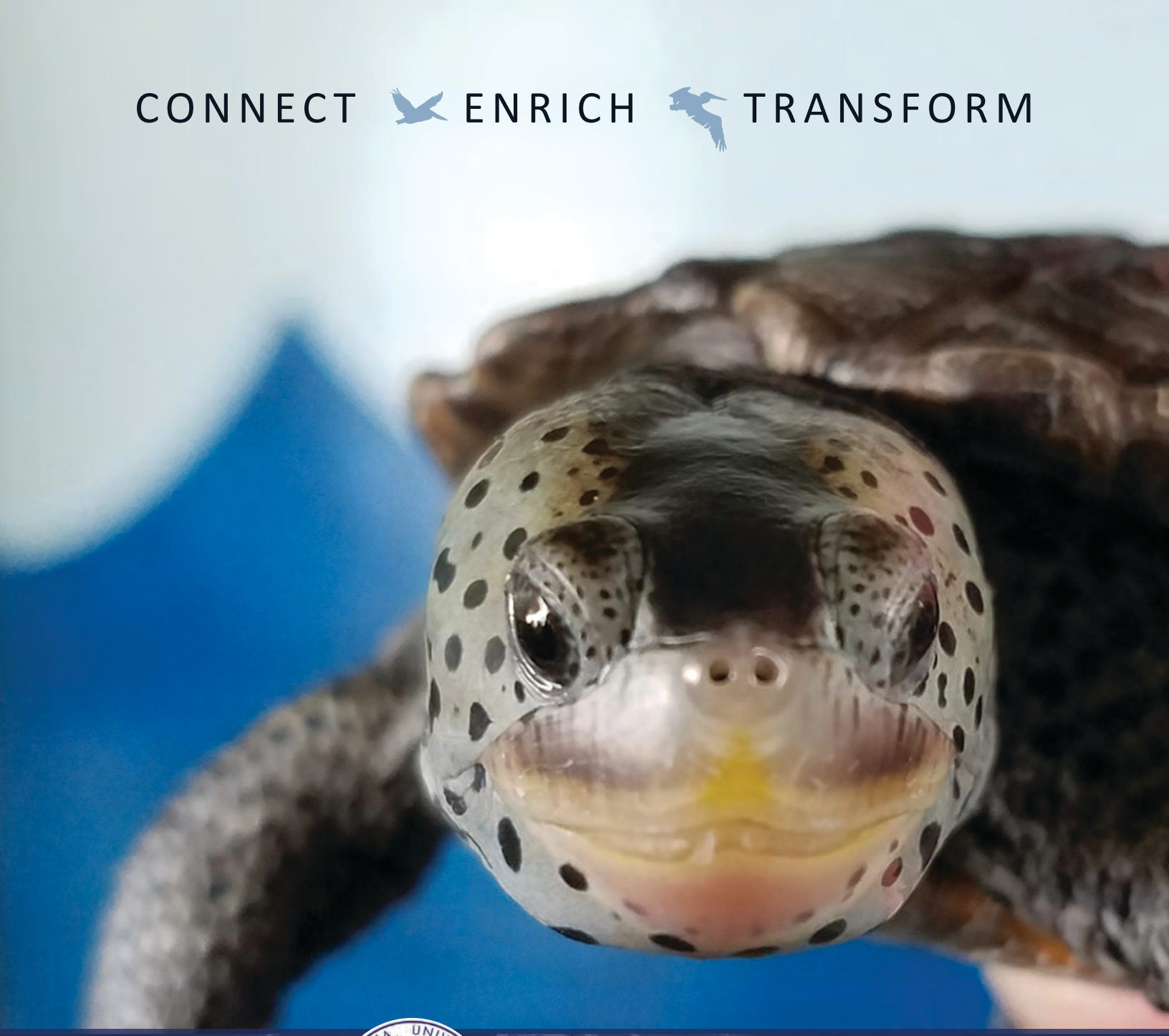
CONNECT ENRICH TRANSFORM



LUMCON 2020 ANNUAL REPORT


LUMCON 2020

ANNUAL REPORT

EXECUTIVE DIRECTOR'S MESSAGE

At the beginning of 2020, LUMCON was positioned for one of the most exceptional years in our history. We were set to have a record number of K-12 students at the DeFelice Center, an extraordinary set of summer courses, groundbreaking field research, and over 400 days at sea on our research vessels. On March 3rd, we celebrated the keel laying of the R/V *Gilbert Mason* with Governor John Bel Edwards and the family of civil-rights advocate, Dr. Mason, in attendance. Dr. Mason's family, our colleagues at the University of Southern Mississippi and Oregon State University, representatives from the parish and state, and LUMCON staff members came together afterward for a crawfish boil. It was good food and good community that is the continued backbone of life in the bayou.

Then on March 13th, coincidentally a Friday, I closed LUMCON to all staff and visitors for four months. Since that time, many of us have continued to work from home, with a small percentage of the staff returning daily to the Center. We continue to remain closed to the public, students, and visiting researchers.

This year presented a host of new challenges; many never encountered at LUMCON. Yet, the staff's persistence through years of hurricanes, flooding, budget fluctuations, and various other adversities, have forged a resilient institution. Those honed skills produced an organization that is adaptable and is always ready to tackle the job at hand. An internal resiliency analysis this year, while flagging areas for improvement, revealed areas where LUMCON staff excel:

- LUMCON staff's connection to the vision and values of LUMCON, a sense of purpose, trust, partnership, and collaboration; and
- LUMCON staff's ability to self-regulate, control emotions, and remain calm under pressure.

With those two strengths, LUMCON's continued stability and success in 2020 was unsurprising. In the following 2020 annual report, what unfolds are countless examples of LUMCON pivoting, capitalizing on new opportunities, maintaining growth, and sustaining operations. Highlights for the year are:

1. The administrative team, while working remotely, transitioned LUMCON to an entirely new state budgeting system.

2. Louisiana's state government honored LUMCON with an increase in budget that allowed LUMCON to support faculty lines and match the EPA funding for Barataria-Terrebonne National Estuary Program (BTNEP).

3. LUMCON received a $1.6 million grant from the U. S. Economic Development Administration to build a portion of the bulkhead at the Houma Marine Campus on Dickson Road. The new bulkhead will enable the Houma campus to serve as the home port for a new R/V *Gilbert Mason* expected to be completed in 2023.

4. The science group continued research on over 40 grants and submitted nearly the same number this year.

5. The science group, while writing and submitting all these grants, published nearly 30 scientific papers.

6. Marine operations returned the R/V *Pelican*, Pt. Sur, and *Acadiana* to operations on July 1, 2020. To accomplish this, the group developed rigid protocols for COVID, protocols now adopted by other vessel operators. The Vessel Operations Standard Outbreak Prevention Management and Response Plan resulted in no positive cases with over 200 days at sea.

7. On Tuesday, March 2, 2020, Governor John Bel Edwards announced that he was including funding for a replacement for LUMCON's iconic R/V *Pelican* in the state's FY 2021 capital outlay budget. The current *Pelican* has been serving LUMCON and the people of Louisiana since 1985 and is one of the busiest members of the University-National Oceanographic Laboratory System (UNOLS) fleet, spending up to 200 days at sea per year. She is nearing the end of her life at sea, and we are now in the process of planning for her $36 million replacement. The state's commitment will ensure world-class research about the changing nature of Louisiana's coast and the Gulf of Mexico for the next 40-50 years.

8. Progress continues for the Houma Maritime Education and Research Campus, a joint venture among LUMCON, the University of Louisiana System, the Louisiana Community Technical College System, Fletcher, South Louisiana Community College, and others to develop the first marine science research and workforce training park in the nation. The designs are finished for LUMCON's Blue Works, and the designs began for the Marine Operations Center. 2021 will bring groundbreakings for Blue Works, the Marine Operations Center, as well as Fletcher's new maritime training center. Behind the scenes, the maritime task force builds partnerships and programs at the interface of coastal sciences and technology.

9. In addition, Blue Works' iconic building will be the first expansion of LUMCON's campus in our history. The Blue Works mission is to build capacity, knowledge, and passion at the intersection of marine science and technology, find innovative solutions, and train the next generation of innovators in Louisiana. LUMCON's Blue Works will truly be a "one-of-a-kind" facility where students and scientists of all ages can gather to explore marine technology.

10. The facilities staff made upgrades to the facility such as painting; installation of fume hoods; preparation, cleanup, and repairs after numerous storms; laboratory renovations; emergency generator upgrades; and began the storm shutter replacement. This team not only has kept LUMCON operational this year but has actively worked to make improvements around the facility.

11. Six storms impacted LUMCON this year, with Zeta being a direct hit as a powerful category two storm on Wednesday, October 28, 2020. From Zeta, LUMCON received five feet of water. We took significant damage to the docks and boardwalks, windows, fencing, roof, lamp posts, and the facilities building. Despite the flooding and the eye of the category two hurricane passing directly overhead, the DeFelice Marine Center remains standing. Two days after Zeta, LUMCON returned to operations. Our thorough hurricane preparation and r esponse plan allowed LUMCON to survive one of the most active hurricane seasons on record.

12. In 2020, we signed memorandums of understanding with Louisiana State University at Eunice, Northwestern State University of Louisiana, Tulane University, and the University of Louisiana at Monroe, adding to partnerships with Louisiana State University Shreveport, Nicholls State University, the University of Louisiana at Lafayette, and University of New Orleans. These partnerships allow LUMCON to offer unique online courses to students from the aforementioned campuses while keeping LUMCON's university programs financially viable.

13. LUMCON pivoted our Research Experience for Undergraduates (REU) program to an online model. This year marks the 10th cohort of students in the REU program. Typically, this 10-week program focuses on students conducting research and learning about careers in the sciences at the DeFelice Marine Center. Things were different this summer. The concern for student and staff wellbeing kept us from having any residential programs this summer which in turn opened up the chance to grow our programs in other ways. This summer, the REU program focused on providing interns with a wide range of professional development opportunities that better prepare them for graduate school or the workplace through a concentrated series of online interactive workshops and discussions.

14. LUMCON worked to increase our digital footprint to bring the LUMCON experience to a larger audience. We worked as fast as possible, reevaluating, adjusting, and expanding the nature of our distance learning programs by applying the knowledge and skills gained over the last few decades to new online content that removes barriers for a broader audience and focuses on the issues and scientific understanding of the Gulf of Mexico. This year we brought two new consortium courses, Oceans and Society and Scientific Leadership, quite literally online.

15. LUMCON introduced an online lecture series in 2020. LUMCON's Science Talk Series is a free lecture series open to the public that provides a wide range of current and emerging topics and issues in marine science that touch our community's everyday lives. These talks found a weekly audience of an average of 100 people.

16. Marine Education built a library of free downloadable and printable activities for students to complete at home.

17. LUMCON's Digital Learning and Visualization Center (DLVC) is progressing. The previously underutilized space is being converted into a new audio/visual production and collaborative space complete with field-rated mobile equipment allowing for content generation on vessels, boats, and in field locations. Upgrading our technology will allow us to produce live broadcasts, record content, or a mixture of both to provide our audiences with learning opportunities that foster passion, excitement, and empowerment. These programs will include but not be limited to virtual field trips on vessels to remote locations, classes or university courses, follow-along experiments, field and laboratory activities, laboratory tours, lectures and seminars, and how-to lessons.

18. LUMCON saw an increase in the number of donors this year. Donations have helped us begin to rebuild our boardwalks and docks and build up the DLVC.

19. LUMCON has added new staff this year that has provided vital expertise in the science, executive, and administration teams.

20. LUMCON survived COVID, hurricanes, and everything else 2020 had to offer. We remain healthy, safe, and operational. I was reminded this year of the concept of antifragile of Taleb. "Some things benefit from shocks; they thrive and grow when exposed to volatility, randomness, disorder, and stressors...Antifragility is beyond resilience or robustness. The resilient resists shocks and stays the same; the antifragile gets better." In 2020, LUMCON proved it was and is antifragile.

No barriers,

Dr. Craig R. McClain

PS At the end of 2020, we say goodbye to Heidi Boudreaux, LUMCON's Chief Financial Officer and Associate Director of Administration, and welcome her to enjoy retirement. Heidi was hired on in 1998 and selflessly gave LUMCON 22 years. Heidi's commitment to LUMCON has been unwavering, and her expertise has weathered LUMCON through both metaphorical and literal storms. While LUMCON and I will miss Heidi, we wish her happiness and contentment in retirement.

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MUSTANG
MUSTANG SURVIVAL

2021 GOALS

1. INFRASTRUCTURE

To better equip LUMCON for increases in flooding and large storms, several major infrastructure initiatives are planned. As well, several upgrades and additions will allow for growth in our science and education missions. Facilities will oversee the conversion to an electric storm shutter system that will allow new, better protection during storm events, as well as save countless labor hours during storm preparations. Dock and boardwalk repairs, door replacement, and electrical repairs from tropical storms will be completed. Facilities will also begin the process of revamping and improving our parking spaces to mitigate flood impacts at LUMCON. Roof repairs will be finished before the 2021 hurricane season.

We also plan on the completion of the exciting and brand new Digital Learning and Visualization Center (DLVC). Our previously underutilized DLVC will be converted into an innovative video/audio production and collaborative space complete with field-rated mobile equipment allowing for content production on vessels, boats, and field locations. To make it happen we will 1) upgrade technologies to allow streaming of online content directly from the Marine Center and 2) remodel the Marine Center's DLVC to house this infrastructure. Upgrading our technology will give us the ability to produce live broadcasts, recorded content, or a mixture of both to provide our audiences with learning opportunities that foster passion, excitement, and empowerment. These programs will include but not be limited to virtual field trips to remote locations and on vessels, classes or university courses, follow-along experiments, field and lab activities, lab tours, lectures and seminars, and how-to lessons on important skills like the use of ArcGIS or R.

Another major initiative involves the Development team and Education and Outreach (E&O) team to tackle two goals — increase diversity in marine science and provide updated, educational infrastructure at the DeFelice Marine Center. By collaborating with Historically Black Colleges and Universities (HBCUs), interns will learn aquarium/exhibit design, construction, and maintenance. Interns will use the rebuilding of LUMCON's aquariums/exhibits as a practical and hands-on learning tool. Each year, a cohort of students will be involved in the redesign of the LUMCON public display aquaria in the lobby of the Marine Center. The renovation will occur in three phases over three consecutive years starting in 2022.

2. *PELICAN* REPLACEMENT

For over thirty-five years, the R/V *Pelican* has served as the flagship of America's Gulf Coast research fleet. Named for the 1938 M/V Pelican, which she replaced when she was completed in 1985, the 116-ft R/V *Pelican* was designed and outfitted to conduct a variety of oceanographic research missions in the Gulf of Mexico. In recent years, she has averaged an incredible 200 working days a year at sea, undertaking both original research central to the mission of the Louisiana Universities Marine Consortium (LUMCON) and contracted research works on behalf of other academic and scientific institutions across the globe. The *Pelican* has been well cared for during her distinguished career, but despite rigorous upkeep and a major refitting of the vessel, the vessel's life expectancy is near end. In 2021, we will begin and finalize the design process for the *Pelican* replacement with $1,000,000 in Louisiana capital outlay. The state and federal legislatures and the Governor's office will also finalize the funding for the construction of the replacement vessel beginning 2022.

