Southeastern Estuarine Research Society

2022 ANNUAL MEETING

March 24-26 | Jekyll Island, GA

Southeastern Estuarine Research Society

The Southeastern Estuarine Research Society (SEERS) is a 501(c)(3) non-profit educational organization dedicated to the informal exchange of interdisciplinary information related to estuaries of the southeastern United States. SEERS promotes discussion of estuarine research, science, and management; promotes discussion of current research projects and management issues; and encourages participation of student colleagues. SEERS membership is largely, but not exclusively, from the states of NC, SC, GA and FL. SEERS typically meets twice per year, including the biennial Coastal and Estuarine Research Federation Conference. SEERS is an affiliate society of the Coastal and Estuarine Research Federation (CERF).
SEERS website: www.SEERS.org

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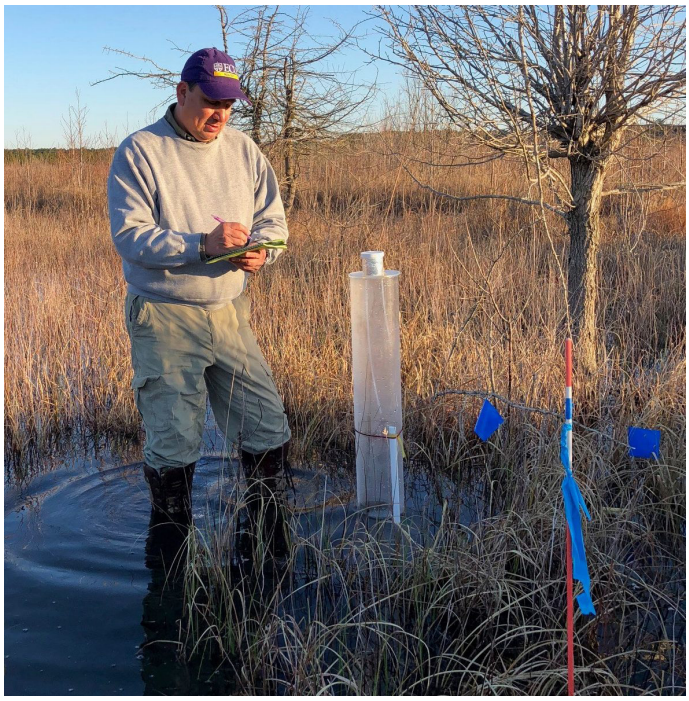
LETTER FROM THE PRESIDENT

Welcome to the Annual Meeting of the Southeastern Estuarine Research Society!



I'm delighted to extend my warmest welcome IN PERSON to the 2022 SEERS Meeting. As we approach our 50th meeting, this being number 48, we are already thinking and asking our members to provide us with ideas and themes for this important milestone. Exciting times to come.

Yes, the last two years have been challenging, but I sincerely believe that SEERS has risen to the challenge (using virtually everything virtual), and have taken the opportunity for growth and created new ways to surface stronger.

For this our first face-to-face meeting in two years, and our conference team has been working non-stop to ensure we rekindle the sense of connectedness and collaboration that SEERS is renowned for. I hope that you will agree with me in recognizing that the planning committee and Dr. Rachel Guy, our local host, have done an extraordinary job, and please don't pass up the opportunity to thank them for their hard work.

I have no doubts that you'll find the conference's program interesting and engaging. I urge you to make the most of the special session on Coastal Cultures and our Keynote Speaker Presentation. I want to thank in advance all the student presenters and student presentation judges. We are deeply grateful for your service.
As my last meeting as President, I want to thank you sincerely for joining us and hope that all y'all learn and enjoy this 2022 SEERS Meeting.

Safe environments,

Enrique Reyes

President 2020-2022
Southeastern Estuarine Research Society

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Cover Photo:
Thank you to Dr. Robin McLachlan from College of Coastal Georgia for this year's cover photo for the program.

Abstract Book Photo:
Thank you to Rebekah Kimbrell from Augusta University for this year's abstract book cover.

THANK YOU

SEERS would like to thank the following for their contributions to this meeting:

OUR LOCAL HOST

Dr. Rachel Guy

Research and Monitoring Coordinator

Sapelo Island National Estuarine Research Reserve

In 2012 Dr. Guy began her research on the Georgia coast for her dissertation for which she developed spatial models of the distribution of juvenile fishes in the estuaries and used these models to forecast changes to the habitat under different sea level rise scenarios. She also conducted research into the drivers of social vulnerability in a local Georgia fishing community and their ability to adapt to external stressors like climate change. She began her position at SINERR in 2016 and obtained her doctoral degree in 2018 from the University of Georgia. Her current research interests include spatial ecology, estuarine fish communities, the effects of climate change on ecosystem processes, and supporting sustainable and resilient coastal communities.

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Sapelo Island NATIONAL ESTUARINE RESEARCH RESERVE

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GTM Friends of GTM RESEARCH RESERVE

CONGRATULATIONS

to our Student Travel Award Winners:

Amy Grogan, University of North Carolina Wilmington
Lakshya Karnati, Augusta University
Jerome Weimers, Georgia Southern University
Haylie Wheeling, University of North Carolina Wilmington
Ashlen Ward, Jacksonville University

AND A BIG THANK YOU TO ALL OF OUR JUDGES AND STUDENT VOLUNTEERS!

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The Bachelor of Science in Sustainability Science at Georgia Southern University is the only undergraduate degree of its kind in the state of Georgia. The program of study is interdisciplinary and focuses on the interaction between people and the environment. Graduates are equipped with the writing, math, presentation, technical, and soft skills that are critical for success in today's economy, as well as prepared for jobs in industry, government, non-profit, and/or educational sectors. Students benefit from small class sizes taught by professors with advanced degrees, that are focused on incorporating modern technology and research, as well as interactive teaching techniques, in the classroom and out in the field. Access to natural laboratories, such as sandy beaches, salt marshes, rivers, and woodlands, expand the opportunities available to students.

Learn more about our new Master of Science in Environmental Science at Georgia Southern University, tentatively set to start accepting students Fall 2022.

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SCHEDULE AT-A-GLANCE

Thursday, March 24	Friday, March 25	Saturday, March 26
Please note that breakfast is <u>not</u> provided in this meeting. On-site food options are available at the Residence Inn Bistro.	**8:00 - 9:30 am** Registration Open	
	8:30 - 9:30 am Career Panel *Moderated by Amy Grogan, SEERS Student Representative*	**8:30 - 9:00 pm** Registration Open
	9:30 - 9:45 am Welcome *Dr. Susan Park, CERF Executive Director*	**9:00 - 10:15 am** Morning Session 3 *Special Session: "National Estuarine Research Reserves"*
	9:45 - 10:45 am Morning Session 1 *Special Session: "Coastal Cultures Guiding Coastal Sciences"*	**10:15 - 10:30 am** Morning Break
	10:45 - 11:00 am Morning Break	**10:30 am - 12:00 pm** Morning Session 4
	11:00 am - 12:00 pm Morning Session 2 *Special Session: "Coastal Cultures Guiding Coastal Sciences"*	
12:00 - 1:30 pm **SEERS Board Meeting** *Board Members Only*	**12:00 - 1:00 pm** Lunch Break, Lunch Provided *Residence Inn Breakfast Area*	**12:00 - 12:45 pm** **SEERS Business Meeting** *All Members Invited*
	1:00 - 2:15 pm Afternoon Session 1	**12:45 - 1:00 pm** **Closing Address** *Dr. Jessica Reichmuth*
	2:15 - 2:30 pm Afternoon Break	
3:00 - 4:15 pm Registration Open	**2:30 - 3:30 pm** Afternoon Session 2 *Special Session: "National Estuarine Research Reserves"*	
4:15 - 4:45 pm **President's Opening Address and Introduction of Local Host** *Dr. Enrique Reyes, SEERS President* *Dr. Rachel Guy, Sapelo Island NERR*	**3:30 - 4:00 pm** Poster Session Break	
4:45 - 5:45 pm Keynote Address *Maurice Bailey, Save Our Legacy Ourself*	**4:00 - 6:00 pm** Poster Session *See Insert for Poster Information*	
5:45 - 7:45 pm Welcome Reception *Hors d'oeuvres and Cash Bar*	**6:00 - 8:00 pm** Banquet *Tortuga Jack's Restaurant* *201 Beachview Dr N, Jekyll Island, GA 31527*	**A Shuttle will be available to bring attendees from the Courtyard Residence Inn to Tortuga Jack's Restaurant between 6-7pm and 8-9pm**

KEYNOTE SPEAKER

Maurice Bailey

President and Chief Executive Officer

Save Our Legacy Ourself

SOLO's mission is to preserve the culture, heritage, and traditions of the Saltwater Geechee people on Sapelo Island. And, to work toward achieving food sovereignty by leveraging partnerships to modernize farming practices and expand agricultural development and economic opportunities for the community of Hog Hammock.

Visit www.saveourlegacyourself.org to learn more about SOLO.

SPECIAL SESSIONS

Coastal Cultures Guiding Coastal Sciences

As the marine sciences have evolved over the years, estuarine scientists have recognized humans as a major player in our coastal environments. Ecosystem-based management decisions without the integration of humans and our impacts are insufficient. Culture, from all walks of life, should be compatible with coastal ecological goals. Thus, our coastal environments represent complex socioecological systems requiring interdisciplinary research in order to conserve them for present and future generations. Presentations in this special session address the influence of culture on governing scientific or managing principles such as community resilience, cultural interaction with the biophysical environment, and/or cultural knowledge on practice.

Sarah Ashley

National Estuarine Research Reserves

The National Estuarine Research Reserve System (NERRS) includes 30 reserves dedicated to scientific research that informs coastal management through a network of partnerships that use information generated in these reserves to address local, regional, and national conservation needs. Through this network of place-based estuarine research, including monitoring of water quality, sediment dynamics, linked to biological indicators such as submerged aquatic vegetation, emergent marsh, fishes and birds, we are able to better understand ecosystem function in a system of protected estuaries and apply those results to identify and address critical resource management questions. The NERRS is unique in its approach to scientific research and monitoring in that the information obtained through local, place-based projects are rapidly disseminated to inform stewardship of coastal habitats and resources, to develop K-12 educational opportunities, and to train local and regional community decision-makers and natural resource professionals. This session provides opportunities for researchers associated with the NERRS and anyone conducting studies in this place-based system to present their projects including the questions asked and answered, the coastal management problems addressed, and the mechanisms used to disseminate the information.

Find a NERR near you!

CAREER PANELISTS

YOUNG PROFESSIONAL

Dr. Robin McLachlan is an Assistant Professor of Geology at the College of Coastal Georgia. She earned a BS in Geology from the College of Charleston in 2014 and then a PhD in Oceanography from the University of Washington in 2020. Her research focuses on the morphodynamics of coastal environments, and she aims to produce actionable results for local communities so they can responsibly manage our dynamic coast. In her current role as an educator, she uses experiential learning activities to show students how the shapes of their coastal communities are intimately linked to human development, and vice versa.

GRADUATE STUDENT

Warner Buchman is currently working towards completing two master's degrees in public policy and marine science at Jacksonville University. She is a concurrently working at the United States Army Corp of Engineers as a Biologist in the Planning Division focused on projects within the Comprehensive Everglades Restoration Plan which is a framework for restoring, protecting, and preserving the greater Everglades system. She earned a bachelor's degree in Marine Science from Eckerd College. Her current professional motto is to "create informed reform" by bringing science to the policy making table in any way she can.

