan G**, Handegard NO, Kimball ME, Boswell KM. 2022. Anthropogenic marsh impoundments alter collective tendency in schooling fish. *Estuaries and Coasts*. 45(3): 856-865. doi:10.1007/s12237-021-00961-y

Rossi RE, Schutte CA, Logarbo J, Bourgeois C, **Roberts BJ**. 2022. Gulf ribbed mussels increase plant growth, primary production and soil nitrogen cycling potential in salt marshes. *Marine Ecology Progress Series*. 689: 33-46. doi:10.3354/meps14032

Rowat D, Robinson DP, Dove ADM, Araujo G, Clauss T, Coco C, Deardon P, Grace MK, Green JR, **McClain CR**, et al. 2022. Outstanding questions in whale shark research and conservation. In Dove ADM, Pierce SJ, editors. *Whale sharks: biology, ecology, and conservation*. Boca Raton (FL): CRC Press. p. 301-318.

Schutte CA, Samarkin VA, **Bowles MW**, Peters B, Casciotti KL, Madigan MT, Joye SB. 2022. Abiotic nitrous oxide production from sediments and brine of Don Juan Pond, Wright Valley Antarctica, at Mars analog temperatures (−40°C). *Geophysical Research Letters*. 49(3): e2021GL094635. doi:10.1029/2021GL094635

Stoner EW, **Archer SK**, Layman CA. 2022. Increased nutrient availability correlates with increased growth of the benthic jellyfish *Cassiopea* spp. *Food Webs*. 31: e00231. doi:10.1016/j.fooweb.2022.e00231

Sweet JA, Bargu S, Morrison WL, Parsons M, Pathare MG, **Roberts BJ**, Soniat TM, Stauffer BA. 2022. Trends in phytoplankton dynamics in Louisiana estuaries: building a baseline to understand current and future change. *Marine Pollution Bulletin*. 175: 113344. doi:10.1016/j.marpolbul.2022.113344

U.S. Ice Drilling Program (including **D'Andrilli J**). 2021. Long range science plan 2021-2031. (publishing location not known): National Science Foundation. 57 p.

Zengel S, Weaver J, Mendelssohn IA, Graham SA, Lin Q, Hester MW, Willis JM, Silliman BR, Fleeger JW, McClenahan G, et al. (including **Rabalais NN**, **Roberts BJ**). 2022. Meta-analysis of salt marsh vegetation impacts and recovery: a synthesis following the Deepwater Horizon oil spill. *Ecological Applications*. 32(1): e02489. doi:10.1002/eap.2489



Appendix C: List of Invited Presentations by LUMCON Faculty in FY2022

Archer SK, Bockus A, Dunn C, Claridge D. "Determining Marine Ecosystem Resilience to Contamination After a Catastrophic Storm Event in Abaco Island, The Bahamas." National Geographic US/Canada Explorer Connector Webinar. July 2021.

Archer SK. "Careers in Marine Science." Southeastern Louisiana University. March 2022.

Bowles MW. "Microbial Ecology." Dauphin Island Sea Laboratory. March 2022.

Bowles MW. "They're Everywhere!: Microbes in Strange Places." Invited seminar for the NSULA chapter of the American Society of Microbiology. November 2021.

D'Andrilli J. "Insights Into the Interconnection and Function of Earth's Ecosystems From Organic Matter Chemistry." LUMCON REU Program Science Talk. July 2021.

D'Andrilli J. "Advancing Chemical Lability Assessments and Biogeochemical Interpretations of Aquatic Organic Matter by FT-ICR MS." Technical University of Denmark, Copenhagen, Denmark. May 2022.

D'Andrilli J. "Descriptions of DOM Optical Properties and Links to Ecosystem Function in the Upper Clark Fork River." NSF EPSCoR presentation across the CREWS (Consortium for Research on Environmental Water Systems). University of Montana, Montana State University, and Montana Tech. February 2022.

Kolker AS. "Climate Change in Louisiana, Causes and Consequences." SPHU 1010, Introduction to Public Health, Tulane University. November 2021.

Kolker AS. "A Global Perspective on Coastal Senegal." Salon De Corbin, Almadies, Dakar, Senegal. February 2022.

Kolker AS. "A Global Perspective on Coastal Senegal." The International School of Dakar, Dakar, Senegal. February 2022.

Rieucan G. "An Eye Below the Surface: Monitoring Ship Shoal Nekton Community, Distribution and Behavior using High-Resolution Imaging Sonar." Biology working group, Bureau of Ocean Energy Management. May 2022.

Rieucan G. "Drone-Based Aerial Surveys and Images Analysis for the Study of Epipelagic Marine Organisms." Invited speaker. Colorado-Wyoming chapter of the American Fisheries Society. February 2022.

Roberts BJ. "Atchafalaya Basin as a Potential Louisiana National Estuarine Research Reserve Site: Phase 2 Site Proposal." Presentation to the LA NERR Site Selection Development Committee. July 2021.

Roberts BJ. "Climate and Disturbance Controls on Biogeochemistry and Microbial Ecology at the Terrestrial-Aquatic Interface in Louisiana Coastal Wetlands." Gulf Coast Terrestrial Aquatic Interfaces Workshop: Climate Change and Disturbance Impacts, ORNL sponsored workshop. September 2021.



Roberts BJ. “Coastal Ecosystem Complexity and Connectivity: What Have We Learned from the Deepwater Horizon Oil Spill?” Northwestern State University Biology seminar. November 2021.

Roberts BJ. “Coastal Ecosystem Complexity and Connectivity: What Have We Learned From the Deepwater Horizon Oil Spill?” University of Louisiana Lafayette Department of Biology Colloquium. January 2022.

Roberts BJ. “Program Handbooks, Preparing Mentors, and Other REU Logistics.” NSF GEO REU Virtual Workshop Series. March 2022.

Roberts BJ. “The Atchafalaya Basin as a Potential National Estuarine Research Reserve for Louisiana.” City of Morgan City and surrounding areas - hybrid town hall. February 2022.

Roberts BJ. “The Atchafalaya Basin as a Potential National Estuarine Research Reserve for Louisiana.” City of New Iberia and surrounding areas - hybrid town hall. February 2022.

Roberts BJ. “The Atchafalaya Basin as a Potential National Estuarine Research Reserve for Louisiana.” Eagle Expo Morgan City, LA. February 2022.

Roberts BJ. “The Atchafalaya Basin as a Potential National Estuarine Research Reserve for Louisiana.” Louisiana residents virtual town hall. February 2022.

Roberts BJ. “Coastal Ecosystem Complexity and Connectivity: What Have We Learned From the Deepwater Horizon Oil Spill?” Old Dominion University Department of Biological Sciences Seminar Series. February 2022.

Roberts BJ. “What is LUMCON?” Northwestern State University Biology seminar. November 2021.



Appendix D: Fiscal Year 2022 LUMCON Donors

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