3. DIVERSITY AND INCLUSION

In efforts to increase revenue and to reach out to a more diverse student population, LUMCON will sign four new MOUs with Southern University New Orleans (SUNO), Dillard University, the Pointe-Au-Chien Indian Tribe, and the Inter-Tribal Council of Louisiana. Collaborations like the one with the Black in Marine Science organization will help LUMCON branch into new areas of opportunities and diversity and inclusion practices. Our Education and Outreach team will join forces with the Board of Regents to plan a summer camp for Historically Black Colleges and University (HBCU) and Historically Minority-Serving Institution (HMSI) students.

4. INTEGRATED MARINE OPERATIONS

LUMCON will continue the effort of fostering an Integrated Marine Operations team across the state of Louisiana. By leveraging technological and engineering expertise across our Consortium partners, we can look forward to increasing our oceanographic assets and developing new infrastructure to address the most pressing scientific problems in the Gulf of Mexico. This new team will also position Louisiana to be the leader in oceanographic instrumentation and open the doors for new funding and scientific initiatives. Through a series of virtual and in-person meetings in 2021, LUMCON will solidify this group and begin to identify future goals.

5. HOUMA MARITIME EDUCATION AND RESEARCH CAMPUS

With our LCTCS partners, LUMCON continues to build spaces and programs at the new campus. Early in 2021, construction will begin on Blue Works with completion in 2022. In late 2021, the new marine operations center will begin its construction phase. Fletcher and LUMCON will also develop in 2021 a new marine technician program as a major educational initiative at the campus. LUMCON and the Terrebonne Economic Development Authority (TEDA) will continue to explore funding and partnership opportunities for research and development programs around low-cost marine/coastal monitoring. We will also continue to build academic, agency, and industrial partnerships that will lead to future presences at the campus. In turn, we will foresee a movement from a single campus to a major education and research park.

6. STRATEGIC PLAN

LUMCON's leadership in collaboration with the Board of Regents will produce and develop the 2022-2027 strategic plan with detailed, measurable, and attainable goals for the next five years. This strategic plan will translate LUMCON's core values, mission, and vision into action plans to realize LUMCON's fullest potential by 2027. This will include recommendations on goals under the three pillars of the LUMCON mission, i.e. education/outreach, science, and consortium, as well as maintaining scientific assets such as the marine vessels, the DeFelice Marine Center, and the growing Houma Maritime Campus. As we strategically think toward the future, we will spearhead efforts regarding the new landscape of marine science, the vision of the marine lab of the future, i.e. marine lab 2.0, the accessibility of marine science and education, and the attributes of novelty and adaptability.

7. DEVELOPMENT

LUMCON's development efforts are anticipated to continue recent growth into 2021. As conditions improve, LUMCON will seek to raise the size of the average donation back to pre-pandemic levels, while maintaining the substantial growth in numbers of donors realized in 2020.

LUMCON will work with the Board of Regents and the local legislative delegation to assure adequate funding to ameliorate lost revenue streams experienced during the pandemic. Development efforts in 2021 will focus on Blue Works and the Marine Operations Center at the Houma Marine Campus. Groundbreakings for both facilities will present opportunities to focus attention on and build donor interest in those specific projects. LUMCON will work to assure that construction funding continues while giving special attention to attracting funding from public and private sources for programs offered at the new campus.

Overarching all of these goals will be LUMCON's efforts to build a culture of philanthropy that has not existed in the past. Development staff will continue to build relationships with potential donors at the major gift and annual donation levels through a variety of means. There will also be a continued focus on emphasizing the importance of philanthropic giving to a variety of LUMCON stakeholders, including businesses, foundations, our South Louisiana neighbors, and other friends across the state and nation, including former students, faculty, and staff.

8. EDUCATION AND OUTREACH

Many of the key initiatives in infrastructure, diversity and inclusion, the new campus, and science fall under and education and outreach (E&O). The E&O program was flexible and innovative to adapt to a world where physical visits were not possible in 2020. This pivot generated considerable new opportunities for 2020. The acquisition of resources to develop and deliver digital content meant allowing for an expansion of LUMCON program offerings for 2021. The LUMCON Science Talks series will evolve to fit a new format, yet deliver science content in a fresh and unique way. Program staff will continue building programs that are diverse and inclusive while providing access and support for all science learners.

9. SCIENCE PROGRAMS

LUMCON's science goals for 2021 are aimed at continuing our growth in four areas. Our first category is research. We will continue the submissions of diverse research proposals to a broad network of funding opportunities. This can be expanded through increased partnerships with community partners (e.g., tribal communities, Parish governments, NGOs, etc.). Faculty and staff will strive to continue to increase the publication output of our research. Increasing the collaborative networks of faculty and staff to stimulate coastal and marine science research projects across existing and expanding programs will also be a focus in 2021. Expanding efforts in the development of the next generation of scientific leaders via the support of postdoctoral researchers, graduate students, undergraduate interns, and scientific staff will be another attainable goal of 2021.

Our second category is education efforts. We will increase the number of graduate and undergraduate students that we mentor. A collaboration with the E&O team will lead to increased interactions between scientific faculty and staff and students ranging in all education levels from kindergarten to university level.

Our third category of achievable objectives is in regards to consortium activities. The Marine Center in Cocodrie has been seeing a growth in scientific usage over the last few years before the COVID-related health and safety restrictions. In 2021, we will continue to work with consortium researchers to facilitate their research needs. LUMCON faculty will remain supportive to graduate students throughout the consortium by serving as direct advisors, members of graduate theses, and dissertation committee members. LUMCON faculty will continue to expand the roles we play on advisory boards on diverse committees at consortium member institutions.

Lastly, the fourth area of growth will encapsulate outreach and broader impact activities. Faculty members will continue to engage in and serve in leadership roles in professional scientific service activities. LUMCON faculty will continue to build on the successes and expand the innovation of broader impact programs within our research projects in partnership with the E&O staff.

10. FINANCE AND ADMINISTRATION

LUMCON's Finance team will have a successful submission of all grant applications for 2021. LUMCON will find innovative ways to increase revenue streams. Our goal is to streamline the LaGOV grant and budget reporting process for all internal and external parties. We will provide detailed monthly grant reports to principal investigators.

CONNECT

CONSORTIUM HIGHLIGHTS

In 2020, LUMCON's consortium activities continued to thrive. They spanned a broad set of activities including:

- Students and researchers participating in online research and educational programs at LUMCON;
- Researchers still utilizing LUMCON facilities, locations, and vessels with new protocols in place;
- Shared research projects, papers, and grants between consortium and LUMCON faculty;
- LUMCON faculty providing quality online courses to consortium students;
- LUMCON faculty serving as guest lecturers for consortium classes

Several highlights of consortium partnerships are notable. We built on Consortium Course partnerships with **Nicholls State University, Louisiana State University Shreveport, University of Louisiana at Lafayette,** and **University of New Orleans**. In 2021, we signed new MOUs with Louisiana State University Eunice, Northwestern State University of Louisiana, Tulane University, and University of Louisiana at Monroe. These MOUs allow LUMCON to provide distance learning/online courses taught by our faculty to our consortium partners such as Changing Coastal Oceans, Oceans & Society, and Scientific Leadership. These MOUs also afford the listing of these courses in partner's course catalogs and return of collected tuition to LUMCON.

Continued research collaborations occur between LUMCON and consortium members. LUMCON led three other institutions, **Dillard University, University of Louisiana at Lafayette,** and **University of New Orleans,** on a $5,000,000 proposal to the National Science Foundation for Coastlines and People call for proposals. If successful, the new Coastal Trauma Hub will integrate transdisciplinary research from across four institutions and become an epicenter of socio-environmental change in coastal Louisiana. Strategically, the initiative would interlink collaborative projects using a holistic approach to integrate trauma temporal dynamics with coastal socio-environmental systems to increase resiliency through more effective policy and management practices.

LUMCON continues the partnership with **Fletcher Technical Community College** and **Louisiana Community & Technical College System (LCTCS)** on the maritime campus in Houma, Louisiana.

LUMCON and **Louisiana Tech University (LA-Tech),** led by Dr. Jennifer Hill, continued to collaborate on the second year of the internship program. Although the program faced some challenges due to COVID, eight students were able to complete successful research projects under the mentorship of six LUMCON and five LA-Tech faculty members (more details are provided in the Education Section).

Dr. Rieucau continues to collaborate with Dr. Solomon David at **Nicholls State University** for a research project involving the Lower Mississippi River Conservation Committee and the National Fish and Wildlife Foundation. Drs. Roberts and Rieucau continue to collaborate on a research project funded by the Bureau of Ocean Energy Management (BOEM) with lead PI Dr. Nelson from the University of Louisiana at Lafayette. Dr. Roberts continues his collaboration with researchers at **University of New Orleans** and **Louisiana State University** for the oil characterization and dissolved organic matter (DOM) sampling components of the marsh mesocosm experiment being conducted at LUMCON. Dr. La Peyre's research group from **Louisiana State University** visited the marine center in November for projects funded by the National Oceanic and Atmospheric Administration (NOAA) Aquaculture Program and the Louisiana Department of Wildlife and Fisheries. Dr. La Peyre and Dr. Roberts continued collaborating on a living shoreline research project funded by Louisiana Sea Grant. Dr. Roberts continues to serve on **Fletcher Technical Community College's** Coastal Advisory Board which is focused on curriculum development for the new Institute of Coastal Studies. Drs. Archer and D'Andrilli continue to collaborate with Dr. Porrier of the **University of New Orleans** and Dr. Miller of **Baton Rouge Community College** on a project to study the distribution, ecology, taxonomy, and phylogeny of Louisiana's freshwater sponges including preparation of NSF PURSUiT funding to resolve the taxonomy of freshwater sponges. Dr. McClain collaborated with Dr. James Nelson at **University of Louisiana at Lafayette** that led to both grant submission and a published paper integrating energy theory and biodiversity to make future predictions about the impacts of climate change.

The year 2020 started well for the LUMCON E&O program. By January, roughly 80% of the spring and summer calendar was filled with reservations for field trips, summer courses and camps, teacher workshops, and outreach events. Besides being on track to meet or exceed the total number of visitors seen in recent years, the E&O staff were working on plans for Meet the Fleet and OCEANDOTCOMM. Both events are the crown jewels of LUMCON public outreach efforts. In late February, in collaboration with members of the faculty, E&O offered the first "Coding for Marine Science" teacher training. Soon after, Louisiana started to see huge increases in the number of COVID-19 infections. As a result, LUMCON education and outreach programs were suspended. Despite the challenges of 2020–a global pandemic, loss of staff, and the most active hurricane season on record–LUMCON's education programs were able to have many great successes that improved upon an already exceptional program and helped to build the foundation for an expansion of the department.

In April, E&O staff knew that in-person education would be suspended for an indeterminable amount of time. Because of that, E&O had to reimagine how to provide marine science content while still remaining true to the E&O program mission and core values. There were challenges, but LUMCON was able to overcome them successfully. The E&O staff focused on developing new skill sets, modifying old program activities and developing new activities, learning and striving to provide access to all groups (especially those underrepresented in marine science), invest funding and resources into infrastructure, and trying innovative approaches to delivering content virtually.

In a time when a lot of organizations flooded an already busy online landscape with digital content, LUMCON had to find a niche for programming that is unique. It was clear that to deliver programming distinct to LUMCON, E&O had to amass a set of assets that would be used to create and deliver excellent marine education content from the Marine Center. To do this, LUMCON sought sources of new funding and requested reallocation of existing funds to purchase 4K video recording equipment and retrofit an outdated education classroom. The acquired equipment has allowed for the development of digital content of the highest quality. The redesigned space will soon house a filming studio, podcast station, green screen, editing station, and a digital collaboration meeting space. A busy hurricane season in 2020 has meant the renovation of the space is behind schedule, but it will be completed in early 2021. This space will allow for a new kind of digital presence for LUMCON. It will be an asset that will enable LUMCON to be a leader in delivering meaningful digital content far into the future.

Through the acquisition of new digital assets, LUMCON will have a "new normal". Once known only for outstanding in-person programs, LUMCON will now be able to bolster those programs with new digital-based programs. With these assets, the LUMCON faculty will be able to redesign courses that leverage their vast experiences as field scientists, enable more collaboration with students and co-instructors, test new methods of content delivery, and better translate lecture content. Within the K-12 programs, LUMCON can now develop pre- and post-field trip activities that carry the in-person experiences of students far beyond the experiences they have accessed at the Marine Center. LUMCON will be able to remove barriers for students for whom the distance to the Marine Center is still a challenge. With these assets, LUMCON can start to think in terms of a multifaceted impact to people who interact with LUMCON staff.

Early in the pandemic there was little being offered in terms of trusted marine science content that the public could take advantage of while staying at home. To meet this need LUMCON immediately developed the LUMCON Science Talk Series. Because of the overwhelming response and large audience sizes, these talks continued through December 2020. The LUMCON Social Media Program also played a big role in how LUMCON delivered marine science content. More details about these programs are provided in greater detail below.

ENRICH

UNIVERSITY EDUCATION

FIELD TRIPS: Before canceling all visitor programs in March, LUMCON E&O staff worked with a total of six university groups who visited the Marine Center for field trip experiences. A total of 117 students visited the Marine Center between January 19 and March 13, 2020. LUMCON educators spent a total of 1,583 hours teaching university students during these in-person visits. A list of institutions is below:

- Augustana College
- Louisiana Tech - Wetland Ecology
- Louisiana State University
- Concordia College
- Louisiana Tech - Marine Biology
- University of South Carolina

COURSES: Events in 2020 forced the cancellation of all in-person programming. Instead, E&O, in conjunction with LUMCON faculty, quickly adapted and was able to offer fall courses to member institutions. Due to years of experience with the remote teaching of Changing Coastal Oceans (CCO), the Marine Center was able to create new courses based on the format of this annual course. The new courses would, like CCO, connect students from multiple campuses to LUMCON and to each other despite barriers of distance. The courses were offered at consortium member schools that have signed MOUs with LUMCON. In keeping with the core values of the E&O programs, these new marine science courses integrated innovative teaching methods that made the content different from typical online courses. Instructors used activities like student-led in-class discussions, online forums, and utilized tools like Moodle to engage students on an individual level and provide "spaces" in which to share opinions, thoughts, and information. Descriptions of each new course follow.

THE OCEAN AND SOCIETY: This course covers a broad spectrum of current science and research programs and how science information 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 on them. Lectures and discussions explore 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.