GOVERNMENT EMPLOYEE

Meghan Angelina is a Wetlands Biologist with the Georgia Coastal Management Program, housed within the Georgia Department of Natural Resources, Coastal Resources Division (GADNR, CRD). She has a BS in Marine Science-Biology from the University of Tampa, and an MS in Wildlife and Fisheries Biology from Clemson University. Before starting in her current position, Meghan was the Georgia Sea Grant State Fellow placed at GADNR, CRD where she led the Georgia Flood Literacy Project, an effort that united professionals from various sectors of the field to work toward a common flood lexicon and highlighted the importance of flood risk communication. Meghan applies a lot of this experience in her current position where she is the point of contact for living shoreline initiatives and wetlands research, as well as having project roles that center around wetlands monitoring and resilience.

NON-PROFIT EMPLOYEE

Nicole Llinas is the Executive Director of Current Problems, a river and waterway restoration nonprofit established in 1993 to protect the water resources of North Central Florida through action, awareness, and education. Nicole studied Coastal Biology and Philosophy at the University of North Florida, specializing in watershed ecosystem management. Her undergraduate thesis project measured the health of *Spartina* marsh grass used in shoreline restoration and was an award recipient at the Florida Lake Management Society symposium. Throughout the course of her career, Nicole has focused on research and education initiatives at the intersection of restoration, ecology, and human interaction with the environment. In the nonprofit sector, she has worked previously for Alachua Conservation Trust, Grades of Green, and has served on the Board of Directors of the League of Environmental Educators in Florida, the Communications Task Force for the Coastal and Estuarine Research Federation and has led Marine Science Education at the Smithsonian.

GRADUATE PROGRAM COORDINATOR

Dr. A. Quinton White, Jr., is Executive Director if the Marine Science Research Institute (MSRI), Professor of Biology and Marine Science, and the Director of the Marine Science Graduate Program at Jacksonville University. He joined the faculty at Jacksonville University in 1976, having completed his Ph.D. at the University of South Carolina at the Baruch Institute for Marine Biology and Coastal Research. Dr. White has written numerous research and technical papers or reports and received grants and contracts to support marine research at JU. Currently he is conducting research on the history of human impact on the Florida environment, focusing on manatees and water quality issues in the St. Johns River. He was a founding member of the St. Johns Riverkeeper and has studied the St. Johns River for over forty years. Dr. White has been active in the Jacksonville community. He writes a monthly column in the Florida Times-Union called "River Life" focusing on river related issues. He serves as a consultant to the City of Jacksonville's Waterways Commission. He was active in establishing the JU partnership with shark tracking organization OCEARCH as an exciting new program now affiliated with the MSRI.

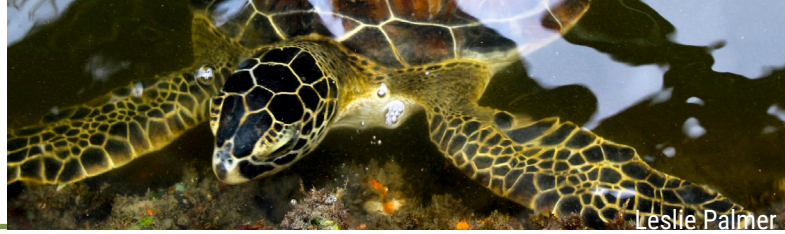
FRIDAY, MARCH 25


Yank Moore

Time	Presentation	Presenter(s)
9:30-9:45 am	Welcome by Coastal and Estuarine Research Federation Executive Director	Dr. Susan Park
9:45-10:00 am	Differential equity in access to public and private coastal infrastructure in South Carolina	Jeffrey Beauvais*
10:00-10:15 am	Transforming Coastal Academic Science	Mariko Polk*
10:15-10:45 am	Restoring the Satilla River Estuary: A Lesson in Grassroots Success	Dr. A. Loren Mathews and Dr. Jessica M. Reichmuth
10:45-11:00 am	Morning Break	
11:00-11:15 am	Quantifying Erosion, Road Flooding, and Vegetation Decline on Little Cumberland Island to Support Community Resilience	Dr. Robin Mclachlan
11:15-11:30 am	W.H.O. FISHES? Wound Infections in Humans Who Occupationally Handle FISHES	Ruth Akintoye*
11:30-11:45 am	Jekyll Island's Fortson Pond Restoration – Acting to improve water quality and habitat for fish, wildlife, and plants	Yank Moore
11:45 am-12:00 pm	The Biodiversity of the Benthic Communities in an Intertidal Pond on Jekyll Island, Georgia	Dr. David J. Stasek
12:00-1:00 pm	Lunch Break	
1:00-1:15 pm	Analysis of heavy metal concentrations in tissues of stranded bottlenose dolphins (*Tursiops truncatus*) in Northeast Florida, present-day compared to the 2013-2015 Unusual Mortality Event	Ashlen Ward*
1:15-1:30 pm	Nekton utilization of mesohaline marsh-edge habitat among riverine and adjoining creek systems	Jocelyn Fifer*
1:30-1:45 pm	No Place Like Home; An Investigation of Homing in Mummichogs (*Fundulus heteroclitus*) in a created marsh, Poplar Island, MD	Jack Brittain*
1:45-2:00 pm	Assessment of large-scale migratory movements of the white shark in the Northwest Atlantic using passive acoustic telemetry	Jackson Hooten*
2:00-2:15 pm	Assessment of the Current Lionfish Management Efforts of the Northwest Atlantic	Warner Buchman*
2:15-2:30 pm	Afternoon Break	
2:30-2:45 pm	Water Quality Monitoring in the Guana Estuary to Assess Ecosystem Health	Olivia Roorbach
2:45-3:00 pm	Refining techniques for high-frequency monitoring of chlorophyll *a* in the National Estuarine Research Reserve System	Dr. Nikki Dix
3:00-3:15 pm	Long-term changes in zooplankton populations of North Inlet Estuary, SC	Joshua Stone
3:15-3:30 pm	Zooplankton trait response to climate change: the case of North Inlet, SC	Nayan Mallick*

Asterisks(*) indicate a graduate student presenter

SATURDAY, MARCH 26


Leslie Palmer

Time	Presentation	Presenter(s)
9:00-9:15 am	Assessing the utility of drone-based imagery to enhance tidal wetland vegetation monitoring	Cristiana Falvo
9:15-9:30 am	Monitoring Change in Salt Marsh Vegetation Distribution and Biomass Using UAS-Derived Multispectral Imagery in North Inlet, South Carolina	Brittany Morse
9:30-9:45 am	Marsh Sparrows: Investigating their winter population biology in North Carolina	Marae L. West*
9:45-10:00 am	Identifying optimal piping plover foraging habitat characteristics to inform management	Sharleen Johnson
10:00-10:15 am	People in the Palmetto State: Current Visitor-Use Research Being Conducted at the NERR Sites of South Carolina	Tyler Cribbs*
10:15-10:30 am	Morning Break	
10:30-10:45 am	Insights into salt marsh plant community distributions through computer vision and structural equations modeling	Jacob Simon*
10:45-11:00 am	Historic Problems, Modern Solutions: Biota Assessment of Wave Attenuators	Katelyn Sullivan*
11:00-11:15 am	Multi-year assessment of HABs in coastal North Carolina	Amy Grogan*
11:15-11:30 am	Investigating the shallow subsurface of St. Catherines Island, GA using geophysical techniques: Implications for saltwater intrusion pathways	Dr. Jacque L. Kelly
11:30-11:45 am	Sea-level Rise Impacts on Coastal Protected Areas in North Carolina	Dr. Devon Eulie
11:45 am - 12:00 pm	Open Session - Q&A or Break	
12:00 - 12:45 pm	SEERS Business Meeting Announcement of Student Presentation and Travel Awards Old and New Society Business New Board Members	
12:45 - 1:00 pm	Closing Address	Dr. Jessica Reichmuth

Asterisks(*) indicate a graduate student presenter

POSTER PRESENTATIONS

Session	#	Title	Presenter
Water Quality	1	Polycyclic Aromatic Hydrocarbon Accumulation Near Public Boat Ramps and Piers, Chatham County, GA	Ryan Jinks
	2	Effects of Water Quality on Oyster Health on Georgia Coast	Percy Henderson**
	3	Variation in areas with submarine groundwater discharge in the Florida Bay	Brielle Robbins*
	4	The effects of water quality condition on eastern oyster, *Crassostrea virginica*, demographics	Wil Atencio*
	5	Current Levels of Nitrate, Ammonia, and Potassium in Comparison to Chlorophyll *a* in Jacksonville, FL Waterways	Jaclyn Beight*
Remote Sensing and GIS	6	Assessment of Atmospheric Correction Algorithms for the Remote Sensing of Water Quality in Southeastern US Estuaries	Jerome Reimers*
	7	Calculating NDVI Over Time to Track Forest Health on Little Cumberland Island, GA	Eric Herrera**
	8	A Spatial Analysis of Coastal Erosion on Little Cumberland Island, Georgia to Guide Future Island Management	Conlan Bertram**
	9	Modeling Potential Relocation Sites for Threatened Sea Turtle Nests on Bald Head Island, North Carolina Using LiDAR	Megan Lapinsky*
	10	Assessing the Effects of Hurricanes Matthew and Irma on Altamaha River, GA Tidal Freshwater Forest Using Satellite Remote Sensing	Galen Costomiris*
	11	Investigating Marsh Grass Productivity and Carbon Storage through UAS and Remote Sensing Technologies	Allison Lapinsky*
Restoration and Resilience	12	Shoreline Erosion Related to Sea-Level Rise and Channel Migration on Little Cumberland Island, Georgia	Chelsea A Brown**
	13	Seawall Remediation to Encourage Oyster Reef Expansion in Tampa Bay, FL	Dr. William Ellis
	14	Constructed oyster reefs as living shorelines in NE Florida coastal wetlands	Patricia McCaul**
	15	Shoreline Loss of Historical Importance: Using 210Pb and 137Cs to calculate sediment accumulation	Sarah Ashley*
	16	Sediment Dynamics of a Vulnerable Barrier Island and Estuary: A Case Study of Little Cumberland Island, Georgia	Skye Alta Lewis**

Asterisks(*) indicate a student presenter: (*) graduate and (***) undergraduate

POSTER PRESENTATIONS

Session	#	Title	Presenter
Special Sessions	17	Historical Ecology of Sweetgrass on the Georgia Coast	Dr. Lizzie King
	18	Recent declines in American Eel (*Anguilla rostrata*) recruitment to the Guana River system of northeast Florida	Hunter Mathews*
	19	Using Chlorophyll fluorescence sensors to investigate temporal dynamics in two contrasting ecosystems in the North Inlet-Winyah Bay National Estuarine Research Reserve	Camille Wheeler**
Education/ Outreach	20	Using Fuzzy Cognitive Mapping to Understand Human Drivers of Homeowner Fertilization Practices in South Carolina	Johanna L'Heureux*
	21	Ecological and educational benefits of a Georgia living shoreline	Dr. Tate Holbrook
	22	Open-Source technology to improve citizen science monitoring of plankton	Alex Barth*
	23	The Georgia Flood Literacy Project	Meghan Angelina
Organismal	24	Territoriality of the Atlantic Ghost Crab, Ocypode quadrata,Based on Anthropogenic Impact of Private and Public Beaches	Meredith LaLumia**
	25	Combining maternal effects and environmental factors for nest incubation and hatchling success of loggerhead sea turtles (*Caretta carretta*) on Ossabaw Island, GA, USA.	Luke Sundquist*
	26	*Crassostrea virginica* recruitment dynamics in Southeast Georgia: A habitat suitability model evaluation.	Caitlyn Napier**
	27	Habitat Partitioning of Aquatic Animal Species in Florida Marinas	Wyatt Starr**
	28	Marina Observation of Sea Turtles (MOST) Establishing a Database of North Florida Green Sea Turtles	Leslie Palmer**
	29	Creating Food Webs of the Satilla River Estuary using PCR and Gene Sequencing	Lakshya Karnati**
	30	Small but Mighty? Grass shrimp behavioral response to climate change conditions	Rebekah Kimbrell**
	31	He, She, It: Vitellogenin (VtG) Expression in Male Blue Crabs, *Callinectes sapidus*: An Indication of Intersex?	Shannon Gregory
	32	Environmental Justice in North Carolina: Impacts of Swine Concentrated Animal Feeding Operations Activity upon Cape Fear River Basin Communities	Haylie Wheeling*

Asterisks(*) indicate a student presenter: (*) graduate and (***) undergraduate

Southeastern Estuarine Research Society 2022 ABSTRACTS

ORAL PRESENTATIONS

All Abstracts are in order of presenting author's last name, which is also underlined. Asterisks indicate student authors: (*) graduate and (**) undergraduate.