SCIENTIFIC LEADERSHIP: Aligned with our mission to develop skill sets, this course targets graduate students to prepare them for success in their scientific careers by equipping them with an advanced set of leadership skills. Students are exposed to the challenges of management and the course helps them to develop a set of resources and the knowledge needed for leadership positions.

The courses did very well with enrollment, demonstrating that students were interested in courses that provided a unique alternative to the course offerings at their home campuses. The ability to reach multiple campuses gives LUMCON the advantage of filling courses despite having limited interest on any single campus. The bridging of students across the consortium institutions adds value to the courses because this capitalizes upon different student perspectives from around the state. Below are tables with a breakdown of the student enrollment for each course by institution.

SCIENTIFIC LEADERSHIP	
Institution	**Number of Students**
University of New Orleans	4
LSU-Shreveport	7
University of Louisiana at Lafayette	4
Total	**15**

THE OCEAN AND SOCIETY	
Institution	**Number of Students**
Nicholls State University	1
University of New Orleans	8
LSU-Shreveport	11
University of Louisiana at Lafayette	2
Total	**22**

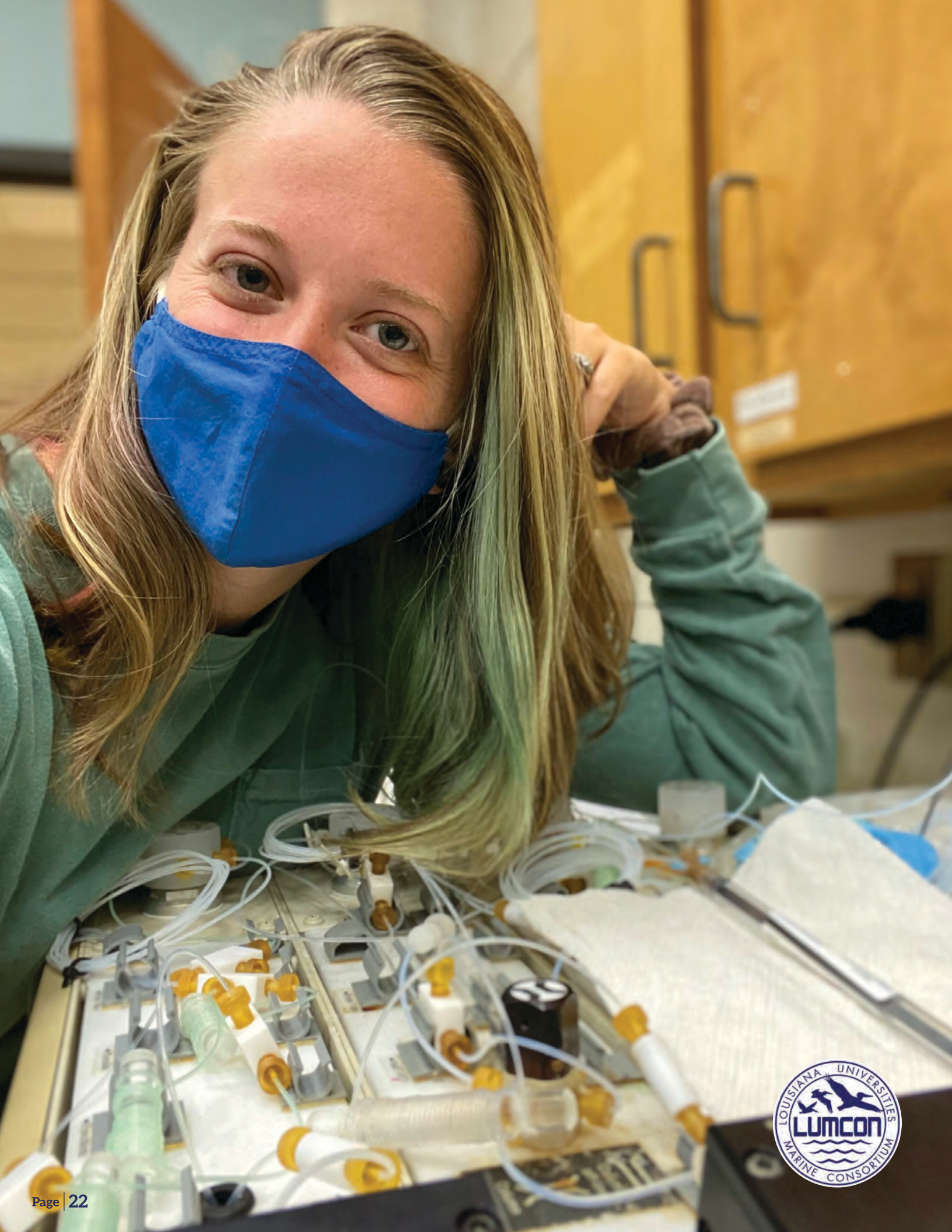
The renewed success of the LUMCON semester courses is a direct result of the agreements with consortium members. The establishment of MOUs with consortium members makes it possible for LUMCON to receive tuition from home institutions of the students that enroll in our courses. This funding allows LUMCON to reinvest into the program so that we can continue to offer courses and provide resources for those classes. Currently LUMCON has MOUs with Louisiana State University at Eunice, Louisiana State University at Shreveport, Nicholls State University, Northwestern State University, the University of Louisiana Lafayette, the University of Louisiana Monroe, the University of New Orleans, and Tulane University.

RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU) VIRTUAL PROGRAM

The year 2020 marked the 10th anniversary of LUMCON's REU program in Interdisciplinary Research Experiences in Changing Coastal Environments that is currently supported by a grant awarded to Drs. Brian Roberts and Craig McClain (NSF OCE-1757887). Due to the concerns over COVID-19 and the risk of contagion among students and staff, the 2020 LUMCON REU program was modified to be a virtual professional development program developed by Dr. Roberts and Associate Director of Education and Outreach Murt Conover. The program consisted of three afternoon introductory sessions on May 26, June 2, and June 9 covering overviews of the program, LUMCON, coastal Louisiana, and getting the most out of the program as well as focused sessions on scientific ethics and conduct and anti-harassment/discrimination training. The core of the virtual REU program was a weeklong professional development workshop that began on June 15 and consisted of morning workshops and afternoon career panels/discussions. The themes of the morning workshops included Becoming the Professional You, Graduate School (determining if and when it is the right choice for you, selecting and applying to graduate schools), Scientific Proposals and Presentations, Scientific Papers, and Elevator Talks. Career Panels included discussions with members of the LUMCON faculty, non-academic scientists, scientific administrators, and a session on science-media communication. Students also had an opportunity to meet individually with researchers and other science professionals during the course of the program. The virtual professional development program was followed by regular check-in sessions to bring the cohort back together. This carries the experience and mentorship of the students forward beyond the scope of the concentrated program and is aligned with the values of LUMCON's overall REU program.

The impact of the 2020 virtual REU program was greatly enhanced by the outside participation of numerous individuals and organizations, including Louisiana Sea Grant, the Barataria-Terrebonne National Estuary Program, Coastal Protection and Restoration Authority (CPRA), Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Oil Spill Coordinator's Office (LOSCO), LSU, National Fish and Wildlife Foundation (NFWF), United States Geological Survey (USGS), the University of Maryland, and The Times-Picayune. Because the program for 2020 was not an in-person research experience, the amount of funding required per intern was less due to the lack of need for room and board expenses. This opened up the ability to impact more students than an in-person program would have and permitted LUMCON to select students that might not normally have had the opportunity to participate in an in-person research-based program. In total, LUMCON impacted 12 students through the 2020 Virtual REU Program. Two of those students were from consortium member institutions. Below is a list of the students and their home institutions.

NAME	INSTITUTION
Eric Austin	University of Louisiana at Lafayette
Allison Benelli	Louisiana State University
Ashley Burgos	Roosevelt University
Wyatt Eads	Mississippi State University
Arika Garcia	Alaska Pacific University
Georgia Hilliard	Ohio University
Grace Hinrichs	Sewanee, The University of the South
Amanda Jackson Mojica	University of Puerto Rico
Andria Miller	Jackson State University
Keegan Rankin	Hiram College
Chaz Rhodes	Wabash College
Brenna Taylor	Western Washington University



LUMCON/LOUISIANA TECH INTERNSHIP PROGRAM

In 2019, LUMCON partnered with Louisiana Tech University to start a three-week coastal research experience for their undergraduate students. Usually, students would be in residence at the Marine Center for the duration, but in 2020 the program was done remotely. When possible, students were allowed in the laboratories at Louisiana Tech with social distancing protocols to perform experiments for the internship period. If samples were needed, they were collected at the Marine Center by LUMCON staff and provided to the students at a later date.

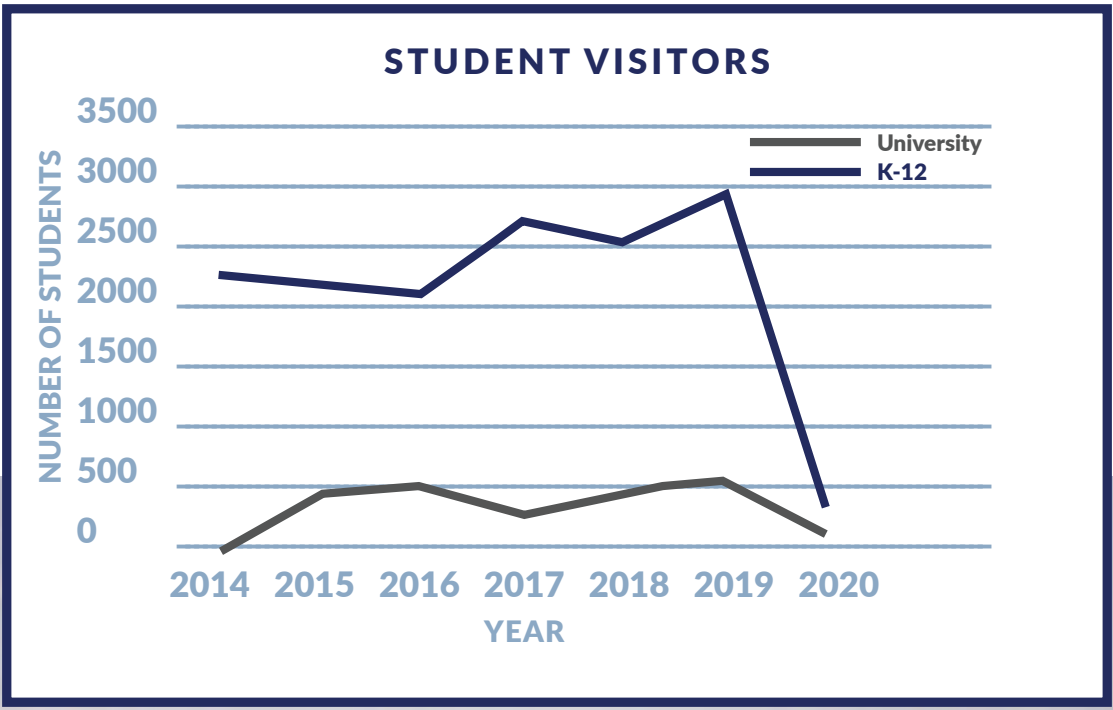
This partnership allows students to engage with coastal research activities and collaborate with and be mentored by both a LUMCON and a Louisiana Tech faculty member on a research project. The program ends with students presenting posters about their research programs at a seminar. Students that participate earn credit for independent research courses.

LUMCON faculty that participated in the 2020 program included Drs. Archer, Bockus, Bowles, McClain, Rieucau, and Roberts. Below is a list of the students that participated.

STUDENT NAME	MENTOR NAME	MENTOR INSTITUTION
Nicholas Benedetto	Dr. Clay	Louisiana Tech
	Dr. Archer	LUMCON
	Dr. McClain	LUMCON
Emily Bordelon	Dr. Giorno	Louisiana Tech
	Dr. Bowles	LUMCON
Tanna Darlton	Dr. Adams	Louisiana Tech
	Dr. Roberts	LUMCON
Caitlyn Fontenot	Dr. Maness	Louisiana Tech
	Dr. Bockus	LUMCON
Timothy Hinkie	Dr. Hill	Louisiana Tech
	Dr. Rieucau	LUMCON
Katelyn Mall	Dr. Adams	Louisiana Tech
	Dr. Roberts	LUMCON
Samuel McCrary	Dr. Maness	Louisiana Tech
	Dr. Bockus	LUMCON
Colton West	Dr. Hill	Louisiana Tech
	Dr. Rieucau	LUMCON

K-12 EDUCATION

Before suspending programs in March, E&O staff had already led ten K-12 student field trips at the Marine Center. A total of 378 students received a total of 5,314 hours of instruction from E&O staff. Before the suspension of activities, the E&O schedule was 75% booked for the spring semester. Below is the graph showing number of visitors from 2014 to 2020 and a list of schools that attended in-person field trips between January and March.



FIELD TRIPS FROM JANUARY-MARCH 2020

SCHOOL	LOCATION
Lacache Middle School	Chauvin, LA
Lusher Charter School	New Orleans, LA
SUNO-TRIO Program	New Orleans, LA
St. Charles Elementary	Thibodaux, LA
Bourg Elementary	Bourg, LA
Forest Hill Junior High	Forest Hill, LA
International School of Louisiana	New Orleans, LA
Doyle High School	Livingston, LA

Development of online content was approached in two different stages. Stage one involved evaluation of products that already existed that could be modified/ updated for digital or virtual delivery. This stage allowed educators to develop better proficiencies in writing instructions, thinking about what resources students would have on hand at home (given stay at home orders), and identify gaps in the content covered in existing materials and products. Stage two was educators starting to develop content materials that were unique to LUMCON and the coastal ecosystems that surround the Marine Center. Educators also used this stage to learn and incorporate free online resources like Google Earth and public datasets into their materials. To get activities into the hands of the public, E&O created a webpage on the LUMCON website at lumcon.edu/educational-activities/.

E&O staff also spent considerable time attending webinars and workshops that focused on diversity in STEM. These trainings allowed educators to better understand the challenges of underrepresented groups in science. They also learned how to develop activities so they could be used by all groups and not just those with access to resources such as a reliable internet connection. One product to come out of this effort is LUMCON's Women in Marine Science series of recordings. The Women in Marine Science series (lumcon.edu/women-in-marine-science/) was created in an effort to document the experiences and opinions of women LUMCON faculty members as a mechanism to help young women considering a career in marine science. Because the response to this first recording was overwhelming, other conversations with women in different career stages and paths, support roles, and backgrounds were also recorded. The vision for this program in 2021 is to broaden the scope and record more conversations with scientists covering a variety of topics that can help any young student considering a career in marine science.

TEACHER WORKSHOP

In February 2020, LUMCON offered a teacher training experience titled “Coding in Marine Science”. The workshop was designed to introduce educators to programs that will be associated with Blue Works. LUMCON succeeded in providing a unique experience that merged marine science and coding. The major successes of the workshop follow:

- The workshop organizers identified a gap in teacher professional development that focuses on coding within marine science and developed a workshop that filled this gap.
- Coding for Marine Science merged coding and marine science in a way that is useful to educators. Teachers now have the knowledge and skills needed to request their students use coding for applications that are outside of robotics and computer sciences.
- The workshop challenged teachers to reach, and succeed, beyond the limitations of traditional coding applications.
- The workshop provided teachers with access to previously unused resources that can be used to engage students through the use of coding.