W.H.O. FISHES? Wound infections in Humans who Occupationally handle FISHES

Ruth Akintoye*[1] Dr. Linda Hooper-Bui[1] Dr. Margaret Reams[1] Dr. Athanasios Gentimis[1]

[1]Louisiana State University

Vibrio is a gram-negative bacterium which causes illness (Vibriosis) in humans. According to the CDC, there are approximately 80,000 reported cases of Vibriosis in the U.S yearly, with *Vibrio cholerae*, *Vibrio parahaemolyticus*, and *Vibrio vulnificus* as the leading disease pathogens. Surveillance of *Vibrio* cases is deficient with no system in place that fully documents the scope of the issue.

There are two major pathways that lead to Vibriosis: foodborne and non-foodborne (through wounds). When the infection is non-foodborne, likely acquired from handling fish or exposed to marine water, the illness causing species are typically *V. vulnificus* and *V. parahaemolyticus*, which often lead to necrotizing fasciitis and septicemia in increased risk populations.

Through evidenced-based sampling and laboratory methods, this research study focused on surveying a fishing community in Plaquemine's Parish at increased risk of acquiring non-foodborne Vibriosis. 97 people were given the survey which focused on examining their knowledge, attitudes, and behaviors surrounding Vibriosis and perceived risk of illness. From the results of this exploratory study, it's shown that 25% of fishers know someone who has had a *Vibrio* wound infection, supporting the idea that *Vibrio* injury is vastly underreported. 90% of survey respondents fish during the summer months, when *Vibrio* species are expected to be at peak numbers, and the survey revealed that knowledge of prevention and protection is limited.

The full results from this study can inform needs for future education, prevention strategies, fatality reduction, while serving as a guide for stakeholders, policy, and future scientific research studies.

Differential equity in access to public and private coastal infrastructure in South Carolina

Jeffrey Beauvais*[1], Nathan P. Nibbelink[2], James E. Byers[1]

[1] Odum School of Ecology, University of Georgia
[2] Center for Integrative Conservation Research, Warnell School of Forestry and Natural Resources, University of Georgia

Despite the ubiquity of coastal infrastructure, it is unclear what factors drive its placement, particularly for water access infrastructure (WAI) that facilitates entry to coastal ecosystems such as docks, piers, and boat landings. The placement of WAI has both ecological and social dimensions, and certain segments of coastal populations may have differential access to water. In this study, we employed an environmental justice framework to assess whether public and private WAI in South Carolina is equitably distributed with respect to race and income. Using publicly available data from state agencies and the US Census Bureau, we mapped the distribution of these structures across the 301 km of the South Carolina coast. Using spatially explicit analyses with high resolution, we found that census block groups with lower income are more likely to contain a public pier or boat landing, but racial composition has no effect. On the other hand, private docks showed the opposite trends, as the abundance of docks is significantly, positively correlated with census block groups that have greater percentages of White residents, while income has no effect. Knowledge of racially uneven private water access can not only guide public policy to rectify this imbalance, but also points to the importance of considering race in ecological work. The spatial distribution of coastal infrastructure both directly affects ecosystems through the structures themselves and regulates which groups access water and what activities they can engage in at those sites.

No Place Like Home; An Investigation of Homing in Mummichogs (*Fundulus heteroclitus*) in a created marsh, Poplar Island, MD

Jack Brittain*

UNC Wilmington

The homing capability of mummichogs (*Fundulus heteroclitus*) across varying distances was examined within created marsh systems in Poplar Island, Maryland during July 2019 and 2021. 1,514 and 1,255 mummichogs respectively were tagged and released either at their capture location or a new location. Fish were marked below the dorsal with different colors based on location and treatment using Visible Implant Elastomer (Northwest Marine Technologies Inc., Shaw Island, Washington). Recapture efforts using baited minnow traps were conducted during July and October 2019, as well as July, August, and September 2021. In July 2019, 130 (25.7%) fish within 24 hours returned 353 meters back to the location they were captured, and 29 (5.7%) were recaptured 3 months later. Similar results were found in 2021. After roughly 1 week, 93 (26.3%) tagged individuals were recaptured in their original location, 522 meters from where they were released. These findings confirm previous studies showing site fidelity capabilities of mummichogs and introduces their potential ability of homing over distances of at least 500 meters.

Jack Brittain

Assessment of the Current Lionfish Management Efforts of the Northwest Atlantic

Warner Buchman*, Dr. Quinton White

Jacksonville University Marine Science Research Institute

Lionfish, *Pterois volitans* and *Pterois miles*, are originally from the Indo-pacific region and have had a rapid population expansion in a non-native habitat of the Atlantic and Caribbean Oceans where they are considered a marine invasive species. They cause environmental, ecological, and economic damages. Many policies have been put into place to expand the quantity of lionfish removed from the coastlines of affected coastal zones. The most effective current management plan is the harvesting of these fish. Lionfish culling occurs scientifically and recreationally. The USGS Lionfish Catch Database shows the location of the most effort for removal primarily recreationally via derbies. However, funding for lionfish management in marine protected zones has trailed off making the removal of the fish much more difficult in these conservation areas. Culling efforts and funding must be continuous as long as the issue persists in order to safeguard coastlines against the overwhelming infiltration of lionfish. Determining funding levels is difficult without standardized data sets. Currently, no data standard exists and there is a paucity of population information. Funding for population studies and lionfish management is required in order to move forward with any hope of successful mitigation of the expansion and occupation of this invasive species.

People in the Palmetto State: Current Visitor-Use Research Being Conducted at the NERR Sites of South Carolina

Tyler W. Cribbs*, Sophie Conerly*, Jeffrey Hallo, Matt Brownlee

Clemson University

Understanding visitor use within the NERR system has begun to become a major research focus of reserve managers and staff. Increased visitor use may lead to impacts to the visitor experience and to natural resources. Empirical information and baseline data, collected through rigorous social science procedures, is needed to deliberately plan for and manage visitor use to protect reserves' natural resources and the quality of visitors' experiences. According to the results of a 2021 survey of NERR managers and staff about characterizing visitor use, two of the most important categories of visitor information needed were "What activities the visitors engaged in while at the reserve?" and "What are the main draws of the reserve?" In the two NERR sites in South Carolina, we aim to answer these questions. Researchers are using a mixed-methods design, incorporating both qualitative semi-structured interviews and quantitative questionnaires, to understand users of both ACE Basin NERR and North Inlet-Winyah Bay NERR in South Carolina. The outcomes and benefits of these studies are to create reliable visitor-based data and results necessary to better understand and manage visitor use at each of the NEER sites in South Carolina. These data are also intended to help inform and guide visitor use management decisions at these reserves and to allow future monitoring of the area to proactively protect both the visitor experience and key resources.

Refining techniques for high-frequency monitoring of chlorophyll *a* in the National Estuarine Research Reserve System

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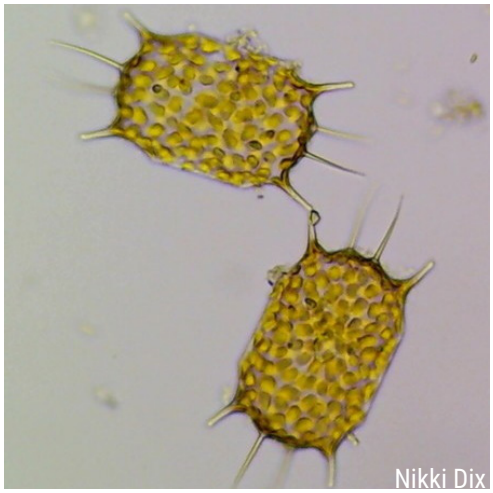
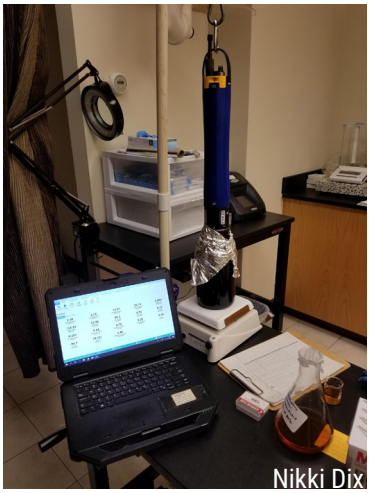
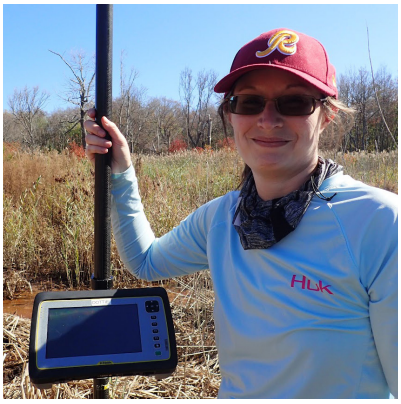
[1]Guana Tolomato Matanzas NERR
[2]North Inlet-Winyah Bay NERR
[3]Lake Superior NERR
[4]Grand Bay NERR
[5]Elkhorn Slough NERR
[6]He'eia NERR
[7]Old Woman Creek NERR
[8]Great Bay NERR
[9]Padilla Bay NERR
[10]Sapelo Island NERR
[11]Mission-Aransas NERR
[12]Wells NERR

The photosynthetic pigment chlorophyll *a* is used as a proxy for phytoplankton biomass to study eutrophication, food web dynamics, and harmful algal blooms. Traditionally, chlorophyll has been measured by filtering a water sample and extracting pigments from the filter in a laboratory, which is the current practice employed by the National Estuarine Research Reserve (NERR) System-wide Monitoring Program (SWMP) in monthly grab samples; however, monthly measurements are not sufficient for tracking plankton dynamics, which fluctuate hourly. Recent sensor technology development allows high frequency, *in situ* measurement of chlorophyll on the YSI EXO sondes used in the NERR SWMP. While *in situ* measurements are related to extracted measurements, there are variations in the natural environment that cause inconsistencies in the relationship. Currently, no tested relationships exist for the EXO sensors, and SWMP practitioners have been asking for this information so that they can respond to local and national needs for algal bloom research. The goals of this research were to compare sensor fluorescence to extracted chlorophyll concentrations, identify possible sources of error in sensor fluorescence, and develop recommendations regarding inclusion of high-frequency chlorophyll in the NERR SWMP. Research staff from 12 biogeographically diverse reserves conducted a one-year study funded by the NERRS Science Collaborative. Overall, sensor fluorescence was related to extracted chlorophyll measurements, but the strength and drivers of the relationship varied by site. Temperature, turbidity, and fluorescent dissolved organic matter influenced sensor readings independent of phytoplankton biomass. Recommendations for *in situ* sensor implementation depend on station-specific chlorophyll monitoring goals.





Sea-level Rise Impacts on Coastal Protected Areas in North Carolina



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Managing protected areas can present a significant challenge in coastal areas. These locations often must balance a unique combination of visitor use, conservation, and research. In addition, they are subject to coastal hazards such as erosion, storms, and sea-level rise. We present here the results of a modeling study undertaken to inform wetland restoration and habitat conservation planning at Carolina Beach State Park, North Carolina. This study utilized the Sea Level Affecting Marshes Model (SLAMM) to examine ecosystem state change and habitat loss under different sea-level rise scenarios. The model was run using four scenarios based on the project goals: IPCC A1B, and the three recommend scenarios from the North Carolina Coastal Resources Commission Science Panel (0.4 m, 1.0 m, and 1.4m). Preliminary results for all sea-level rise scenarios show good agreement on a tipping point in ecosystem state change by the year 2050. Another key finding was conversion of freshwater wetland habitat to transitional and tidal saltmarsh habitats. The park is home to many endemic species of carnivorous plants that require unique freshwater wetland habitat types. These results highlight the importance of incorporating sea-level rise into coastal protected area planning and will be utilized to inform the design of wetland restoration projects at the site.

Assessing the utility of drone-based imagery to enhance tidal wetland vegetation monitoring

Cristiana Falvo, Charles Deaton, Brittany Morse, Justin Ridge, Erik Smith, Brandon Puckett

Climate impacts on wetlands are continually monitored through the National Estuarine Research Reserves (NERRs) System-wide Monitoring Program (SWMP). Traditionally, wetland monitoring has been accomplished with field-based surveys at m^2 permanent plots. Uncrewed Aerial Systems (UAS) are emerging tools in marine science that have the potential to provide high quality data for traditional ground-based wetland monitoring metrics at landscape scales and user-defined times. The purpose of our study was to conduct a regionally coordinated effort in tidal wetlands in six NERRs across the Southeast and Caribbean to assess the accuracy and precision of UAS for generating critical tidal wetland monitoring metrics including: digital elevation models, vegetation canopy height, vegetation percent cover, ecotones and above-ground biomass. Accuracy was assessed relative to field-based measurements. Precision was assessed as reproducibility of results generated by different team members. UAS-based measurements produced varying levels of accuracy for different measures (e.g., digital elevation models and canopy height estimates were found to be inaccurate, while NDVI values were well correlated with above ground biomass of *Spartina alterniflora*). As part of the project we developed a UAS-based wetland monitoring protocol to guide the collection, processing and analysis of UAS imagery. The project serves as a critical first step for improving tidal wetlands monitoring using UAS.

Nekton utilization of mesohaline marsh-edge habitat among riverine and adjoining creek systems

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University of North Carolina Wilmington

Intertidal marsh-edge is an important sub-habitat for resident and transient nekton, providing refuge, food and passage to the marsh surface. A variety of factors may affect the use of marsh-edge habitat, including geomorphology, vegetation, wave exposure, tidal inundation and sediment composition. These factors may change significantly over short distances as one moves from within tributary creek areas to the exposed shores bordering the main channels of estuaries. However, few studies have compared nekton utilization of riverine and adjoining creek marsh-edge or even the broader utilization patterns of mesohaline marsh habitat characteristics of mid and upper estuarine areas. The objective of this study is to describe nekton utilization of shallow water habitats along mesohaline marsh edges and investigate how utilization may differ among river and adjacent creek marsh-edge habitats. This included monthly sampling of paired creek and river sites using active and passive sampling techniques in mesohaline areas of the Cape Fear River estuary in southeastern, NC. Preliminary results indicate differential use of paired creek edge versus riverine edge habitats located within 500m of each other. However, patterns of use varied with seasonal variations in abundance and size changes over time of juvenile nekton. The results of this study broaden our understanding of how nekton utilize mesohaline estuarine habitats and may inform conservation and management efforts for these habitats and associated fauna that are experiencing anthropogenic stressors.

Multi-year assessment of HABs in coastal North Carolina

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University of North Carolina Wilmington Center for Marine Science

Blooms of cyanobacteria are becomingly increasingly common and problematic in freshwater environments. Eutrophication and increased climate warming have been identified as two of the most influential factors driving harmful algae blooms (HAB). One of the largest sources of nutrients to freshwater bodies is stormwater runoff. As such, stormwater retention ponds in urban areas have become a hot spot for cyanobacterial HABs. Likewise, growing development, particularly in coastal areas, increases impervious surface cover escalating nutrient concentrations in stormwater runoff. The current knowledge of taxonomic diversity and the abiotic conditions associated with freshwater algal blooms in coastal North Carolina is lacking. Over the course of the last three years (2019 – present) thirty-nine blooms have been collected in the New Hanover County area and twenty different taxa of cyanobacteria have been identified. Additional data including abiotics, chlorophyll *a*, and total nitrogen/total phosphorous nutrient samples have been collected for each bloom. Several blooms were found to produce microcystin congeners (measured with Abraxis test strips) and the successfully isolated species *Cuspidothrix issatschenkoi* was found to obtain genes for saxitoxin production. As all bloom samples were collected in neighborhood ponds or recreational areas additional efforts, and surveillance of cyano-HABs is desperately needed to ensure environmental health and public safety.

Assessment of large-scale migratory movements of the white shark (*Carcharodon carcharias*) in the Northwest Atlantic using passive acoustic telemetry

Jackson Hooten*, Dr. Bryan Franks

Jacksonville University Marine Science Research Institute

The white shark (*Carcharodon carcharias*) is an apex predatory shark species with a cosmopolitan, global distribution. White sharks have extensive literature analyzing fine-scale movements, population dynamics, migratory patterns, predatory ecology, and even reproductive biology across the planet. However, the white shark population in the Northwest Atlantic (NWA) is understudied with a significant lack of data on their migration patterns, predatory ecology and reproductive habits. This study uses acoustic telemetry to address three research questions; 1) Do the NWA white sharks exhibit seasonal residency and site fidelity? 2) Do the NWA white sharks correlate migratory movements and residency times with changes in ambient sea surface temperature? 3) Do the NWA white sharks concentrate movement around structures while in the SE of the US? The non-profit group OCEARCH tagged 41 individual white sharks of varying sizes, sexes and ages with acoustic transmitters during multiple expeditions across the US Eastern Seaboard and Canadian waters. Through the use of passive acoustic telemetry and non-parametric analyses this study addresses the research questions mentioned with results indicating that the NWA white sharks exhibit strong site fidelity and seasonal residency with distinct migratory phases. These findings add to the existing literature on the species as well as assist, in some part, in the assessment of the migratory patterns of the NWA white shark population.

Identifying optimal piping plover foraging habitat characteristics to inform management

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Piping plover (*Charadrius melodus*) is a federally listed shorebird species that spends most of the year in its wintering range, which includes intertidal habitats in South Carolina. Piping plover have exhibited population declines in recent years, and this is believed to result from impacts to migratory and overwintering habitats, rather than breeding grounds. Recent research has established linkages between benthic prey abundance and foraging activity along SC beaches. However, piping plover prey preferences and the site characteristics that determine relative foraging habitat quality remain incompletely understood, presenting an obstacle to those tasked with protecting key habitat and reviewing coastal engineering permits. This talk will provide updates on two projects working to address this knowledge gap. The primary project employs a combination of newly collected and pre-existing piping plover surveys, UAV-collected imagery/elevation, point elevation, sediment composition, and benthic community data (reanalyzed based on an updated prey list), all synthesized and analyzed using GIS to quantify characteristics associated with active foraging habitats. To improve understanding of piping plover diet in its SC wintering range, fecal samples were collected and are being genetically sequenced. Meanwhile, a supporting project is underway to fill gaps in the sequence reference database by collecting and sequencing potential intertidal prey species (amphipods, polychaetes, small mollusks). Based on this rich dataset, the research team are working with end users to develop a foraging habitat assessment tool to guide management of coastal habitats in the face of sea level rise, increasing coastal development and shoreline modifications, and declining shorebird populations.

Investigating the shallow subsurface of St. Catherines Island, GA using geophysical techniques: Implications for saltwater intrusion pathways

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In-situ data from the shallow groundwater system of St. Catherines Island, GA indicates that saltwater intrusion events impact the surficial aquifer. However, the complex shallow groundwater system cannot be understood without an accurate subsurface and stratigraphic database for the island. We therefore used complimentary surveys of electrical resistivity tomography (ERT) and ground penetrating radar (GPR) to noninvasively explore the top 20 meters of the island's subsurface near locations experiencing saltwater intrusion. We present geophysical data constrained by core logs that better elucidates the occurrence and potential impacts of subsurface structures that can act as lateral and vertical saltwater intrusion pathways in the island's surficial aquifer system. We hypothesize that structural features impact saltwater intrusion pathways and that they are more common along the Georgia coast than previously recognized.

Zooplankton trait response to climate change: the case of North Inlet, SC

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Rising temperatures due to anthropogenic climate change is adversely affecting aquatic biota in multifaced ways. Change in body size, a dominant trait controlling ecosystem function, is one of the pervasive consequences of elevated temperature. We investigated change in body size of mesozooplankton groups copepoda and chaetognatha from spring to early summer (March – July) for two decades (1981-1990 and 2010-2019). Biweekly mesozooplankton samples were collected using 153 µm mesh net from North Inlet, a designated NEER site. Over the last four decades (1981-2020) temperature increased about 1.5°C in this estuary. Interannual variability in body size anomaly was evident for both the taxa examined but chaetognatha showed strong variability among years (Adj R^2: 0.51, p= 0.01) in first decade (1981-1990). Body size of both taxa was significantly larger (Mann Whitney U test, $p<0.001$) in the latest decade (2010-2019) compared to first decade. For both the taxa, body size on average decreases significantly seasonally from spring to early summer during the latest decade. Temperature is negatively correlated with body size of both groups, but more strong relationship was found for copepods (Adj R^2: 0.31, $p<0.001$). These findings have important ramifications for predator populations especially larval fish as their feeding is limited by gape size.

Restoring the Satilla River Estuary: A Lesson in Grassroots Success

A. Loren Mathews[1], Risa A. Cohen[1], John Carroll[1], Jessica M. Reichmuth[2], Amy Abdulovic-Cui[2], Chris Bates[2], Stacy Bennetts[2], Jeffrey Fischer[2], Joseph Hauger[2], Bruce Saul[2]

[1]Georgia Southern University
[2]Augusta University

Eight artificial cuts were made through the marshlands of the Satilla River Estuary, Georgia (USA) in the early 1900s to improve navigation and facilitate timber transport. Although the cuts are no longer maintained for their original purposes, their long-term impacts on the flow and quality of water and resulting habitat suitability are still in question today. For decades, local residents raised concerns about shoaling problems resulting from the shifting channel configurations. Subsequent investigations have repeatedly identified Noyes Cut as the primary cause of increased sedimentation, disturbed salinity gradients, and decreased water quality in the Dover-Umbrella-Parsons Creek system that connects to the Satilla River. These hydrological and physical-chemical changes are believed to negatively impact the abundance and distribution of commercially and recreationally valued fish, crabs, and shrimp as well as the organisms that they feed or otherwise depend on. A collaborative holistic assessment of the ecological effects of Noyes Cut was launched in 2013 by researchers at two universities, members of local interest groups, and a multitude of citizen scientists and student volunteers. Between June of 2014 and September 2019, monthly sampling events identified spatial and temporal patterns in both bottom-up parameters (e.g., water chemistry, light availability, phytoplankton abundance, salt marsh plant diversity, and sediment microbial diversity) and top-down forces (e.g., fish/mobile invertebrate diversity, crustacean population structure, and food web analysis). This research has since helped the US Army Corps of Engineers make sound decisions and move forward with a plan to close Noyes Cut and restore the Satilla River Estuary.