PUBLIC AND EVENTS

Because of ongoing restrictions, two major outreach events hosted by LUMCON (Meet the Fleet and OCEANDOTCOMM) were canceled. LUMCON attendance at other outreach events (festivals, classroom visits) also did not occur because of widespread cancellations.

In an effort to provide reliable marine science content to the public, LUMCON developed the LUMCON Science Talk series. Our Science Talk Series is a free lecture series open to the public that provides a wide range of current and emerging topics and issues in marine science that touch the everyday lives of our communities. All talks are streamed live, as well as recorded for later viewing. Each talk is 30-40 minutes with time to interact with the presenter and a LUMCON educator. The series was initiated in April and continued through December.

The program began with a weekly schedule of talks, but after restrictions started to be relaxed nationwide, talks switched to a biweekly schedule beginning in August. The series became a popular event and had a global reach with people from four additional countries regularly attending the talks. The talks reached over 1,350 people in total during the live broadcasts with an average of 50 people attending each talk. Science Talk recordings archived on Youtube averaged about 100 views each. The exact reach of this program is impossible to gauge since many audience members viewed the talks at home with family members.


LOUISIANA UNIVERSITIES
LUMCON
MARINE CONSORTIUM

SOCIAL MEDIA

LUMCON's Social Media Program experienced considerable growth and maturation during 2020 because of the adaptability of the program, greater collaboration, and increased efforts of engagement. The LUMCON Twitter audience grew by 42%, the Facebook audience grew by 58%, and the Instagram audience grew by 40%, see table below. The increased effort in engagement resulted in more people liking, sharing, commenting, or clicking on links within the posts than posts generated in 2018 or 2019. More audience members are taking an interest in the posts and interacting with LUMCON in ways that they did not in the past. Dedicating resources to the Social Media Program has resulted in broader awareness of LUMCON and its programs and made LUMCON a trusted source of science information.

SOCIAL MEDIA ACCOUNT FOLLOWERS

Year	2017	2018	2019	2020
Twitter	803	1745	2009	2798
Facebook	2396	3682	4126	6407
Instagram	324	1123	1303	1750

Early in the pandemic, LUMCON Social Media audiences were consuming scientific content differently than before the pandemic started. People were consuming science content as a way to escape the nearly constant coverage and news about the severity of COVID-19. In response, LUMCON increased the number of original science content posts and primarily focused on engaging the audience in fun and informal ways. The success of the Social Media Program can be traced to the efforts of Catalina Rubiano, who served as the Social Media Coordinator from February to July in 2020. Ms. Rubiano was able to connect to audiences in fun ways without compromising the quality of the content through her unique and diverse perspective.

After some restrictions were lifted, people started to revert back to pre-restriction patterns and their "normal" social media habits. LUMCON social media adjusted once again. At the start of hurricane season, social media pivoted to being a source and filter for the most up-to-date, trusted information on coastal impacts during storm events. LUMCON set out to fill that niche within our region. To inform the public about real-time conditions on the coast, LUMCON utilized its extensive camera system, consisting of tower cameras and a network of security cameras throughout the facility and grounds. To provide information about the region, LUMCON E&O staff monitored social media accounts of trusted news, local agencies, and political leadership. As soon as new information was posted, this information was shared across LUMCON accounts. This strategy was successful. LUMCON accounts and posts began to be followed by regional and national news outlets.

TRANSFORM

LUMCON MARINE CENTER FACULTY

JUNIOR FACULTY

DR. STEPHANIE ARCHER made great strides in establishing her benthic ecology laboratory at LUMCON, despite the challenges that 2020 presented. Dr. Archer has established new collaborations with local researchers at Baton Rouge Community College, Louisiana State University, and the University of New Orleans, and hired both a student worker from Southeastern Louisiana University and a research technician. She was awarded an Exploration Grant from the National Geographic Society to study potential chemical contamination in seagrass beds after Hurricane Dorian devastated Abaco Island, The Bahamas. Dr. Archer will work with Dr. Abigail Bockus from LUMCON and scientists from The Bahamas Marine Mammal Research Organization to complete this work. She is also a Co-PI on a project focused on identifying life history requirements (e.g., spawning and nursery grounds and preferred habitats) that may prevent fishes from shifting their distribution as the oceans warm. This work is funded by the Lenfest Ocean Foundation and is a collaboration between investigators at seven institutions across the United States. Additionally, Dr. Archer was a Co-PI on three proposals submitted to the National Science Foundation, and also led a proposal to the Gulf of Mexico Coastal Ocean Observing System (GCOOS) to establish benthic monitoring in Terrebonne Bay. Dr. Archer had six papers published this year, including two publications through the Canadian government's formal process for providing scientific advice for policy. Finally, Dr. Archer contributed to the instruction of a new course for LUMCON, The Ocean and Society, and co-mentored a student through the Louisiana Tech-LUMCON Internship program.

DR. ABIGAIL BOCKUS was awarded a National Geographic grant and received continued research support from the Gulf States Marine Fisheries Commission, Louisiana Board of Regents, Louisiana Sea Grant, and NSF-UNOLS Chief Scientist Training Program in 2020. Ongoing projects included: examining offshore aquaculture development in the Gulf of Mexico, enhancing aquaculture feed development and sustainability, promoting shrimp fishery success in coastal Louisiana, determining the impacts of hurricane-derived contaminants on marine ecosystem stability and seafood safety in the Bahamas, and characterizing the factors affecting zooplankton's contribution to carbon cycling in oceanic waters near Hawaii. This work was accomplished with partners at LUMCON, Louisiana State University, Louisiana Tech, Southern University at New Orleans, the University of New Orleans, the University of Idaho, the University of Hawaii, Gulf Offshore Research Institute, Bermuda Institute of Ocean Sciences, Bahamas Marine Mammal Research Organization, NOAA, USFWS, USDA, Innovasea Systems, Nobilis Aqua, and Frontier Trout Ranch. Dr. Bockus published one peer-reviewed paper and has two manuscripts under review, attended one scientific conference, mentored three undergraduate interns, and presented guest lectures at Southeastern Louisiana University and the U.S. Naval Academy. She served on LA Sea Grant's Louisiana National Estuarine Research Reserve Site Development Committee, U.S. Aquaculture Society's Diversity and Inclusion Committee, Nicholls State University's Marine and Environmental Biology Program Advisory Board, and the World Aquaculture Society's Aquaculture America Steering and Program Committee. Dr. Bockus also sat on LUMCON's Women in Science panel, presented a live-streamed lecture for LUMCON's Science Talk series, wrote an article for the LUMCON newsletter, developed curriculum materials for LUMCON's Changing Coastal Oceans course, and designed and built research infrastructure at LUMCON.

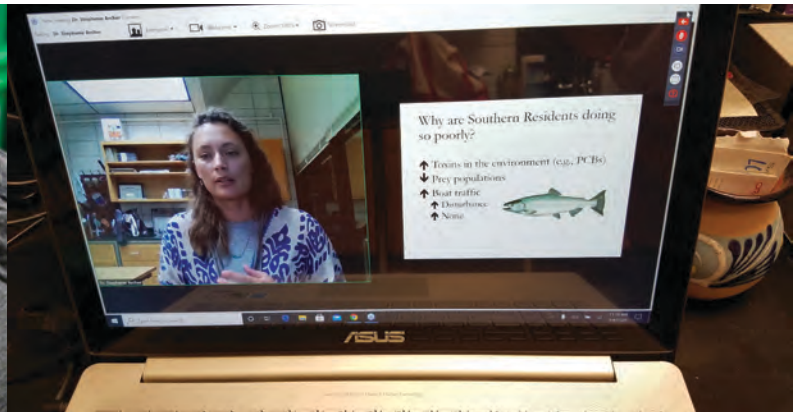
DR. MARSHALL BOWLES had a very productive 2020 in terms of conducting cutting edge research, numerous proposal submissions, obtaining a prestigious fellowship, aiding in a teacher workshop, and mentoring. Within the framework of the Gulf Research Fellowship at the National Academies of Sciences, Engineering, and Medicine, Dr. Bowles secured funding to expand his research at cold seep sites and the Louisiana coast. Along these lines Dr. Bowles procured a state-of-the-art quantitative PCR (polymerase chain reaction) instrument, enhancing LUMCON's (and Louisiana's) ability to quantify microorganisms from the environment. Additionally, he was a co-author on two publications in 2020, one in press at Limnology and Oceanography and a book chapter currently in revision. Dr. Bowles submitted an American Chemical Society (ACS) proposal, and letters of intent (LOIs) for the Simons Research Foundation, NASA Research Opportunities in Space and Earth Science (ROSES), and the Department of Energy (DOE). Dr. Bowles served as the Honor's thesis supervisor for Moshe Steyn at Brown University and serves as a committee member for Kaliope Bousses (University of Pennsylvania). Dr. Bowles strengthened his collaborations within the state by working extensively with Drs. Kanchan Maiti (LSU) and Becky Giorno (LaTech) on multiple projects. He also focused on connections along the Gulf of Mexico with collaborative projects and proposals being developed with Drs. Brandi Kiel-Reese, Dauphin Island Sea Lab (DISL), and Jessica Labonte, Texas A&M University at Galveston (TAMUG). Concerning education, Dr. Bowles and Murt Conover played a major role in developing a coding course for teacher development at LUMCON. Finally, Dr. Bowles served the academic community by reviewing manuscripts for diverse journals (Science, Frontiers, and Environmental Microbiology) and grant proposals (NSF and ACS).

DR. GUILLAUME RIEUCAU is leading the Coastal Behavioral Ecology Laboratory (CBEL) at LUMCON. His research projects focus on fish and marine mammal behavioral ecology in south Louisiana, the Gulf of Mexico, Mexico, and the Caribbean Sea. Due to the pandemic, most of the field work activities in line with Dr. Rieucau's research project have been postponed. His research program is currently funded by Louisiana Sea Grant, the Bureau of Ocean Energy Management and the National Fish and Wildlife Foundation. Dr. Rieucau's laboratory is now the only Gulf of Mexico-based research laboratory equipped with an operational high-resolution imaging sonar. In 2020, he developed in-state, out-of-state, and international collaborations. Dr. Rieucau has been appointed as a member of the scientific committee of Caribaea Initiative and the Fundación Internacional para la Naturaleza y la Sustentabilidad. At LUMCON, he is the lead instructor of the new course entitled the Ocean and Society offered to graduate and undergraduate students across the Consortium. Dr. Rieucau mentored two undergraduate students under the LA Tech University/ LUMCON internship program. Dr. Rieucau is appointed as an adjunct faculty at Louisiana State University, Nicholls State University, and the University of Louisiana Lafayette. Dr. Rieucau continues to publish his research (three published articles and six currently in review) in peer-reviewed journals. He acted as an Academic Editor (PeerJ) and reviewer for several journals. Dr. Rieucau is also involved in the development of the aquaculture facilities at LUMCON.

SENIOR FACULTY

DR. ALEX KOLKER started 2020 as a Fulbright Scholar in Morocco, where he researched the climatic and meteorological drivers of sea level change in Morocco and the eastern Atlantic Ocean. The Fulbright program also sponsored a scholarly visit to the University of Jordan, Aqaba's Marine Science Center in the northern Red Sea. In this visit, Dr. Kolker studied sea level dynamics in the Red Sea and examined how other marine research facilities are responding to rising waters. Despite an early return forced by the global pandemic, Dr. Kolker continues his international work. He collaborated with Moroccan and Smithsonian researchers on a proposal to the U.S. Agency for International Development; he is also working with three Moroccan graduate students, and is collaborating with several Moroccan faculty. Since returning to Louisiana, Dr. Kolker has been productive writing grants and working with collaborators. He led a five-year, $5 million proposal to NSF's Coastlines and People (CoPe), with collaborators from Stanford, Louisiana State University, Tulane University, and the private sector. Dr. Kolker is working with the Louisiana Coastal Protection and Restoration Authority and the U.S. Geological Survey to study how climate variability impacts sea level and Mississippi River plume dynamics. He is collaborating with Tulane University researchers to study peat compaction in the Mississippi River Delta. A Tulane student that Dr. Kolker mentors will complete her Master's degree in December. This year, Dr. Kolker was a subject in the award-winning documentary, "Last Call For The Bayou."

DR. NANCY RABALAIS continued several offshore and inshore projects through 2020. The summertime area of bottom-water hypoxia determined by a research cruise on the R/V *Pelican* documented a bottom-water low oxygen area much reduced compared to prior years. Hurricane Hannah crossed the northern Gulf of Mexico and the Louisiana coastline before and during the mapping of the area. The resulting winds and waves mixed the shallower waters inshore and forced the remaining hypoxia that had built up to be pushed into deeper water offshore. The July cruise followed COVID-19 precautions with fewer scientific crew onboard. Dr. Rabalais was unable to join the research cruise, and Dr. Cassandra Glaspie of Louisiana State University, Department of Oceanography and Coastal Sciences, led the cruise. Dr. Rabalais provided the summer hypoxic size data for the use of the Mississippi River Nutrient/Hypoxia Task force as it attempted to lower nutrient loads in the Mississippi River and their effects on the offshore ecosystem. In addition to the low oxygen, the bottom waters are also subject to increased concentrations of CO2, resulting in acidification. A National Science Foundation-funded project, collaborative with the University of Delaware and focused on ocean acidification, was completed in 2020. A multi-collaborative program on the effects of the Deepwater Horizon oil spill continued in the marshes of southeastern Louisiana and with marsh mesocosms at the LUMCON Marine Center. Further marsh investigations continued with restored salt marshes in southeastern Louisiana as part of the NOAA RESTORE Food Web studies.



DR. BRIAN ROBERTS is the Associate Director of Science at LUMCON. He continued to serve on the executive committee of and lead the biogeochemistry, microbial ecology, and plant ecology components of the GoMRI-funded Coastal Waters Consortium (CWC) project through its conclusion in mid-2020 with many research activities initiated in CWC continuing through 2020, including a large-scale marsh mesocosm oiling experiment. The Roberts laboratory continued to contribute to a NOAA RESTORE project focused on the impacts of salinity alterations and marsh creation projects on food webs, a LA Sea Grant project focused on evaluating how Gulf ribbed mussels enhance living shoreline restoration projects (which also supports two LSU graduate students), and a project studying assimilation wetlands with colleagues from University of Louisiana at Lafayette (with field activities for all being impacted by COVID-19). Field work associated with new projects in 2020 included a BOEM-funded project examining the impacts of dredging on the ecology of Ship Shoal and a NASA project monitoring and forecasting coastal wetland carbon exchanges with several delays and disruptions resulting from COVID restrictions for both. Dr. Roberts is 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 is the program director for LUMCON's NSF-funded REU program which marked its 10th anniversary this year. He also co-mentored two interns in the Louisiana Tech-LUMCON Internship program this fall. Finally, Dr. Roberts serves on the Gulf Estuarine Research Society board, helping to organize a virtual meeting this fall.

LUMCON GRANTS 2020

CONTINUING

ARCHER SK, Haggarty D, Dudas S; "Development of a Passive Acoustic Approach to Monitor Abundance, Spawning, and Habitat Use of Rockfishes (Sebastes spp) and Herring (Blupea pallasii)", Fisheries and Oceans Canada: Strategic Program for Ecosystem-based Research and Advice, 2018-2021; $239,315 (LUMCON portion $0)

BOCKUS AB, Green CG, Gaylord TG; "Assessing the Physiological Effects of Feed pH on Postprandial Processing and Growth in Marine Finfish", Louisiana Board of Regents Research Competitiveness Subprogram, 2019-2022; $130,947

BOWLES MW; "A Highly Resolved Spatial Analysis of the Biogeochemistry of a Common Salt Marsh Grass Rhizosphere", Hansewissenschaftskolleg, 2019-2021; €30,000

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, 2019-2022; $1,123,976

Klevjer TA, **RIEUCAU G,** et al. (5 total PIs); "SWARM: From Swarming Behaviour to Trophic Interactions: Forecasting Krill Dynamics in Ecosystem Hotspots Using Behaviour-Based Models", Norwegian Research Council--Norwegian Antarctic Research, 2017-2020; $950,000

Kolker AS; "Understanding Carbon Sequestration, Suberin Production and Climate Change in Coasts and Wetlands"; Brown Foundation, 2018 – no end date; $40,000

KOLKER AS; "Understanding Sedimentation Rates in the Rookery Bay National Estuarine Research Reserve", Rookery Bay NERR, 2018-2020; $35,000

KOLKER AS; "Understanding How Sea-Level Dynamics Influence Coastal Processes and Resiliency Along the Moroccan Coast", US Department of State/Institute for International Education, Fulbright Scholar, Morocco, 2019-2020; $50,000

MCCLAIN C, et al.; "The Energetic Assembly of Invertebrate Communities: A Test with Experimental Wood Fall", NSF Biological Oceanography, 2017-2020; $833,270

MCCLAIN CM, 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

Nelson J, **ROBERTS BJ, RIEUCAU G,** Xu K, Johnson D; "Ecological Function and Recovery of Biological Communities Within Sand Shoal Habitats within the Gulf of Mexico", Bureau of Ocean Energy Management, 2019-2022; $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, 2017-2021; $2,040,845

RABALAIS NN, ROBERTS BJ, et al. (24 total PIs); "Coastal Waters Consortium III: Oil Spills as Stressors in Coastal Marshes: The Legacy and the Future", Gulf of Mexico Research Initiative, 2018-2020; $4,800,000

RIEUCAU G; "Implementing Video Analysis and Automated Tracking to Unmanned Aerial Vehicle (UAV) Surveys for the Study of Distribution, Movement, and Behavior of Gulf Menhaden (Brevoortia patronus) in Louisiana's Coastal Zone", LA Sea Grant - Project Development Seed program, 2018-2020; $9,896

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

ROBERTS BJ, MCCLAIN CM; "REU Site: Interdisciplinary Research Experiences in Changing Coastal Environments", NSF OCE, 2018-2021; $238,102

ROBERTS BJ; "Core: Incorporating Life into Living Shorelines: Can Gulf Ribbed Mussels Reduce Shoreline Erosion and Enhance Restoration Practices?", Louisiana Sea Grant, 2018- 2021; $144,000

Rosario-Ortiz F, **D'ANDRILLI J;** "Application of Fluorescence Spectroscopy for the Characterization of Dissolved Organic Matter: Disentangling Common Misconceptions and Underlying Chemistry", NSF, 2019-2021; $329,873 (LUMCON portion $48,658)

ROSSI R, ROBERTS BJ; "Exploring the Role of Biological Factors in Widespread Mangrove Die-Off: A Citizen Science Based Approach", National Geographic, 2019-2021; $28,900

Satterlee K, **BOCKUS AB,** Snyder B, Riley K, Sclodnick T; "MMEERSET Phase One: Developing Platform-Based Offshore Aquaculture Using a Multi-Use Approach at Station Padre", NOAA Gulf States Marine Fisheries Commission, 2020-2021; $81,082

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)

NEW

ARCHER SK, BOCKUS A, 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

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)

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

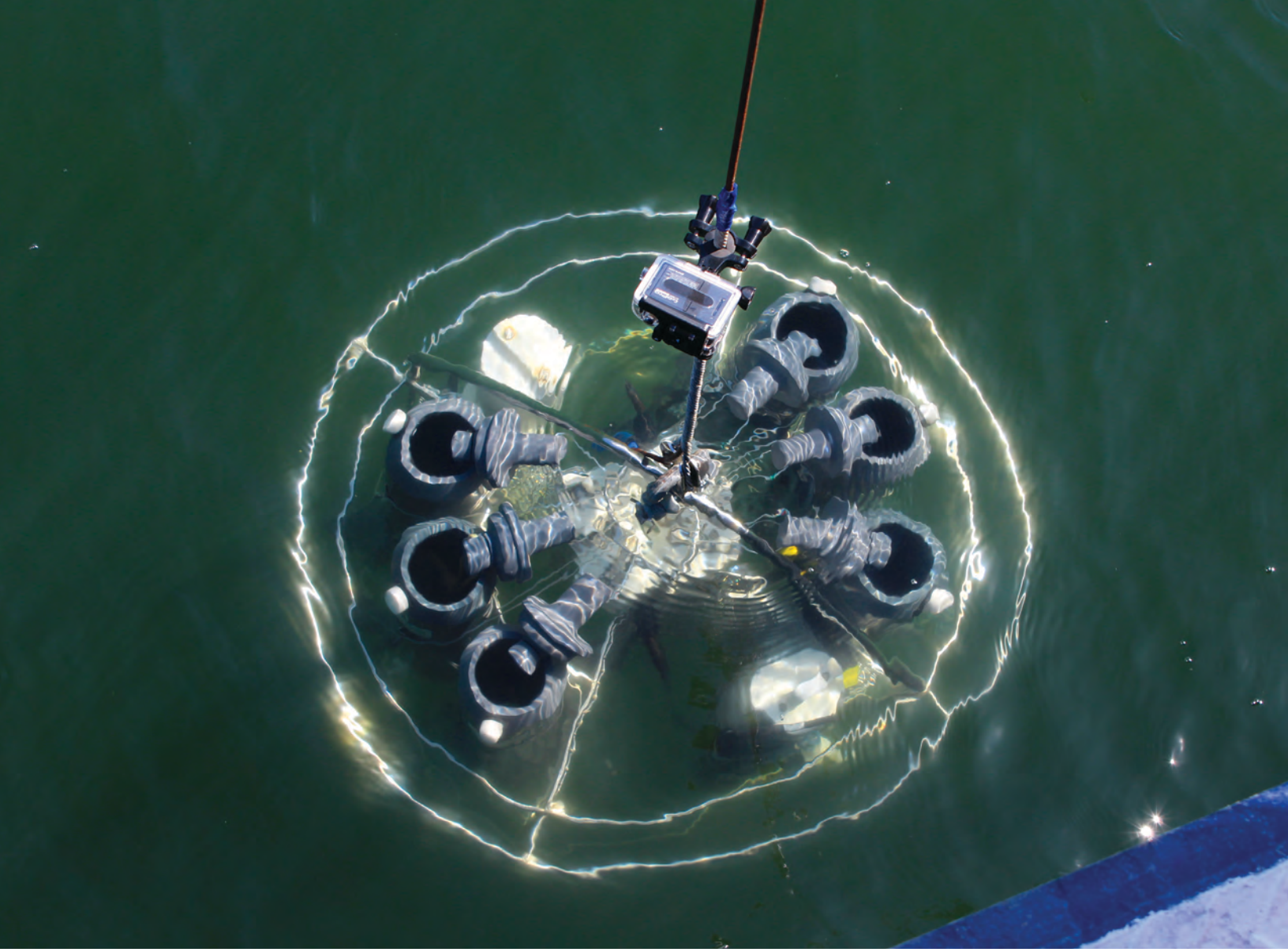
Morley JW, Ajemian MJ, **ARCHER SK,** Baskett M, Ciannelli L, Duffy E, Nelson MW; "Ecosystem Mismatch in Fisheries Vulnerability to Climate", Lenfest Ocean Foundation, 2020-2023; $299,335 (LUMCON portion $12,609)

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

RABALAIS NN; Mentorship Award for Early Career Fellowship to Cassandra Glaspie (LSU DOCS) and to Michael Polito (LSU DOCS), NAS, 2020-2021; $2,000 ($1,000 per award)

ROBERTS BJ; Mentorship Award for Early Career Fellowship to Marshall Bowles (LUMCON), NAS, 2020-2021; $1,000
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)



MENTORSHIP OF GRADUATE STUDENTS AND POSTDOCS

GRADUATE STUDENTS

PhD Students: River Dixon, University of Louisiana Lafayette Biology (McClain); Skyler Flaska, University of Louisiana Lafayette Biology (co-advised by Roberts)

MS Students: Jordan Logarbo, Louisiana State University RNR (Roberts); Sarah Catherine LeBlanc, Louisiana State University RNR (Roberts); Ronald Scheuermann, Louisiana State University DOCS (Roberts); Olivia Floyd, University of Louisiana Lafayette Biology (Roberts); Emilie Foster, University of Louisiana Lafayette Biology (co-advised by Roberts); Bikie Gerald, The African Regional Center for Space Science and Technology Education (CRASTE-LF) (Kolker)

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: Ryann Rossi (Roberts); Lauren Brown (Roberts)

SCIENTIFIC INFRASTRUCTURE

2020 saw continued advances in our 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 2020, but was largely limited to LUMCON faculty and staff as a result of pandemic related restrictions. LUMCON received a grant from the Arthur M. Blank Family Foundation in 2020 to replace/upgrade one of our upright, illuminated, temperature-controlled incubators. The room is arranged to be able 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.

Experimental Wet Laboratory Facilities: There was significant progress in the engineering, design, and expansion of our experimental wet laboratory and aquaculture facilities during the past year. 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 on 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. Additional upgrades are currently underway and will expand the number and variety of systems available, providing treatment tanks up to 3,000 gallons in size. This effort has been led by Dr. Bockus with input from Drs. Rieucau, Roberts, and McClain.

Marsh Mesocosm Facility: LUMCON's marsh mesocosm facility was completed in 2019 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 bird-proof netting. Briefly, water is pumped from the bayou adjacent to the Marine Center through two settling tanks, 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) salt marsh ecosystems. The transplanting of intact sections of marsh containing S. alterniflora and soil was completed in 2018 and 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 the publication of this report. The facility experienced significant impacts during Hurricane Barry in July 2019 and during several storms during 2020, especially during Hurricane Zeta which resulted in significant impacts on plumbing and water movement. Despite the numerous disruptions caused by the events of 2020, the facility and oiling experiment have been successfully maintained and monitored throughout the past year. The oiling experiment has thus far involved collaborators from LSU and University of New Orleans as well as out-of-state collaborators from the Marine Biological Laboratory, Connecticut College, the University of Florida, Florida State University, and USGS. 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.

INFRASTRUCTURE

FACILITIES

Facilities were especially strained by the incredibly overactive hurricane season. The 2020 storm events began in May and continued through November when we experienced Hurricane Zeta, a Category 2 hurricane that caused extensive damage to our facility. Our team prepared for, recovered from, and restored to "normal" the facility from six individual named storms and several unnamed high water events. This required an incredible number of staff hours. Besides storm preparation and recovery, the following were accomplished by the facilities team this year.

Renovations: Several renovation projects were undertaken, with some remaining in various stages of completion. The Archer laboratory renovation and refurbishment of sea water tanks below the Marine Center were completed. All of the demolition work was completed in the lower wet laboratory in anticipation of its total renovation. Demolition, design, planning, and pricing for the DLVC project has been undertaken and is near completion, with construction to continue into 2021.

Repairs: Repairs were made throughout the course of the year at the Marine Center. Electrical work was done to the mesocosm system, drainage issues in the aquarium were resolved, and plumbing issues in the wet laboratory were addressed. A radiator for an emergency generator was replaced with assistance of the vessel crew, saving LUMCON $20,000. Several other emergency generator and elevator repairs were also required through the course of 2020.

Upgrades to Facility and Grounds: The emergency generator transfer system was upgraded which allows the entire facility to run on only one generator if the other fails. An air pump was relocated from an interior passageway to the pump room below the facility to alleviate noise issues within the Marine Center. Other examples of upgrades to the facility this year included fume hood replacements and painting of interior sections of the Marine Center.

Special Projects: The project to replace the storm shutters began, with the removal of the existing shutters underway. Work on installing new shutters will begin in January 2021. Many hours were spent in planning and preparation before construction at the new Blue Works and the new Marine Operations facilities on the Houma campus. Restoration work resulting from the damage of multiple storms is ongoing.

VESSELS

An 87-day pause in vessel operations began in mid-March, forcing the cancellation and postponing of multiple vessel cruises. However, the pause allowed Vessel Operations to formulate policies and standard operating procedures in response to the pandemic. This resulted in the creation of the Vessel Operations Standard Outbreak Prevention Management and Response Plan. Due to enactment of stringent requirements in the Response Plan, in the nine months following the outbreak of COVID-19, no positive cases nor incidences of vessel quarantining were experienced. Below is a table listing the days at sea for each of our vessels during the calendar year of 2020.

VESSEL NAME	DAYS AT SEA	LOST DAYS AT SEA
R/V *Acadiana*	37	60
R/V *Pelican*	102	65
R/V *Pt. Sur*	68	51

R/V Gilbert R. Mason: Dr. McClain and Mr. Joseph Malbrough, along with the other members of the Gulf-Caribbean Oceanographic Consortium and Gulf Island Shipyard, organized the keel laying ceremony for the new R/V Gilbert R. Mason in Houma in March. Governor Edwards and Commissioner Reed were highlighted speakers at the ceremony.

R/V *Pelican*: Our flagship UNOLS vessel, the *Pelican* spent 113 days offshore in support of marine science and education, down from 185 in 2019. Of these, NSF funded 13 ship days while the U.S. Navy funded 34 days at sea. This year, the *Pelican* completed two annual inspections: her annual ABS load-line survey and a biannual NSF ship inspection. The *Pelican* received a recommendation of "Unlimited Service" as a result. It was one of the first in the American Research Fleet to begin "at sea" operations following the COVID pause. In 2020, the vessel was the most utilized research vessel in her size class. The *Pelican* supported various data collection cruises of both the physical and chemical environments in the Gulf. The *Pelican* performed over 30 days of research in international waters off the coast of Mexico conducting research surveys and science buoy maintenance funded by the Navy and the National Academy of Sciences. Other research days consisted of hypoxia and ocean acidification research along the Louisiana and Texas coasts. Multiple mooring cruises utilized the vessel and its systems, which includes 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 *Acadiana*: The *Acadiana* completed 37 sea days in support of education and research this year. She conducted 13 days of education cruises and 24 days devoted to research.