Quantifying Erosion, Road Flooding, and Vegetation Decline on Little Cumberland Island to Support Community Resilience

Dr. Robin McLachlan

College of Coastal Georgia

Georgia's barrier islands are increasingly threatened by coastal erosion and flooding due to climate change and diminished sediment availability. Little Cumberland Island (LCI) is experiencing rates of tidal-channel migration and shoreline erosion, especially along its southern end, that are unprecedented in remembered history. Flooding of several road stretches is also becoming more common during high tides and storms. As a result, the longevity of the roads and access to many homes, particularly those on East Ridge, are under threat. The Little Cumberland Island Homes Association, whose purpose is to preserve the land in as near its natural state as possible, requires actionable data to responsibly manage the island moving forward. Faculty and students in the Environmental Science Program at the College of Coastal Georgia have committed to working with LCI homeowners to gather and analyze data on historic and modern environmental changes on the island to provide the LCI homeowners with this information and offer possible solutions. Historic shorelines were traced from satellite imagery and future erosion rates were calculated to inform which roads and homes are most susceptible to erosion. Additionally, high-resolution elevation surveys were conducted along the flood-prone roads. When analyzed in conjunction with local meteorological and tide data, future flooding frequency and intensity can be predicted. Finally, temporal changes in forest health quantified using NDVI demonstrate a persistent decrease in vegetation since 2008. These results can inform the management decisions of may regional barrier islands which face similar threats of increased flooding and erosion.

Jekyll Island's Fortson Pond Restoration – Acting to improve water quality and habitat for fish, wildlife, and plants

Yank Moore

Jekyll Island Authority

During the development of Jekyll Island, Georgia in the first half of the 20th century, construction of hard infrastructure resulted in hydrologic alteration and fragmentation of a tidal system that was historically known as First Creek. These alterations were drastic enough that First Creek no longer appears on modern maps. After preliminary monitoring of Fortson Pond and the adjacent marsh fragments, it was determined that one fragment of the former First Creek system, known as Fortson Pond, persists in a chronically impaired state adjacent to the island entryway. After discussions in a professional and stakeholder workshop, a hydrodynamic modeling study was pursued for the former First Creek tidal system to analyze hydraulic and limited water quality response to tidal fluctuations in terms of stage, flow, velocity, and inundation duration. The results of the hydrodynamic modeling suggested alternatives and phasing of restoration options. Phase one of the restoration was recently completed with a vision in mind:

"*When restored, Fortson Pond will be a continuum of mosaic habitats, supporting a diverse community of native fish, wildlife and plants, and providing connectivity with both the headwaters and the estuary.*"

Restoration has begun including a channel dredging of anthropogenic materials, a culvert replacement, and the installation of a living shoreline. Preliminary results have already shown changes to the northern half of the former First Creek tidal system and Fortson Pond.

Monitoring Change in Salt Marsh Vegetation Distribution and Biomass Using UAS-Derived Multispectral Imagery in North Inlet, South Carolina

Brittany P. Morse, Erik M. Smith

Belle W. Baruch Institute for Marine and Coastal Sciences, University of South Carolina
North Inlet-Winyah Bay National Estuarine Research Reserve

Coastal marsh responses to increasing rates of sea level rise and episodic storm events are spatially variable, depending on a range of local factors. The National Estuarine Research Reserve System (NERRS) uses a suite of standardized ground-based measurements to track marsh response to sea level rise across the different estuaries represented by the NERRS. To increase both the temporal frequency and spatial resolution of its marsh monitoring program, The North Inlet – Winyah Bay NERR is now supplementing these ground-based efforts with data collection from Uncrewed Aerial Systems (UAS) and analysis workflows developed in a collaborative effort among the six Southeastern and Caribbean NERRs. Beginning in 2020, a UAS (DJI Matrice 200 v2) equipped with a multispectral sensor (MicaSense Altum) was flown on a bimonthly to monthly basis to collect data on vegetation community distributions and biomass across the marsh platform of the landward-most creek basin of the North Inlet estuary. This talk will highlight progress to date on the use of spectral reflectance indices to quantify spatio-temporal patterns in *Spartina alterniflora* biomass. Of all indices tested, the Normalized Difference Vegetation Index (NDVI) produced the strongest predictive relationship with live biomass, based on comparisons with clipped vegetation harvested seasonally across the elevation gradient. This relationship was then used to quantify spatially-explicit seasonal growth curves and biomass distributions as a function of marsh elevation. Integrating the use of UAS into monitoring protocols greatly expands the scale and resolution of assessment, enabling an improved understanding of salt marsh vegetation dynamics.

Transforming Coastal Academic Science

Mariko Polk*

University of North Carolina Wilmington

Historic biases and systemic factors are associated with the loss of scientists who identify as part of underrepresented groups. In fact, Department of Education statistics and the United Nations both show that within marine science specifically, women, LGBT+, and people of color (POC) are severely under represented. Diversity in coastal science matter because the scientific community and society at large, needs more scientists. Coastal science needs more perspectives that will influence the type of research questions that are posited, how that research will benefit the community, and can reduce the assumptions that personal biases may bring into research. Here, I discuss the efforts of my university department, institution, and myself in transforming academic culture to be more diverse, equitable, and inclusive (DEI). This includes the application of social justice considerations to my dissertation research. Actively considering underrepresented groups in coastal science research can influence the wellbeing of coastal communities and aid in short- and long-term decision making can reduce risks to lives, properties, and ecosystems. Developing a culture of diversity in coastal science academia is a multifaceted effort that includes disrupting norms institutional, scientific, and personal realms. Diversity in coastal science in academia is something that every scientist and coastal institution should be working on to enhance the coastal science being produced and to benefit the communities we work and reside in.

Water Quality Monitoring in the Guana Estuary to Assess Ecosystem Health

Olivia Roorbach

Guana Tolomato Matanzas National Estuarine Research Reserve

Nutrient enrichment is a well-known cause of various negative responses in marine ecosystems waters. High nutrient concentrations can amplify algal production causing hypoxic or anoxic zones, a loss of vascular plants resulting in fish/shellfish habitat loss and has the potential to cause harmful algal blooms. In the Guana Estuary, monthly grab samples are taken from ten sites and sent to the lab for nutrient analysis. Increasing trends in chlorophyll *a* concentrations have started to surface with 2021 marking the fourth consecutive year of water quality sampling in the Guana Estuary. The state of Florida has also declared the Guana Estuary to be impaired for chlorophyll a. Further investigation of nutrient metrics, concentrations and potential sources in the Guana Estuary will inform future management efforts and further our understanding of nutrient enrichment in impounded estuarine systems.

Insights into salt marsh plant community distributions through computer vision and structural equations modeling

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Community structure and dynamics are influenced by numerous abiotic and biotic factors requiring large datasets to disentangle, which are often difficult to obtain over the spatiotemporal scales necessary for meaningful analysis. Our approach illustrates one potential solution to this problem by leveraging computer vision methods to gain accurate, in-depth community data from ~10,000 photographs of salt marsh plants across an elevation gradient on Sapelo Island, GA, USA. A convolutional neural network (ResNext101) trained to detect the 6 dominant plant species achieved high accuracy for all species, allowing mapping of high-marsh plant communities over gradients in elevation and pore-water salinity. To statistically analyze the high-resolution data, we constructed a structural equations model using the generated data as informed by prevailing ecological theory for salt marshes in the Southeastern United States. Model fit to data was strong, with R^2 values for five of six plant species > 0.7. The distribution of the rare understory perennial *Limonium carolinianum*, however, was not accurately predicted by the model. Modeled effects of abiotic factors elevation and soil salinity were commensurate with the literature. Biotic interactions also largely conformed to ecological understanding of Southeastern marshes, but a potentially novel positive interaction between *Borrichia frutescens* and *Batis maritima* was observed. Overall, this approach shows promise as a method of efficiently generating and statistically analyzing community data for sessile species at scales not previously possible. This study provides a solid foundation from which further work studying salt marsh ecology using computer vision can be developed.

The Biodiversity of the Benthic Communities in an Intertidal Pond on Jekyll Island, Georgia

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There is extensive literature documenting the biodiversity of benthic communities in freshwater systems, but there is limited research on the biodiversity of the benthic communities of intertidal systems. To quantify the biodiversity of benthic intertidal communities on the Georgia coast, we sampled Rixen Pond on Jekyll Island, GA. Rixen Pond is a manmade saltwater pond that is influenced by the tide from the nearby Atlantic Ocean. We surveyed the macroinvertebrates of Rixen Pond from April 2019 to March 2020. Sampling was conducted every other week or as often as weather conditions would allow. Sampling was conducted at five sites along the eastern shore of the pond with three transects of different depths sampled at each site. Two culverts which connect the pond to the Atlantic Ocean were also sampled. Macroinvertebrates were identified to species or morphospecies if species could not be determined. The pond exhibited the greatest biodiversity during the spring months with diversity decreasing through the rest of the year. There was a high abundance of ctenophores, crustaceans, molluscs, and other taxa during the spring months with abundance decreasing through the rest of the year. The increases in the spring were due to several species breeding in the pond during the spring months as well as moderate water temperatures. Rixen Pond may serve as an important breeding and nursery location for several species though more work is needed to confirm this hypothesis.

Long-term changes in zooplankton populations of North Inlet Estuary, SC

Joshua Stone, Dennis Allen

University of South Carolina

Zooplankton are key components of estuarine food webs, and their populations show high interannual variability and are sensitive to environmental change. In order to understand the impacts of climate change on zooplankton populations, we have been sampling zooplankton populations in North Inlet estuary biweekly from 1981 to present. North Inlet is a relatively pristine, high-salinity estuary that is part of the North Inlet-Winyah Bay NERR. Due to the low impact of local anthropogenic effects, this estuary is an excellent location for studying regional and global processes. We will present long-term changes in zooplankton abundance and phenology from 1981-2017, a time period which has seen warming of the estuary by more than 1°C on average. Through that time period, many zooplankton populations had significant decreases in abundance in the early 1990s, especially copepoda and meroplanktonic taxa. Although trends in abundance of total zooplankton and many taxa stabilized after the early 1990's, some taxa continued to change. Also, shifts in seasonal phenology have been observed in several taxa, including a steady shift in copepod abundance to later in the spring. The possible environmental drivers of these changes in zooplankton populations will also be discussed.

Joshua Stone

Historic Problems, Modern Solutions: Biota Assessment of Wave Attenuators

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Anthropogenic forcing is amplifying the frequency and magnitude of stressors impacting coastal cultural and natural sites globally. This is exemplified at North Carolina State Historic Site Brunswick Town Fort Anderson (BTFA) in the Cape Fear River Estuary, North Carolina, where erosion of the site's shore zone is resulting in the loss of estuarine habitat and important cultural archaeological relics. Sections of shoreline at BTFA have eroded to the high marsh-upland transition—over 12 acres in the last 81 years—resulting in steep vegetated bluffs. Hard structures, like sea walls and bulkheads, are known to reduce biodiversity and negatively impact many ecosystem services of the intertidal zone due to their lack of adaptability. In order to allow for controlled water movement along the natural shoreline, wave attenuator structures known as Reefmakers, comprised of stacked concrete layers with granite rock, were installed in an effort to protect the riparian marsh habitat from continued degradation. As the wave attenuators represent novel hybrid structures that maintain the interface between land and water, this study seeks to understand the influences on biota abundances and habitat by monitoring invertebrate movement and survivorship as well as changes in elevation and land shape. In order to gain insight on the relationship between local biota and the habitat provided by Reefmakers population studies focused on vegetation, crabs, and oysters. Vegetation stem counts have been completed along 12 transects to examine abundance, species presence/absence, and heights of the dominant *Sporobolus alternifolius*. Additional studies include the monitoring and tracking of the sand fiddler crab *Leptuca pugilator,* terrestrial wildlife via game cameras, and bivalve recruitment and survivorship on the Reefmaker structures.