R/V *Point Sur*: The *Point Sur* conducted 67 days of support of oceanographic research in 2020. The *Point Sur*'s presence in the Gulf was critical in aiding scientific community needs.

Small Vessels: In 2020 LUMCON's small boat fleet aided researchers for a total of 124 days, down from 286 in 2019. Research-related work accounted for 96 research days. Small boats were used by Education & Outreach for a total of 25 days, prior to COVID-19.

ENVIRONMENTAL MONITORING

The Environmental Monitoring program strives to chronicle changes that are occurring along Louisiana's coast.

Quality Control of Historical Data: Environmental Monitoring (EM) staff spent the majority of 2020 curating Terrebonne Bay station's entire dataset (2000-present). During the years 2000 to 2012, the data was formatted into hourly and minute data. Monitoring was able to reformat this data into 15-minute increments to standardize past and present data. With this quality control improvement, LUMCON will have a dataset spanning 20 years with 10 different parameters.

Grants: Dr. Roberts, in conjunction with The EM team, submitted a proposal that was approved by GCOOS for funding. This proposal will fund some of EM's operations for the next five years. Dr. Beth Stauffer (the University of Louisiana Lafayette) was awarded a NOAA-funded grant to test the compatibility of an in-situ analyzer alongside active monitoring stations. LUMCON was selected as one of the five deployment sites for this nutrient sensor. EM was able to deploy the instrument near our Marine Center station, and is currently working with Dr. Stauffer to develop calibration and deployment methods for this analyzer.

DIVE OPERATIONS

The year 2020 has proven difficult for almost all scientific diving programs across the nation, requiring the cessation of nearly all dive operations and dive training. LUMCON has not been an exception to this trend as only a handful of research diving operations have been conducted, and all training scheduled from spring through fall was, of necessity, canceled. Nonetheless, the department had several notable accomplishments this year.

Dive Operations: Three dive operations were conducted during 2020. They occurred in February, June, and October. These were done to assist the Office of Naval Research with telemetry buoys, and to assist LSU with offshore equipment. During the hiatus, attention was directed in upgrading dive-related equipment at the Marine Center and installing safety equipment related to dive operations aboard all LUMCON research vessels.

Reports, Policies, and Manuals: Throughout the year the Diving Safety group dealt with a variety of issues in developing the diving program going forward. These have included review and approval of the 2019 Annual Diving Program Report which contains metrics reported to American Academy of Underwater Sciences (AAUS), approval of the recently rewritten LUMCON Diving Safety Manual, a new LUMCON Working Diver Manual for control of non-scientific dives at LUMCON, production of a COVID-19 Diving Policy containing best practices, and participation in development of a Diversity Scholarship for Scientific Diving.

Scientific Diving Network: A website devoted to networking among scientific divers was launched in May (diving.lumcon.edu). The site provides a resource for divers in Louisiana to communicate directly with each other to network, find help, and seek out collaborative projects.

Safety Diving Courses: Syllabi were developed to conduct college credit summer courses in scientific diving and recreational scuba when training and teaching statewide resumes. A framework document for conducting a Discover Diving experience for local area high school students was also developed. CPR First-aid courses were conducted and completed for crew members aboard all LUMCON vessels containing COVID-19 best practice procedures promulgated by the American Red Cross. The Moodle online teaching course for scientific diving has been revised to make it specific to LUMCON and LUMCON diving conditions.

INFORMATION TECHNOLOGY

Transition to Remote Work: When transitioning to a COVID-19 working environment, IT personnel used their skills and technical expertise to provide LUMCON staff with all the technical tools necessary to be productive in a remote work environment. By implementing AnyDesk software for remote support, IT personnel were able to assist staff with any technical issues that arose. IT also applied additional security measures to LUMCON's network, such as updating the local admin password on staff computers, and implementing a secure VPN connection to ensure staff could work from home safely.

Eduroam: After two years of troubleshooting, IT was able to resolve network and authentication issues involving Eduroam. In doing this, IT was able to implement the Eduroam SSID fully for LUMCON staff to use on site, and remotely for use at other educational institutions.

Backup Solution: LUMCON IT has succeeded in creating a remote, automatic solution for daily backups of LUMCON's entire server environment. Additionally, IT configured and scheduled backups for multiple LUMCON websites. All backups are stored in two locations and go through scheduled testing for additional security.

Websites: This year, the IT department had a bigger role in managing LUMCON's websites, such as maintenance, troubleshooting, and development of multiple LUMCON-affiliated web pages. This included multiple projects, such as launching the Scientific Diving Network web site, and deploying a forum for LUMCON divers to use. In doing so, IT personnel became more acquainted with web server and database management.

System Building: To cut costs on computer hardware purchases, IT began offering computer building services to LUMCON staff. This includes the research, purchasing, construction, and deployment of multiple high-performance desktop computers.

Improved Bandwidth: In December, LUMCON upgraded bandwidth from 100Mpbs to 1Gbps. This increase was a critical upgrade, due to needs for increased streaming of educational content, offsite security monitoring during storms, and increased needs of faculty for collaborative meetings, data sharing, and other tasks.

LIBRARY

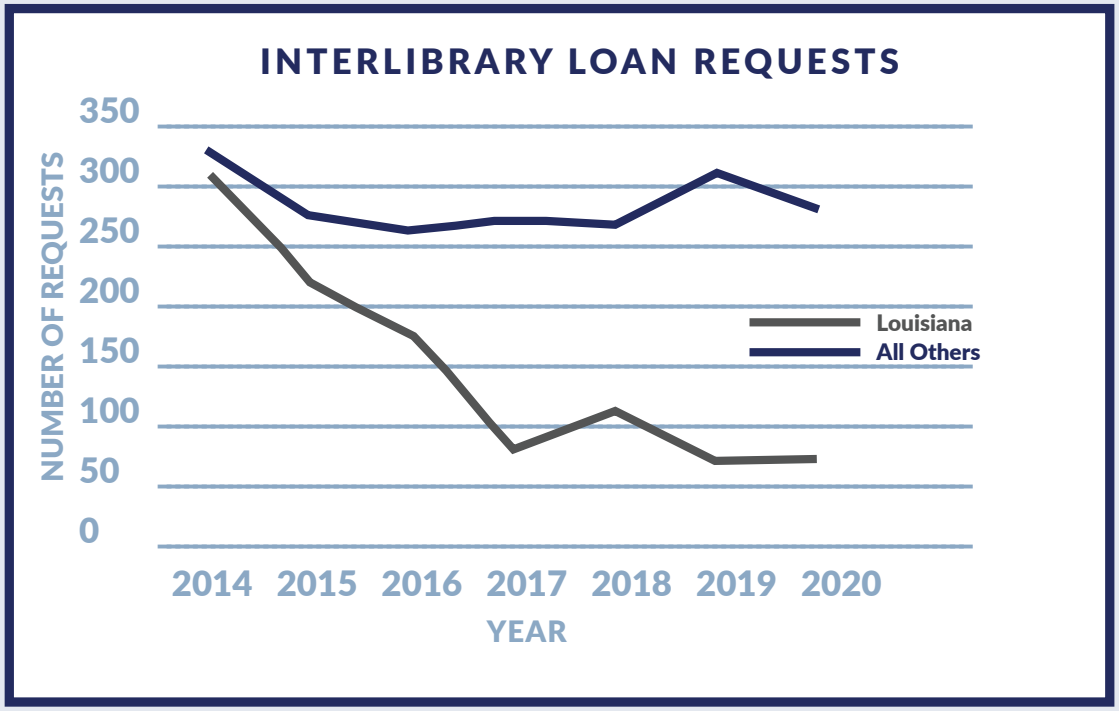
Restrictions on public access to the Marine Center allowed library staff to direct a large amount of time on the LUMCON Institutional Repository (IR) and creation of bibliographies in support of ongoing research-related activities. Remote access to digital resources by library staff enabled the department to serve as a conduit between home-bound researchers and materials when physical access to the Marine Center was severely limited.

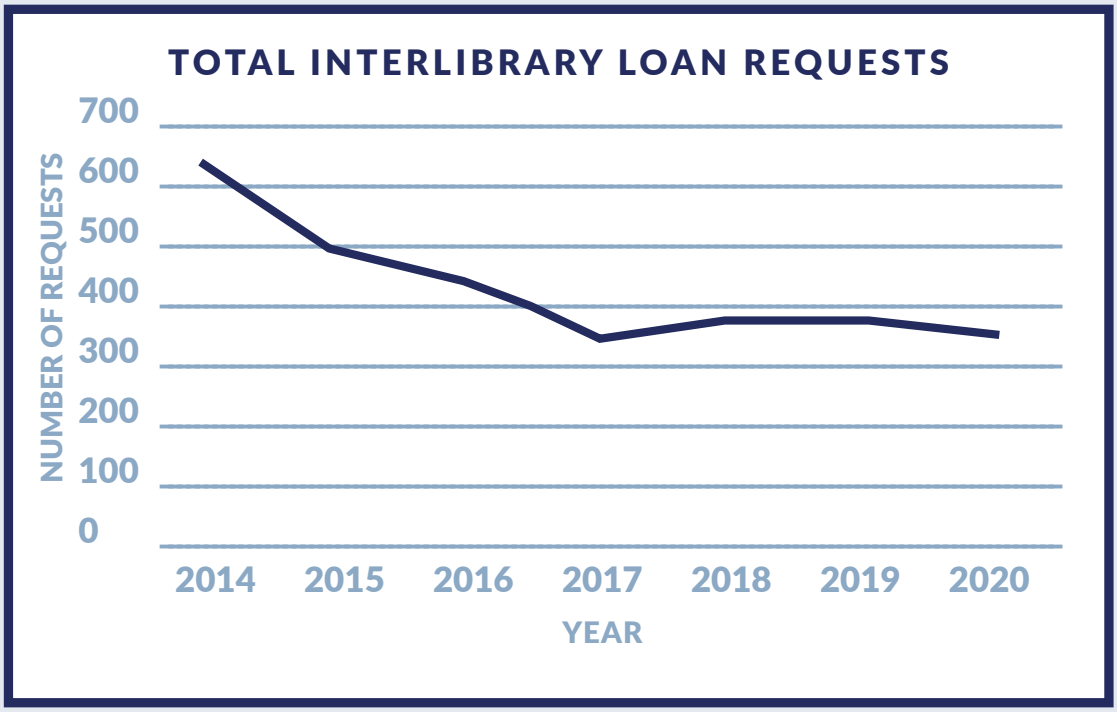
EM Bibliography: A previous bibliography of published research that relied on data from LUMCON Environmental Monitoring stations was brought up to date in the summer of 2020. This was done in support of a grant proposal that was submitted to help fund further collection and archiving of EM data through 2025.

CCO Bibliography: A bibliography was compiled which focuses on historic and current work done by LUMCON scientists investigating anthropogenic effects and influences on the coastal and ocean environments.

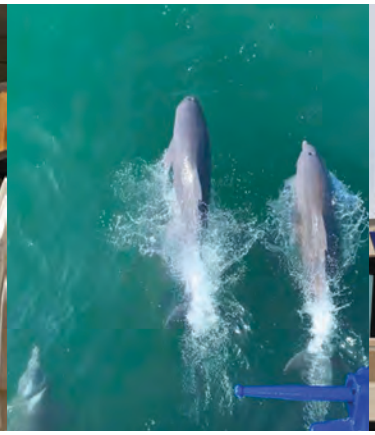
LUMCON Institutional Repository and Bibliography: Master lists of all LUMCON-published research were compiled on a yearly basis which served to identify publications to be added to the Institutional Repository (IR) in an effort to make that collection as comprehensive as possible. For this project, citations in previous LUMCON Annual Reports were collected, and amended with results from Google Scholar and Microsoft Academic web sites, CVs from former LUMCON faculty, and vertical files containing reprints and photocopies of older published research. By the end of 2020, almost all material published between 1981 and 1993 had been collected, digitized, and added to the library catalog. The LUMCON IR is currently populated with more than 675 individual papers, chapters, reports, and books. Additionally, the yearly master list files used to identify material for the IR can be compiled into a comprehensive listing of all research published by LUMCON faculty, staff, and postdocs since 1981.

Interlibrary Loan: Library staff were able to continue typical routines in support of LUMCON's mission while working remotely. For example, the library fielded about 350 interlibrary loan requests from other institutions and organizations worldwide, with 22% of those coming from in-state libraries. The library also secured approximately 200 items requested by LUMCON researchers, postdocs, and staff unable to access content while working from home. Tables below detail interlibrary loan requests from 2014 to 2020.


INTERLIBRARY LOAN REQUESTS
NUMBER OF REQUESTS
350
300
250
200
150
100
50
0
2014
2015
2016
2017
2018
2019
2020
YEAR
Louisiana
All Others


TOTAL INTERLIBRARY LOAN REQUESTS
NUMBER OF REQUESTS
700
600
500
400
300
200
100
0
2014
2015
2016
2017
2018
2019
2020
YEAR

FINANCES AND DEVELOPMENT



ADMINISTRATION, FINANCE, AND BUDGET

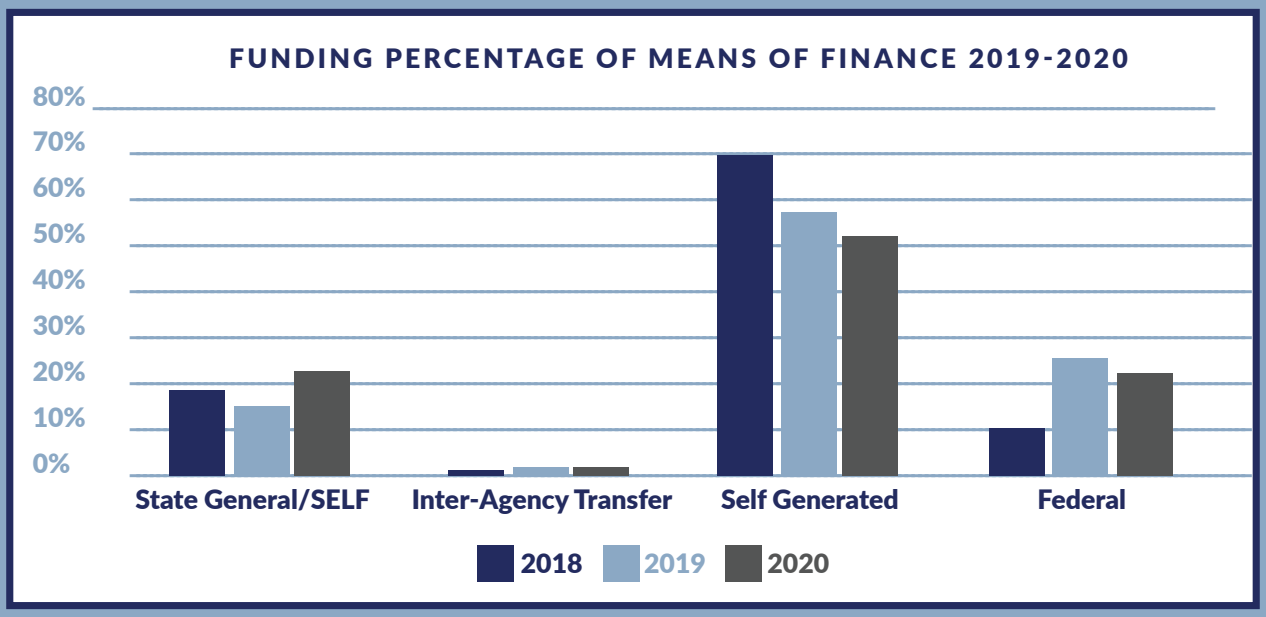
The transition from 2020 to 2021 will also be the transition of tenure from long-time Chief Financial Officer (CFO)/Associate Director of Administration Heidi Boudreaux to John A. Stassi, III.

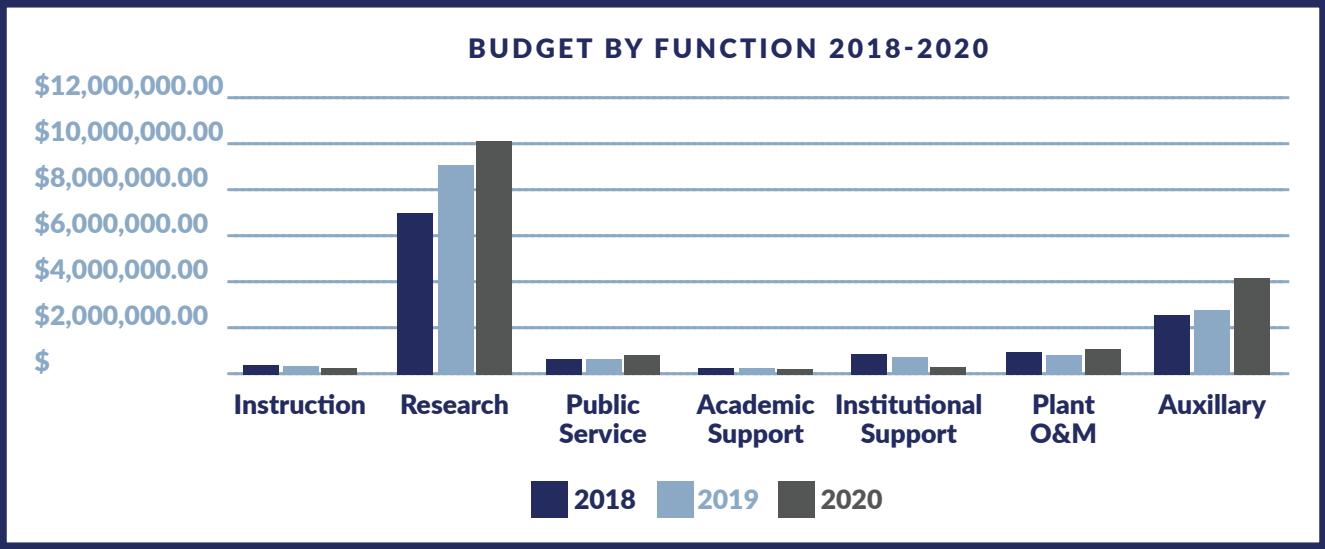
John has a wealth of experience as a CFO and executive officer in the non-profit and private sectors before joining LUMCON. He served as upper management in hospice and long-term care providers for a number of years before overseeing the finances of a fleet of car dealerships until recently. His experience is also substantial in risk and crisis management through several roles including captain of a fire department. In his early days, he also worked as a commercial diver. John clearly possesses a variety of skills that will prove beneficial to LUMCON.

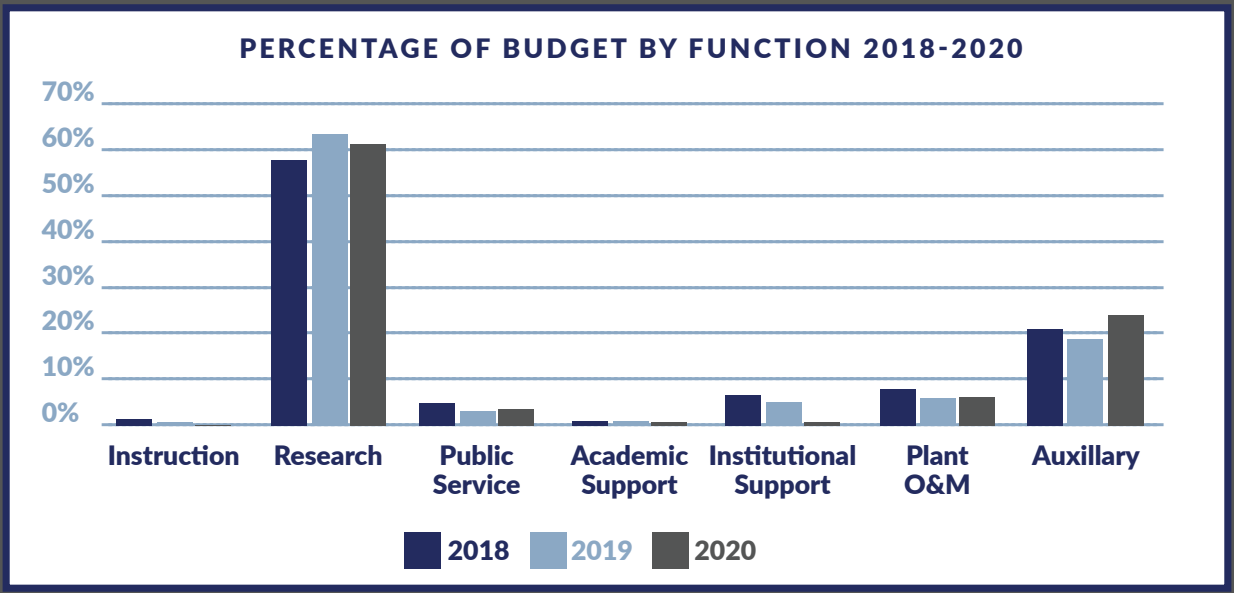
Transition: 2020 created many opportunities for the finance and administrative departments to develop processes, teamwork, and efficiencies. The team was already moving from the legacy software to the new LaGOV ERP (Enterprise Resource Planning System), and while challenging in pre-COVID times, working from remote locations, meeting in parking lots to hand off materials, and dealing with the aftermath of multiple tropical systems made this transition a monumental task.

Human Resources (HR): The HR department continued its transition under the Board of Regents. Leadership provided many years of experience which helped make successful transitions while ensuring that all existing policies were adhered to, such as when new COVID policies were implemented without interrupting LUMCON's mission. Additionally, HR is leading the charge to bring to LUMCON an electronic time reporting system that will continue the efficiencies the facility recognized in 2020.

Finances: In 2019 LUMCON realized a 29% increase in funding and in 2020 another 10% increase in funding led by an increase in our state budgeting, in the figures below. LUMCON continues to seek self-funding sources through its foundation sources as outlined in the Development section below.


FUNDING PERCENTAGE OF MEANS OF FINANCE 2019-2020
80%
70%
60%
50%
40%
30%
20%
10%
0%
State General/SELF
Inter-Agency Transfer
Self Generated
Federal
2018
2019
2020


BUDGET BY FUNCTION 2018-2020
$12,000,000.00
$10,000,000.00
$8,000,000.00
$6,000,000.00
$4,000,000.00
$2,000,000.00
$
Instruction
Research
Public Service
Academic Support
Institutional Support
Plant O&M
Auxillary
2018
2019
2020


PERCENTAGE OF BUDGET BY FUNCTION 2018-2020
70%
60%
50%
40%
30%
20%
10%
0%
Instruction
Research
Public Service
Academic Support
Institutional Support
Plant O&M
Auxillary
2018
2019
2020


ACADIANA
COCODRIE, LA

DEVELOPMENT

LUMCON mirrored the experiences of most colleges and universities during 2020 as donors gave to those organizations to whom they were committed but were reluctant to make major investments during a time of uncertainty. Success at LUMCON was mixed as the number of donations increased 29%, while the total raised from those donations decreased by 32%. Part of that decrease can be attributed to support for education programs and projects in earlier years that did not happen in 2020. Expanding our donor base laid the groundwork for growth in the years ahead.

Direct Appeals: During the course of the year, LUMCON conducted direct mail appeals in April, August, and November, with email and social media appeals in March and October. 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 Zeta. A list of donors who had made donations prior to mid-December is provided at the end of this annual report.

Grants: LUMCON experienced success in 2020 and laid the groundwork for continued success in 2021. In September, LUMCON was awarded $2 million from the U.S. Economic Development Administration for bulkheading of the Henderson Slip at the Houma Marine Campus. This award ameliorated a two-fold increase in the cost of the bulkheading project and allowed it to proceed on schedule. Recently an application was submitted to FEMA for $1.8 million to replace the roof at the DeFelice Marine Center.

Appropriations: In 2020, 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. When Governor Edwards visited Houma in March for the keel laying of the R/V Gilbert R. Mason, he announced at a meeting of the combined chambers of commerce of Houma, Thibodaux, and Morgan City that he had included $36 million for planning and construction of a replacement for the R/V *Pelican*. The appropriation was approved during the legislative session, and by the end of the year, the State Bond Commission had approved a line of credit to begin the planning process. During the legislative session, an increase in capital outlay funding was approved which will permit us to break ground for our Blue Works facility at the Houma Marine Campus and the Marine Operations Center. The total cost of these two projects is $29.8 million. The legislators also approved an increase in LUMCON's annual budget which will increase the amount we are able to match from the federal government to fully fund BTNEP. Finally, the legislators approved a $725,000 special appropriation to LUMCON which helped us to continue to operate at a time when we were facing significant losses of self-generated revenues.

Donor Communications: Although development efforts were severely curtailed after the onset of the pandemic, we were 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. In the spring, we determined that another way to maintain communication with stakeholders was to increase the frequency of our email newsletters from monthly to weekly. This continued into the late fall, when the newsletter became bi-weekly. From "open" and "click" rates, we can tell that the newsletters have been well-received, and we plan to continue at an increased frequency into 2021. Likewise, the number of people receiving the email newsletter increased 30% by year's end.

BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM

During 2020, the BTNEP staff made great progress toward implementing the updated BTNEP Comprehensive Conservation and Management Plan (CCMP).

Water Quality: With water quality as the main focus of the program, BTNEP continued work to address non-point source water pollution related to fecal coliform, dissolved oxygen, nitrate/nitrite, and total phosphorus. Malfunctioning individual sewage treatment systems present significant nutrient, solids, and pathogen loading problems for many local bayous. Because surface water is also the local drinking water source, it is especially susceptible to contamination from nonpoint sources of pollution. BTNEP and its foundation received a contract from Louisiana Department of Environmental Quality to conduct monitoring and inspections and two grants from the EPA's Gulf of Mexico Division (GMD) to provide cost-share incentives and educational programs to homeowners in the estuary. Funds from GMD are being used as a cost share incentive with homeowners ($1,000 direct reimbursement, plus 50% of remainder costs up to $4,000) to reimburse for repairing or replacing the onsite disposal systems for 400 homes with malfunctioning systems in targeted parts of the watershed.

Ridge and Marsh Restorations: Born out of the work BTNEP did nearly two decades ago in effectively establishing woody species beneficial to Neotropical migratory songbirds on a manmade ridge in Fourchon, BTNEP continues its involvement in ridge projects throughout coastal Louisiana. The State of Louisiana used trees that BTNEP grew for the Grand Liard Marsh & Ridge Restoration (BA-68) project in June. For three years, BTNEP collected the seed and grew out the 3,600 woody species at our Native Plant Production Facility located on the Nicholls State University Farm in Thibodaux, Louisiana. BTNEP also collected seeds and is growing out an additional 1,200 seedlings for use in the upcoming Bayou Decade Marsh and Ridge Restoration Project (TE-138) sponsored by National Marine Fisheries Service (NMFS), CPRA, and Terrebonne Parish. BTNEP has begun collecting seeds for the multiyear Barataria Basin Ridge & Marsh Creation Project Spanish Pass Increment, ultimately growing out 64,200 tree seedlings over the duration of the project. Trees established on these ridges will provide habitat, food, and a resting place for migrating birds, as well as other fauna. The tree-lined ridges also provide protection from storm surges during extreme weather events. Additionally, BTNEP grew out 2,500 salt matrimony vine (Lycium carolinianum) seedlings for use in the Louisiana Department of Wildlife and Fisheries Queen Bess Island planting implemented in November.

Volunteer Program: As with many BTNEP initiatives, the volunteer program efforts were severely hampered this year. Prior to the pandemic, BTNEP planted 1,000 tree seedlings beneficial to Neotropical migratory birds at Grand Isle State Park with two out-of-state groups. BTNEP also utilized volunteers to continue ongoing work to remove invasive species (Triadica sebifera and Ipomoea spp.) from Grand Isle State Park in Jefferson Parish. BTNEP hosted a number of groups at our Native Plant Production Facility who assisted in potting seed and dividing and increasing herbaceous grasses used in our restoration projects.

Threatened and Endangered Species: BTNEP continued its research focusing on the protection and restoration of threatened and endangered species. In January, a bird survey was conducted on the Chandeleur Islands to assess the wintering population of the federally threatened rufa subspecies of Red Knot (Calidris canutus rufa). A shorebird, the Red Knot is one of the longest distance migrants in the world, typically traveling over 12,000 miles in a year between its breeding grounds, stopover locations, and wintering sites. A total of 2,059 individuals were documented. This new finding highlights Louisiana as an important wintering site for Red Knot in the Gulf of Mexico and adds to information for the recovery effort for this species. Continued assessment of Red Knot use of the Louisiana coast for the census project unfortunately was cancelled this year due to COVID-19 restrictions. We hope and expect to continue this work in 2021. During October, BTNEP was awarded an additional $150,000 for "Available Prey Base on a Louisiana Migratory Stopover Site for Red Knots" by the U.S. Fish and Wildlife Service. The objectives are to gather data on Red Knot prey availability and selection in Louisiana to help guide future conservation efforts in the Gulf of Mexico.

Education and Outreach: BTNEP seeks to play an active role in environmental education. Environmental education connects people of all ages to nature and encourages long-term stewardship. BTNEP has always used its education programs to help the public understand how they, as individuals, can make informed and responsible daily decisions. During 2020, BTNEP was limited because of the COVID-19 pandemic. The Education/Outreach Coordinator did hold Zoom webinars and participated in many meetings to keep the students and public informed.