Analysis of heavy metal concentrations in tissues of stranded bottlenose dolphins (*Tursiops truncatus*) in Northeast Florida, present-day compared to the 2013-2015 Unusual Mortality Event

Ashlen Taylor Ward*[1], Dr. G.K. Bielmyer-Fraser[2], Dr. A. Johnson[2], Dr. R. Borkowski, DVM[2]

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Anthropogenic metal pollution in marine ecosystems is a growing concern. Metal contamination can cause developmental, metabolic, and reproductive problems in aquatic organisms; and potentially increase susceptibility to pathogenic infections. High metal loads could affect population levels and could have contributed to the current decline of bottlenose dolphin stocks along the Atlantic Coast and Gulf of Mexico. Bottlenose dolphins are top coastal predators, ecologically important, popular for tourism/ recreational activities, and indicators of environmental health. Baseline metal concentrations and levels at which metal toxicity occurs in this species are largely unknown. The objective of this study was to measure concentrations of cadmium, copper, nickel, zinc, silver, selenium, lead, and arsenic in blubber, muscle, liver, skin, and small intestine of stranded dolphins in Northeast Florida from 2016-2021 and temporally compare them to stranded dolphins from the 2013-2015 Unusual Mortality Event (UME). Element concentrations were compared amongst the five tissues and reported in µg/g dry weight. Metal accumulated in tissues as follows: muscle (77) > skin (64) > liver (52) > intestine (38) > blubber (28) for copper; skin (459) > liver (303) > muscle (151) > intestine (125) > blubber (69) for zinc; skin (141) > muscle (124) > liver (91) > blubber (90) > intestine (53) for nickel; liver (0.371) > blubber (0.343) > intestine (0.252) > skin (0.152) > muscle (0.142) for cadmium, and liver (0.474) > blubber (0.0409) > muscle (0.0245) > skin (0.0182) > intestine (0.0178) for silver. Additionally, for some metals, temporal differences in tissue concentrations were detected. This research provides important information about tissue metal concentrations and pathogen susceptibility and may be used during future UME.

Marsh Sparrows: Investigating their winter population biology in North Carolina

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There are large gaps in knowledge regarding the winter movements of Saltmarsh Sparrows (*Ammospiza caudacuta*, SALS), Seaside Sparrows (*Ammospiza maritima*, SESP), and Nelson's Sparrows (*Ammospiza nelson*, NESP). Marsh species are losing essential habitat due to sea level rise, development, and other anthropogenic forces. All three species are listed as Species of Greatest Conservation Need in the NC Wildlife Action Plan and the USFWS will determine if SALS should be federally listed as Threatened or Endangered in 2024. Understanding winter movements and habitat utilization of marsh sparrows throughout their winter stationary period is important to understand the impacts of sea level rise and design effective conservation solutions. During the winters of 2019–2022 we are researching marsh sparrow populations at five sites in North Carolina (Rachel Carson Reserve, Hammocks Beach State Park, Masonboro Island, Fort Fisher, and Bird Island) using a combination of mark recapture and radio telemetry. Both species use regularly flooded tidal marshes and their movements track the tidal cycle, suggesting that both supratidal roosting and intertidal foraging areas are important to conserve. The extent of their daily range differs significantly between species, leading to different patterns of habitat use, which suggests a need for different management priorities for each species. Both SALS and SESP have high site fidelity within seasons, suggesting little flexibility in habitat use. In field seasons 2019–2021 we collectively banded 546 SESP, 178 SALS, and 148 NESP while placing radio tags on a subset of individuals of each species to help answer our objectives.

POSTER PRESENTATIONS

All Abstracts are in order of assigned poster number with presenting author's last name underlined. Asterisks indicate student authors: (*) graduate and (**) undergraduate.

1. Polycyclic Aromatic Hydrocarbon Accumulation Near Public Boat Ramps and Piers, Chatham County, GA

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Savannah State University

The salt marshes of Georgia account for approximately one-third of the salt marshes on the US east coast. Although they are expansive, the estuarine salt marshes abut developed uplands and are thus at risk of contamination. Organic contaminants such as polycyclic aromatic hydrocarbons (PAHs) are toxic and have been known to bioaccumulate in coastal zones, particularly in tidal creeks and salt marshes where recreational fishing occurs. The purpose of our study was to assess PAH concentrations in both sediments and blue crab (*Callinectes sapidus*) near boat ramps and fishing piers to determine if fishers were at risk of consuming PAH contaminants in their catch. The accumulation of PAHs in both sediments and blue crab were assessed at 4 public fishing sites in Chatham County, GA and a relatively pristine site near Wassaw Sound. PAHs were detected in all sediment samples with total PAH concentrations ranging from 19 to 214 ppb. In contrast, only 2 PAHs were detected in blue crabs from two of the five sites at a maximum concentration of 13.3 ppb. Although additional analyses of crabs are recommended, results suggest PAH accumulation in salt marsh creek bank sediments at public fishing sites, with minimal accumulation in blue crab

2. Effects of Water Quality on Oyster Health on Georgia Coast

Percy Henderson**, John M. Carroll

Georgia Southern University

Oysters are an economically and ecologically important shellfish species found along most coastlines. Along the Georgia coastline, oysters form extensive reefs, and are economically important as a food source. In addition, oysters perform a vital role in maintaining water quality due to their high filtration capacity in coastal waters. Oyster reefs form solid, 3-D substrate that prevent coastline erosion and provide structure for numerous other coastal species to grow, including many commercially and recreationally important species. Water quality factors, such as temperature and salinity, can influence oyster density, condition, and growth, and ultimately affect the services the reefs provide to the estuary. In this study, we examined whether oyster density, size, and condition were different at sites that have different water quality. Oysters were collected within replicate 20x20cm quadrats from three locations along Georgia's coast: Cabretta Creek and Hunt Dock on Sapelo Island, and in front of the SKIO hatchery bulkhead. Oysters were returned to the lab where they cleaned, measured and weighed, and then dissected for condition index. Water quality data collected from the National Estuarine Research Reserve System Wide Monitoring Program stations were used for water quality. Oyster size and condition were then compared to water quality to identify which location has the "healthiest" oysters, and ascertain which water quality factors might play a role.

3. Variation in areas of submarine groundwater discharge within the Florida Bay

Brielle Robbins*, John Carroll, Jacque Kelly

Department of Biological Sciences, Georgia Southern University

Seagrass die-off events in the Florida Bay have negative effects on the ecosystem services and economic outputs that the bay can provide. These impacts fuel ongoing research investigating the complex causes of seagrass die-offs. Studies have shown that although water quality parameters can lead to die-offs, there is still much to be explored regarding the proximate causes for these quality changes. The aquifers underneath the bay may hold the missing pieces in our understanding of die-off events, as submarine groundwater discharge (SGD) can provide as much groundwater input to the bay as the Everglades. Perforating through the limestone underneath the bay, the groundwater picks up the natural gas Radon and allows us to track SGD. Our project assessing the differences in SGD between basins of high, moderate, to low seagrass die-off intensity maps the basins based on collected radon data at the surface waters. Interpolating over the area of the basins from a grid displays patterns of SGD in the bay and pinpoints areas of high SGD for future inspection. These maps will inform the future of the project by indicating parts of the basins which will be surveyed for community variation. Once these surveys occur, insights as to the community characteristics between sites of low to high die-off and radon intensity will advise management decisions and provide valuable information about the potential affects of SGD on local communities.

Brielle Robbins

4. The effects of water quality condition on eastern oyster, *Crassostrea virginica*, demographics

Wil E. Atencio*, John M. Carroll

Department of Biological Sciences Georgia Southern University

Reef building eastern oysters, *Crassostrea virginica*, are both economically and ecologically important by providing valuable commercial products, forming complex habitats, improving water quality, and protecting shorelines. Despite this, oyster populations have experienced drastic declines worldwide, driving incentives for management and restoration. For these practices to be successful, it is important to investigate factors that currently influence oyster demographics to help predict how those factors might change in the future. Water quality parameters such as temperature, salinity, dissolved oxygen, and pH are all important environmental factors that influence oysters and are likely to change with changing climate. Through a series of field surveys and experiments we will assess how water quality parameters influence the overall health of oyster populations between two sites of differing water quality at Sapelo Island, GA. Specifically, we expect that increases in salinity and temperature and decreases in pH and dissolved oxygen will negatively affect oyster condition, growth, and survival. Additionally, we predict lower growth and survival of reciprocally transplanted individuals compared to those that remain at local sites. This work will expand our knowledge for how oysters respond to short-term shifts in water quality, help predict oyster resilience to future climate change, and ensure sites designated for restoration maximize success.

5. Current Levels of Nitrate, Ammonia, and Potassium in Comparison to Chlorophyll *a* in Jacksonville, FL Waterways

Jaclyn Beight*, Katherine Klein**, Kaitlyn Stewart**, Meghan Ross**, Rebecca Lewis**

Jacksonville University

The purpose of this study is to determine the ionic concentrations of nitrate (NO_3), ammonia (NH_4), and potassium (K) in the St. Johns River and its tributaries in the Jacksonville area and compare it to chlorophyll a levels. The concentrations of the ions will, also, be used to determine pollution runoff in the local area. The chlorophyll a data was provided by Dr. Simmons, faculty of Jacksonville University. Collected data by undergraduate students will be analyzed using sample collection techniques and Vernier ion concentration measurement methods for surface and bottom water. The data will be analyzed by using interpolation tools in ArcGIS Pro. The results will demonstrate what the concentration levels are in the St Johns River and tributaries at a specific time point. Further research can be done using this data to determine areas of potential sources of runoff pollution. Once the hotspots are identified, they can be the focus for future mitigation efforts and policies related to the St. Johns River.

6. Assessment of Atmospheric Correction Algorithms for the Remote Sensing of Water Quality in Southeastern US Estuaries

Jerome Reimers*

Georgia Southern University Geology and Geography

Water quality acts as a key indicator in representing an environment's health. Through developments in satellite technology and remote sensing, we can utilize satellite imagery to monitor and determine the quantity of water parameters in each aquatic system. Within optically complex estuarine systems, contributions from inorganic and organic matter complicate resulting reflectance. Water reflectance is further influenced by inaccurately or un-atmospherically corrected data, making it challenging to separate various optically active water quality constituents. When accurate atmospheric correction has been performed, remote sensing can account for atmospheric attenuation and scattering effects to measure the reflectance and optically active constituents present in water. ACOLITE is an atmospheric correction algorithm designed specifically for robust atmospheric correction in aquatic settings, and generally performs better compared to algorithms designed more specifically for land surfaces (e.g., Sen2Cor). While ACOLITE has been tested in a variety of water bodies, an evaluation of atmospheric correction methods for coastal water quality for Georgia, USA, where contributions from pigments, inorganic matter, and organic matter are variable, has not been performed. This project will conduct an analysis of the accuracy of atmospheric correction methods for several Georgia estuaries with variable concentrations of water quality constituents using both satellite imagery, in situ close range spectral remote sensing match up data, and water samples.