LIST OF SCIENTIFIC PUBLICATIONS IN 2020

Archer, S.K., G. Dennison, L. Tryon, S. Byers, and A. Dunham. 2020. Invertebrate settlement and diversity on a glass sponge reef. The Canadian Field-Naturalist, 134(1):1-15. doi:10.22621/cfn.v134i1.2297

Archer, S.K., A.S. Kahn, M. Thiess, L. Law, S.P. Leys, S.C. Johannessen, C.A. Layman, L. Burke, and A. Dunham. 2020. Foundation species abundance influences food web topology on glass sponge reefs. Frontiers in Marine Science, 7:549478. doi:10.3389/fmars.2020.549478

Bockus, A.B., C.J. Labreck, J.L. Camberg, J.S. Collie, and B.A. Seibel. 2020. Thermal range and physiological tolerance mechanisms in two shark species from the northwest Atlantic. Biological Bulletin, 238(2):131-144. doi:10.1086/708718

D'Andrilli, J., S.J. Fischer, and F.L. Rosario-Ortiz. 2020. Advancing critical applications of high resolution mass spectrometry for DOM assessments: Re-engaging with mass spectral principles, limitations, and data analysis. Environmental Science and Technology, 54(19):11654-11656. doi:10.1021/acs.est.0c04557

Danovaro, R., et al., including **C.R. McClain.** 2020. Ecological variables for developing a global deep-ocean monitoring and conservation strategy. Nature Ecology & Evolution, 4(2):181–192. doi:10.1038/s41559-019-1091-z

Department of Fisheries and Oceans (Contributors: Archer, E.J. et al., including S.K. **Archer**). 2020. Ground-Truthing the Final Set of Suspected Glass Sponge Reefs in Howe Sound: Reef Delineation and Status Assessment. DFO Canadian Science Advisory Secretariat Science Response 2020/026. Canadian Science Advice, Pacific Region, Fisheries and Oceans Canada, Nanaimo, B.C., 29 p.

Hawkes, J.A. et al., including **J. D'Andrilli.** 2020. An international laboratory comparison of dissolved organic matter composition by high resolution mass spectrometry: Are we getting the same answer? Limnology and Oceanography: Methods, 18(6):235-258. doi:10.1002/lom3.10364

de Jong, K., T.N. Forland, M.C.P. Amorim, **G. Rieucau,** H. Slabbekoorn, and L.D. Sivle. 2020. Predicting the effects of anthropogenic noise on fish reproduction. Reviews in Fish Biology and Fisheries, 30(2):245-268. doi:10.1007/s11160-020-09598-9

Malaska, M.J. et al., including **J. D'Andrilli.** 2020. Subsurface in situ detection of microbes and diverse organic matter hotspots in the Greenland ice sheet. Astrobiology, 20(10):1185-1211. doi:10.1089/ast.2020.2241

Martin, C.W., A.M. McDonald, **G. Rieucau,** and **B.J. Roberts.** 2020. Previous oil exposure alters Gulf Killifish Fundulus grandis oil avoidance behavior. PeerJ, 8:e10587. doi:10.7717/peerj.10587

McClain, C.R., T.J Webb, C.C. Nunnally, S.R. Dixon, S Finnegan, and J.A. Nelson. 2020. Metabolic niches and biodiversity: a test case in the deep sea benthos. Frontiers in Marine Science, 7:216. doi:10.3389/fmars.2020.00216

Nephin, J., S. Jeffery, M. Thiess, **S.K. Archer,** I. Murdock, J. Boschen-Rose, and S. Dudas. 2020. Methods and Results from Remotely Operated Vehicle (ROV) Survey PAC2017-030: Exploring High and Low Current Areas in the Salish Sea. Canadian Technical Report of Fisheries and Aquatic Sciences no. 3405. Fisheries and Oceans Canada, Sidney, B.C., 39 p.

Nunnally, C.C., M.C. Benfield, and **C.R. McClain.** 2020. Trait-based diversity of deep-sea benthic megafauna communities near the Deepwater Horizon oil spill site. Marine Ecology, 41(5):e12611. doi:10.1111/maec.12611

Rabalais N.N., and M.M. Baustian. 2020 Historical shifts in benthic infaunal diversity in the northern Gulf of Mexico since the appearance of seasonally severe hypoxia. Diversity, 12(2):49. doi:10.3390/d12020049

Ren, L., **N.N. Rabalais,** and R.E. Turner. 2020. Effects of Mississippi River water on phytoplankton growth and composition in the upper Barataria estuary, Louisiana. Hydrobiologia, 847(8):1831-1850. doi:10.1007/s10750-020-04214-0

Rodriguez-Pinto, I.I., **G. Rieucau,** N.O. Handegard, and K.M. Boswell. 2020. Environmental context elicits behavioural modification of collective state in schooling fish. Animal Behaviour, 165:107-116. doi:10.1016/j.anbehav.2020.05.002

Rossi, R.E., **S.K. Archer,** C. Giri, and C.A. Layman. 2020. The role of multiple stressors in a dwarf red mangrove (Rhizophora mangle) dieback. Estuarine, Coastal and Shelf Science, 237:106660. doi:10.1016/j.ecss.2020.106660

Sabando, M.A., **G. Rieucau,** D. Bradley, J.E. Caselle, and Y.P. Papastamatiou. 2020. Habitat-specific inter and intraspecific behavioral interactions among reef sharks. Oecologia, 193(2):371-376. doi:10.1007/s00442-020-04676-y

Saulsbury, J. et al., including **C.R. McClain.** 2020. Idiographic and nomothetic approaches to heterogeneity are complementary: Response to comments on "Evaluating the influences of temperature, primary production, and evolutionary history on bivalve growth rates". Paleobiology, 46(2):275-277. doi:10.1017/pab.2020.20

Schutte, C.A., J.M. Marton, A.E. Bernhard, A.E. Giblin, and **B.J. Roberts.** 2020. No evidence for long-term impacts of oil spill contamination on salt marsh soil nitrogen cycling processes. Estuaries and Coasts, 43(4):865-879. doi:10.1007/s12237-020-00699-z

Schutte, C.A., V.A. Samarkin, B. Peters, M.T. Madigan, **M.W. Bowles,** R. Morgan-Kiss, K. Casciotti, and S.B. Joye. 2020. Vertical stratification and stability of biogeochemical processes in the deep saline waters of Lake Vanda, Antarctica. Limnology and Oceanography, 65(3):569-581. doi:10.1002/lno.11327

Schwing, P., P.A. Montagna, S.B. Joye, C.B. Paris, E. Cordes, **C.R. McClain,** J.P. Kilborn, and S.A. Murawski. 2020. A synthesis of deep benthic faunal impacts and resilience following the Deepwater Horizon oil spill. Frontiers in Marine Science, 7:560012. doi:10.3389/fmars.2020.560012

Sert, M.F., **J. D'Andrilli,** F. Gründger, H. Niemann, M.A. Granskog, A.K. Pavlov, B. Ferré, and A. Silyakova. 2020. Compositional differences in dissolved organic matter between Arctic cold seeps versus non-seep sites at the Svalbard continental margin and the Barents Sea. Frontiers in Earth Science, 8:552731. doi: 10.3389/feart.2020.552731

Stevenson, A., **S.K. Archer,** J.A. Schultz, A. Dunham, J.B. Marliave, P. Martone, and C.D.G. Harley. 2020. Warming and acidification threaten glass sponge Aphrocallistes vastus pumping and reef formation. Scientific Reports, 10:8176. doi:10.1038/s41598-020-65220-9

Strychar, K.B, and **P.W. Sammarco.** 2020. An overview with discussions on freshwater and marine ecosystems in North America. Pages 1-24 in P.T.K. Woo, and G.K. Iwama (eds.), Climate Change and Non-infectious Fish Disorders. CAB International, Oxford, UK.

Wang, H., J. Lehrter, K. Maiti, K. Fennel, A. Laurent, **N.N. Rabalais,** N. Hussain, Q. Li, K.M. Scaboo, and W.-J.Cai. 2020. Benthic respiration in hypoxic waters enhances bottom water acidification in the northern Gulf of Mexico. Journal of Geophysical Research: Oceans, 125(10):e2020JC016152. doi:10.1029/2020JC016152

Wilson, C.A., Z.J. Hughes, D.M. FitzGerald, **A.S. Kolker,** J.C. Lynch, and P. Rosen. 2020. Saltmarsh sustainability throughout the Holocene in Boston Harbor: A new sea-level curve for the lower Gulf of Maine and implications of recent anthropogenic alteration. Quaternary Science Reviews, 240:106383. doi:10.1016/j.quascirev.2020.106383

2020 MEDIA AND PRESS

The work of LUMCON researchers and staff were featured in the following print/radio/web-based media outlets in 2020:

AGDAILY
AP News
Atlas Obscura
Baton Rouge (La.) Advocate
Broadway World
CNET
CNN
Delta Dispatches
EarthSky
France 24
Gizmodo
Global News (Canada)
Great Big Story
Hattiesburg (Ms.) American
Houma (La.) Daily Courier
Houston (Tx.) Chronicle
IFL Science
Inverse
Jambalaya Anthology
KATC Lafayette
Live Science
MarineLink
Medium
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National Post (Canada)
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Syfy Wire
Texas Fish and Game
The Scientist
Thibodaux (La.) Daily Comet
Travel Awaits
TravelPulse
Tuscaloosa (Al.) News
USA Today
Washington Post
WDSU New Orleans
WLOX Biloxi
WWL 870 AM New Orleans

VESSEL OPERATIONS SCHEDULES

R/V *Pelican* Calendar Year 2020 Ship Schedule (102 Research days)

Cruise Dates	Map Index/Area Purpose	P.I./Institution Proposal No.	Days/ Agency Ports	Status/Clearance
08 FEB 09 FEB	NA09/GOM Sediment Trap	Reynolds, C/USGS N/A	Cocodrie Cocodrie	2/USGS/T
10 FEB 14 FEB	NA09/GOM N9 Engineering Test	Clark, R/NAVO N/A	Cocodrie Cocodrie	5/NAVY/T
18 FEB 20 FEB	NA09/GOM Brydes eDNA/PAM	Soldevilla, M/NOAA N/A	Cocodrie Cocodrie	3/NOAA-NMFS/F
26 FEB 29 FEB	NO09/GOMA N9 Engineering Test	Clark, R/NAVO N/A	Cocodrie Cocodrie	4/NAVY/T
04 MAR 06 MAR	NA09/GOM Whitecaps	Potter, H 1829986	Cocodrie Cocodrie	7/NSF-OCE-PO/F
11 MAR 12 MAR	NA09/GOM Mooring Retrieval	Griffin, S/PTL N/A	Cocodrie Cocodrie	2/OTHER/F
01 JUN 03 JUN	NA09/GOM Mooring Maintenance	Aronchick, E/WHGRP N/A	Cocodrie Cocodrie	4/OTHER/F
18 JUN 21 JUN	NA09/GOM Mooring Retrieval	Griffin, S/PTL N/A	Cocodrie Cocodrie	4/OTHER/F
21 JUL 23 JUL	NA09/GOM Mooring Maintenance	Aronchick, E/WHGRP N/A	Cocodrie Cocodrie	4/OTHER/F

Cruise Dates	Map Index/Area Purpose	P.I./Institution Proposal No.	Days/ Agency Ports	Status/Clearance
24 JUL 31 JUL	NA09/GOM Hypoxia Survey	Rabalais, N/LUMCON N/A	Cocodrie Cocodrie	8/INST-LUMCON/F
11 AUG 30 AUG	NA09/GOM Environ Character	Hildebrand, J/SIO N00014-19-1-2575 TFO	Cocodrie Cocodrie	25/NAVY-ONR/F
24 SEP 06 OCT	NA09/GOM GOM_CPIES	Donohue, K/URI_GSO 2000009943	Cocodrie Cocodrie	14/OTHER/F
13 OCT 24 OCT	NA09/GOM Mooring Deployment	Ogle, M/FGEOS N/A	Cocodrie Cocodrie	12/OTHER/F
25 OCT 25 OCT	NA09/GOM Glider Retrieval	Martin, K/USM N/A	Cocodrie Cocodrie	1/OTHER/F
02 NOV 04 NOV	NA09/GOM Crew Performance	Turlington, R/LUMCON N/A	Cocodrie Cocodrie	3/NSF-OCE/F
16 NOV 20 NOV	NA09/GOM Mooring Maintenance	Aronchich/WHGRP N/A	Cocodrie Cocodrie	5/OTHER/F
05 DEC 11 DEC	NA09/GOM SEAMAP	Dean, C/LDWF N/A	Cocodrie Cocodrie	6/NOAA/F
08 DEC 10 DEC	NA09/GOM Crew Performance	Turlington, R/LUMCON N/A	Cocodrie Cocodrie	3/NSF-OCE/F

R/V *Point Sur* Calendar Year 2020 Ship Schedule (67 Research days)

Cruise Dates	Map Index/Area Purpose	P.I./Institution Proposal No.	Days/ Agency Ports	Status/Clearance
16 JAN 19 JAN	NA09/GOM Mooring Deployment	Ogle, M/FUGRO N/A	Gulfport Gulfport	4/INST/ F/No
22 JAN 24 JAN F/No	NA09/GOM DARPA Cruise	Delgado, R/USM N/A	Gulfport	3/INST/ Gulfport
07 FEB 07 FEB	NA09/GOM Mooring Deployment	Book, J/Navy N/A	Gulfport Gulfport	1/INST/ F/No
11 FEB 18 FEB	NA09/GOM Sediment Sampling	Douglas, B/CSA N/A	Gulfport Gulfport	8/INST/ F/No
02 JUN 05 JUN	NA09/GOM Survey Equip Test	Sell, A/Leidos N/A	Gulfport Gulfport	4/INST/ F/No
11 JUN 13 JUN	NA09/GOM Survey Equip Test	Sell, A/Leidos N/A	Gulfport Gulfport	4/INST/ F/No
15 JUN 15 JUN	NA09/GOM Buoy Retrieval	Book, J/Navy N/A	Gulfport Gulfport	1/INST/ F/No
01 JUL 08 JUL	NA09/GOM ROV Testing	Marcelloni, L/USM N/A	Gulfport Gulfport	8/INST/ F/No
18 AUG 21 AUG	NA09/GOM Buoy Recovery/Repair	Ogle, M/Fugro N/A	Gulfport Gulfport	4/INST/ F/No
27 AUG 31 AUG	NA09/GOM DARPA Cruise	Delgado, R/USM N/A	Gulfport Gulfport	5/INST/ F/No
02 SEP 23 SEP	NA09/GOM Naval Warfare	Manley, L/Navy N/A	Gulfport Gulfport	22/USGS/ F/No
14 NOV 16 NOV	NA09/GOM Multicore Sampling	Hamdan, L/USM N/A	Gulfport Gulfport	3/INST/ F/No

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