Jerome Reimers

7. Calculating NDVI Over Time to Track Forest Health on Little Cumberland Island, GA

Eric Herrera**, Robin McLachlan

College of Coastal Georgia, Department of Natural Sciences, Environmental Sciences Program

The residents of Little Cumberland Island (LCI), GA have experienced a mass die off of pine trees and a general decline in forest heath over the past decade. Residents are also currently facing more frequent saltwater flooding and erosion on the southern and eastern sides of the island largely due to the northward migration of Christmas Creek. Because the decline in forest health is not the most immediate problem facing residents, it is not as regularly discussed or considered as erosion and flooding. This project was developed to raise awareness of forest decline, not for just LCI residents, but also for others along the vulnerable Georgia coast experiencing similar issues. Temporal changes in forest health were tracked using Landsat 5 and 8 imageries from 1984 to 2021, and the NDVI values of the northern and eastern parts of the island were recorded and visually represented on scatter plot graphs. NDVI values can range from 1, which is extremely healthy forests, to -1, which is open water. Every area studied showed a near-linear increase in NDVI values from 1984 to around the year 2008. The NDVI values for every area studied then declined at a near-linear rate from 2008 to 2021, the least year studied. Hypotheses that could explain forest health decline all over the island include saltwater intrusion and pine beetle infestations. Future plans for this project are to determine what is causing this decline in forest health and to study other islands along the coast to see if other coastal forests demonstrate similarly alarming trends.

8. A Spatial Analysis of Coastal Erosion on Little Cumberland Island, Georgia to Guide Future Island Management

Conlan Bertram**, Robin McLachlan

Department of Natural Sciences, College of Coastal Georgia

Barrier islands along the southeast coast of the United States face increasing rates of erosion due to sediment deprivation, sea-level rise, and storms. One such island is Little Cumberland Island (LCI), Georgia, which is separated from Cumberland Island to the south by Christmas Creek and salt marsh. LCI is owned and maintained by the homeowners, who strive to keep LCI as natural as possible with only 43 homes and having all roads made of sand. Much of the island's shoreline is eroding, including stretches to the south along Christmas Creek, to the east along the ocean, and to the north along the inlet and back barrier. To quantify erosion, Google Earth Pro was used to measure changes in coastline position. A shore-parallel transect was used to anchor eleven shore-perpendicular transects, which were positioned at homes and a lighthouse. Microsoft Excel was used to calculate and predict erosion rates and determine if any homes are at risk of falling into the water. Data was collected from 1988 to 2019. Erosional rates varied across the island. There were higher erosion rates along Christmas Creek than the more northern portion, which had minimal erosion or accretion. Rates ranged from -0.031 to 5.48 m/yr and had an average rate of 1.23 m/yr. Areas with a high concentration of homes tend to have higher rates of erosion, and homes are on the dune's edge. Results from this study will be used to guide future development on the island, such as road construction and house relocation.

9. Modeling Potential Relocation Sites for Threatened Sea Turtle Nests on Bald Head Island, North Carolina Using LiDAR

Megan Lapinsky*, Joanne Halls

University of North Carolina Wilmington

Ecosystems are home to a diverse number of flora and fauna, many of which are affected by both natural and anthropogenic factors. The conservation of species in the wild plays an important role in maintaining ecosystem health and sustainability. All seven species of sea turtles help maintain healthy ocean and coastal ecosystems, in turn influencing our terrestrial ecosystems. Sea turtle populations are being affected by many factors, including excessive coastal development and climate change. To conserve these species, accurate and successful habitat conservation practices must be a priority for coastal regions. This project developed a predictive model that ranked suitable areas for the relocation of threatened sea turtle nests on Bald Head Island, North Carolina. Using sea turtle nesting records from 2004, 2010, 2014, 2017, and 2021, hatchling emergence success were placed into four groups (poor, fair, good, and excellent) and compared with LiDAR extracted beach morphological characteristics (elevation, elevation change, slope, aspect, curvature, and rugosity). Group statistics were used to generate a map that ranks poor through excellent areas for sea turtle nest relocation. This research will assist the Bald Head Island Conservancy to better understand how past beach characteristics relate to hatchling emergence, assist with their sea turtle monitoring and nest relocation program, and further investigate spatial trends in beach morphology and sea turtle nesting patterns.

10. Assessing the Effects of Hurricanes Matthew and Irma on Altamaha River, GA Tidal Freshwater Forest Using Satellite Remote Sensing

Galen Costomiris*, Christine Hladik

Georgia Southern University

Situated in the transitional zone between non-tidal forests upstream and tidal fresh marshes downstream, tidal freshwater forests (TFF) occupy a unique and increasingly precarious habitat. TFF are valuable ecosystems, providing a number of ecosystem services, from water filtration to flood protection to buffering coastal areas against tropical storms. Prior studies have explored the physiological and ecological responses of TFF to saltwater intrusion and sea level rise, but few have taken advantage of the synoptic potential of remote sensing to map TFF extent and vegetation species distributions. In this project, we used 13 band, 10m resolution Sentinel-2 satellite imagery to map species distribution of TFF on the Altamaha River, GA and examine the long-term effects of hurricanes Matthew (10/2016) and Irma (10/2017) on vegetation by conducting a time change analysis focused on the forest-marsh transition zone. Classification of multiple image dates before and after these hurricanes will enable us to assess the nature and extent of changes in TFF health and distribution. Supervised classification of imagery was carried out with the R package randomForest, using the Sentinel-2 MSI spectral bands, vegetation indices, and a digital elevation model as inputs. Preliminary classifications results show vegetation patterns consistent with our field observations, with error across a range of image dates consistently below 6%. Elevation, coastal blue and red edge reflectance, and the MNDWI index were the most important predictor variables. These results are encouraging and demonstrate the potential of Sentinel-2 data and the power of the randomForest classifier to separate similar cover classes.

11. Investigating Marsh Grass Productivity and Carbon Storage through UAS and Remote Sensing Technologies

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Coastal marsh environments provide a wide range of ecological and economic benefits. These include but are not limited to buffering the impacts of storms, attenuating wave energy, stabilizing coastlines, providing important nursery habitats for key fisheries' species, and improving water quality. Erosion is increasing within many coastal marsh ecosystems and the impacts of climate change have resulted in stronger storm intensities and higher wave energies. As climate change impacts, such as global warming, become more frequent in the upcoming years, it is important to understand ways in which to combat and monitor these impacts. Living shorelines are an increasingly popular green management strategy that are implemented to reduce the amount of wave energy interacting with a shoreline, in turn helping to reduce rates of erosion. They often include natural structures like oyster reefs and native marsh vegetation. Technological advancements within the last decade have expanded opportunities to monitor coastal environments with unmanned ariel systems (drones) and remote sensing technologies. The goal of this study is to use drone and remote sensing technologies to investigate salt marsh vegetation health and blue carbon storage capacities along various living shorelines in coastal North Carolina. The effectiveness of using remote sensing and drones as a monitoring method will also be assessed. Preliminary analyses support the use of remote sensing and drone monitoring, suggesting that these methods are an easy and less destructive way to monitor coastal environments and living shoreline installments.

12. Shoreline Erosion Related to Sea-Level Rise and Channel Migration on Little Cumberland Island, Georgia

Chelsea A. Brown**, Robin L. McLachlan

College of Coastal Georgia, Department of Natural Sciences

Little Cumberland Island (LCI) is a barrier island on the southern Georgia coast situated at the confluence of the Satilla River and the East River with the Atlantic Ocean. The island is accessible only by boat and development has been limited to small dirt roads that lead to ~40 houses. The residents on LCI have experienced increased flooding and shoreline erosion over the past decade which has impeded their access to the roads and dock, commonly stranding them in their homes for multiple days. On LCI, erosion has been exacerbated by sea-level rise and the migration of tidal channels. Residents are concerned about their community resilience and their longevity of their time remaining on the island. To predict the longevity of modern roads and houses, historic satellite imagery in Google Earth Pro was used to survey the position of the coastline during ten dates from 1988 to 2019. Trends in historic erosion rates were then calculated and future erosion rates up to the year 2029 were predicted using linear regression. Shoreline erosion varied spatially, with the most extreme erosion rates measuring ~10 m/year over the past 31 years. The estimated projections indicate that while much of the road will not be directly impacted by marsh erosion over the next decade, the shoreline will likely erode into a small section of road cutting off access to >10 houses. Additionally, the severity and frequency of periodic tidal and storm flooding will increase along this road as the marsh buffer continues to diminish.

13. Seawall Remediation to Encourage Oyster Reef Expansion in Tampa Bay, FL.

William L. Ellis, Laela Ouellette**

Saint Leo University

Throughout the latter half of the 20th Century much of Florida's natural shoreline was modified by dredging, filling, and subsequent armament with seawalls. While there is a movement to remove seawall and replace it with natural vegetation creating Living Shoreline, wholesale reclamation is not always feasible. In these instances, modification of the existing shoreline armament to foster natural recruitment of native foundation species can be a desirable compromise. In partnership with the Students of St. Raphael Catholic School, we created inexpensive oyster restoration blocks to attach to seawalls and attract oyster pediveligers. The blocks were designed to increase the wall surface area and to provide larval oysters with structurally complex surfaces upon which to settle and grow. Four months after installation, oyster growth was present on all blocks including those at depths where oyster was mostly lacking on the adjacent seawall. Oyster density was particularly high on the protected undersurfaces of the restoration blocks. We will continue to monitor reef development, but these preliminary results suggest that the restoration blocks will greatly increase the amount of oyster relative to that on unmodified sheer sea walls.

14. Constructed oyster reefs as living shorelines in NE Florida coastal wetlands

Patricia McCaul**, SavannahLynne Bowen**, Dr. Jessica Veenstra

Department of Natural Sciences, Flagler College

Coastal wetlands are unique ecosystems that have been declining. Constructed oyster reefs, a type of living shoreline, provide protection to coastal wetlands, by serving as breakwaters to slow wave energy and reduce sediment erosion, while providing habitat and ecosystem services. Sediments found behind these constructed reefs can give insight into the breakwater's ability to prevent erosion. Twenty-eight intertidal oyster reefs were constructed on the Tolomato River in 2012, within the Guana Tolomato Matanzas Research Reserve in NE Florida. In May 2021, we measured the height of the oyster reefs and the percentage of live oyster coverage at each reef. Sediment samples were collected one meter behind each constructed reef, then wet and dry-sieved for the mass percent of coarse, medium, and fine sand, and silt and clay particles. Oyster reefs with higher live oyster cover are taller, and the taller reefs would be expected to function more effectively as breakwaters, reducing erosion behind these reefs and allowing fine sediment to accumulate. There was a correlation between percent live cover and the height of the reefs (r^2=0.63). However, the data shows only a weak correlation between reef height and silt and clay content (r^2=0.23). This may be because the tallest point of each reef only ranged between 10-18 cm. Overall, there was more silt and clay behind the oyster reefs (mean: 27%, SD:14) than in the control sites (Mean: 7%, SD:3). This indicates that the reef structures are dissipating wave energy and allowing finer sediments to accumulate.

15. Shoreline Loss of Historical Importance: Using 210Pb and 137Cs to calculate sediment accumulation

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The United States' East Coast is at increasing risk of degradation and devastation as a result of factors associated with climate change. Common among these threats are rising relative sea level, nuisance flooding, and tropical cyclone storm events, augmented both in frequency and severity. Due to their position in the landscape, salt marshes are often the first area to be impacted by storms. Many salt marshes are considered ecotones, or, boundaries between two systems. Ecotones are transitional ecosystems, and typically appear wedged between a riverine or marine environment and a terrestrial ecosystem. Areas experiencing sea level rise alongside anthropogenic effects are at a greater risk for marsh erosion. As these marshes retreat laterally in response, the dynamics of the ecosystem effectively change. The retreating marsh becomes transgressive, encroaching into adjacent terrestrial ecosystems, which can cause significant impacts to agricultural or developed land and forests. Brunswick Town Fort Anderson is a local historic site bordering the Cape Fear River. The site is experiencing high rates of shoreline loss which is threatening the very survival of many historic artifacts and fortifications.This study examines the relationship between anthropogenic effects and paleotempestology and their combined effects on the marsh's formation and the processes that drive its development. Specifically, how do the effects of paleotempestology and anthropogenic impacts affect sediment accumulation rates and the marsh's ability to keep pace against rising sea level?

16. Sediment Dynamics of a Vulnerable Barrier Island and Estuary: A Case Study of Little Cumberland Island, Georgia

Skye Alta Lewis**

College of Coastal Georgia

Barrier Islands are commonly dynamic sand deposits that form parallel to the coast. They are highly susceptible to erosion, overwash, and breaching due to their low elevation profile and readily mobile sediment. Little Cumberland Island is a barrier island off Georgia's southeastern coast that is owned and operated by a homeowner's association. The island is less urbanized than most other barrier islands along the U.S southeastern coast, and infrastructure is limited to approximately 43 houses. The roads are made of sand and are commonly not built up above the surrounding topography. As a result, many stretches of roads become flooded and impassible during spring high tides and extreme precipitation events. Residents are commonly stranded for multiple days during these events, which have historically occurred about once a year but are becoming more common. To help residents plan their next steps, seven HOBO pressure gauges were deployed in stilling wells in the intertidal marsh, and their elevations were surveyed in relation to nearby roads to record road-flood events. Additionally, historic satellite imagery was analyzed on Google Earth Pro to track shoreline erosion over the past three decades. This allows us to analyze how the sediment has moved over time and predict future erosion rates. This study sheds light on how nuisance flooding may continue to worsen with sea-level rise, storm intensification, and continued shoreline erosion and will inform the management plans for resilient coastal communities.

17. Historical Ecology of Sweetgrass on the Georgia Coast

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Historical ecology seeks to reveal how landscapes are created, shaped, and transformed through intertwining ecological and human processes. This project aims to examine these processes within a highly conservation-relevant facet of the ecological and cultural history of Georgia's barrier islands: Sweetgrass (*Muhlenbergia sericea*) and the maritime meadow landscapes in which this plant grows. For several centuries, sweetgrass has been deeply woven into the cultural history of Georgia's coast through complex networks of use and meaning, which extend far beyond the limited range of near-shore meadows where they occur. Long ago, enslaved Africans whose descendants became the Gullah Geechee people harvested sweetgrass to make baskets for rice-winnowing, a practice that originated in Africa and evolved into the high cultural art form of today. This evolution embedded sweetgrass within social, economic, and political histories of rice cultivation, slavery, cultural identity, and artistic expression, through interconnections that span the Southeastern U.S., the Caribbean, Europe, and Africa. The conservation value of sweetgrass and maritime meadows derives from both their cultural and ecological significance. Maritime meadows occur between active dunes and woody vegetation on the seaward sides of barrier islands. While these landscapes are continuously shaped by coastal geological and ecological processes, they also have been impacted by human land use, livestock, and coastal urban development. Today they face added threats stemming from global climate change. Studying the historical ecology of Sweetgrass and maritime meadows can deepen our appreciation of their biocultural conservation value and provide guiding knowledge regarding past and future trajectories of change.

18. Recent declines in American Eel (*Anguilla rostrata*) recruitment to the Guana River system of northeast Florida

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The University of North Florida and the Florida Fish and Wildlife Conservation Commission have been monitoring annual recruitment of young-of-year American eels (*Anguilla rostrata*) into the Guana River system since 2001. Sampling is performed through a standardized dip-netting technique in a water control structure as glass eels migrate upstream into freshwater. American eels are threatened by habitat loss, dam and weir construction, and commercial exploitation. Over the last 22 years we have observed a decline in annual catch per unit effort (CPUE), with a consistent downward trend since 2010. Over the last three years CPUE has continued to decline and deviate far from the long-term average (0.59 eels dip-1), with an all-time low recorded during the 2022 recruitment season (2020: 0.22, 2021: 0.09, 2022: 0.02).

Life history events of fish like the American eel can be affected by climate, and recent data has supported the possibility of a shift in spawning and migration to earlier in the year, potentially resulting from climate change. The 2020-2021 sampling season was the first to include the full month of December in sampling. Additionally, the 2021-2022 season is the first to integrate the month of December into the regular sampling schedule. Over the last three sampling seasons we continue to see greater recruitment in December and January over February (2019-2020: Dec. 0.62, Jan. 0.23, Feb. 0.22, 2020-2021: Dec. 0.06, Jan. 0.12, Feb. 0.02, 2021-2022: Dec. 0.02, Jan. 0.02, Feb. 0.01). No significant differences between months exist ($p > 0.05$, Kruskal-Wallis).

19. Using Chlorophyll fluorescence sensors to investigate temporal dynamics in two contrasting ecosystems in the North Inlet-Winyah Bay National Estuarine Research Reserve

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Effectively monitoring chlorophyll in aquatic ecosystems is important for various reasons. Chlorophyll serves as a proxy for phytoplankton biomass, an important measure of ecosystem trophic status as well as a priority water quality indicator. In addition, spikes in chlorophyll levels can be a warning sign of Harmful Algal Blooms, an increasing public health concern. High frequency, *in situ* chlorophyll monitoring has the potential to provide a more comprehensive characterization of chlorophyll variability, and thus the factors that may drive this variability, than conventional discrete water sampling. This study investigated chlorophyll variability in two contrasting estuarine systems, North Inlet, a high salinity, ocean dominated estuary, and Winyah Bay, a river dominated system. Sampling was conducted using both high-frequency (every 15 minutes) sampling with an *in situ* fluorescence sensor on a continuously deployed YSI EXO2 datasonde, and monthly grab collected 13 times over a full tidal cycle. Grab samples were returned to the laboratory, extracted, and quantified by standard fluorometric methods. Laboratory-based comparison between sensor measured chlorophyll and extracted chlorophyll yielded strong correlations under controlled conditions (R^2= 0.892 for North Inlet, R^2=0.808 for Winyah Bay), providing confidence in interpretation of time-series measurements in these two systems. Results showed that North Inlet has distinct tidal and seasonal variability while Winyah Bay is largely dominated by stochastic variability driven by variable river inputs. Continuously deployed in situ chlorophyll fluorescence sensors allow for an understanding of phytoplankton temporal dynamics not possible with traditional grab sampling methods.

20. Methods Development for a Field 13CO2 Labeling Experiment to Investigate Sea Level Rise Effects on Salt Marsh Plant-Microbe Interactions

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Understanding carbon dynamics in salt marshes is essential for predicting response to future global change because of their role in capturing significant amounts of atmospheric CO_2 and storing it as organic carbon, where it is stable on millennial timescales. To elucidate how carbon dynamics will respond to environmental change, we must look to the communities of microbes within marsh sediments that are known to regulate biogeochemical reactions. Belowground microbial communities are especially influenced by vegetation because photoassimilated carbon is secreted out of roots, greatly impacting microbial structure and activity within the rhizosphere. One way to assess how rhizodeposits exhibit control on microbes within the rhizosphere is through the application of the novel RNA stable isotope probing (RNA-SIP) technique, that allows for labelled photosynthate to be traced into the RNA of the microbes that consume the rhizodeposits. To understand the effects of sea level rise on *Spartina alterniflora* rhizodeposit production and microbial community composition, I will perform a $^{13}CO_2$ labeling experiment at North Inlet-Winyah Bay NERR this summer using marsh organs - platforms containing planters at different elevations. Before performing this labeling experiment in the field, it was essential to determine the optimal length of time to label and harvest plants. In the summer of 2021, *Spartina alterniflora* plants grown in the greenhouse were labeled for either one long (5 hour) dose or short (3 hour) doses on 3 consecutive days. Ultimately, sediment δ13C values revealed that harvesting immediately after the shorter dose on the third consecutive day yielded the greatest amount of label.

21. Ecological and educational benefits of a Georgia living shoreline

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Living shorelines (LSLs) use native plants, oyster reefs, or other natural elements to stabilize estuarine shorelines. They represent a nature-based alternative to hard armoring structures such as bulkheads and rock revetments. In addition to preventing erosion, living shorelines are designed to meet secondary conservation goals such as enhancing or restoring coastal habitats and providing ecosystem services that mimic those of natural salt marshes and oyster reefs. This approach is relatively new on the Georgia coast, where scientific monitoring is needed to better understand and evaluate the performance of living shorelines and to inform design and management. In 2015, the fourth LSL in Georgia was constructed of bagged oyster shells and planted vegetation along a disturbed and eroding bank of Lawrence Creek at Cannon's Point Preserve, St. Simons Island. From 2014 to 2020, before and after the LSL was installed, College of Coastal Georgia students conducted annual surveys of adjacent oyster reef and marsh-edge vegetated habitats. Despite a series of tropical cyclones, the LSL supported rapid population growth of the eastern oyster (*Crassostrea virginica*) and smooth cordgrass (*Spartina alterniflora*), native species that stabilize tidal creek banks, improve water quality, buffer uplands from storms, and provide valuable nursery, refuge, and foraging sites for fish and crustaceans. Moreover, as one of the first and most accessible LSLs in Georgia, the Lawrence Creek project has fostered experiential learning by K-12 and college students and served as a popular demonstration site for coastal managers, contractors, and property owners.

22. Open-source technology to improve citizen science monitoring of plankton

Alex Barth*, Dr. Joshua Stone,

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A full understanding of coastal plankton communities requires long-term monitoring programs. However, time-series are often limited in spatial, temporal, or taxonomic resolution. Citizen science offers an exciting opportunity to expand plankton monitoring, and simultaneously engage in community outreach. Several existing citizen science plankton monitoring programs have shown the benefits of this model. While successful, these programs are often are limited in taxonomic resolution and focus on just presence/absence. Improving data quality in citizen science programs can be challenging due to the amount of time it requires to fully train someone in plankton taxonomy.

Recently, PlanktonPlanet, a group of ocean scientists and engineers, developed the PlanktonScope, an open-source, benchtop, imaging device designed to expand access to plankton imaging equipment. The PlanktonScope is built on a RaspberryPi framework with other low-cost equipment. Our lab is building on this open-source technology and constructing devices to distribute to citizen science monitoring programs. This will allow citizen science groups to process live samples through the PlanktonScope as a part of regular sampling efforts. The imaged plankton can be sorted using classifier programs and validated by experts. This method of data collection will remove the barrier of taxonomic expertise which has limited the scope of citizen science monitoring programs. We will discuss the capabilities of the PlanktonScope, current efforts to integrate it into an existing citizen science program (NOAA's Phytoplankton Monitoring Network) and planned scientific investigations for the collected data.

23. The Georgia Flood Literacy Project

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Terms related to flood hazards are being used inconsistently by professionals and the public. Some terms are used as synonyms when they refer to different concepts, while others are not scientifically defined and have taken on several meanings. Inconsistent terminology may cause confusion about to respond to flooding events. Ultimately, the way flooding is communicated and interpreted could impact how the public responds and a community's ability to adapt, prepare, and recover from disasters. The Georgia Flood Literacy project is an effort to unite professionals of various sectors of the field to establish a common flood-hazard lexicon by understanding what flood terms are being used and how they are being used. A Taskforce comprising of members from emergency management, academia, non-governmental organizations, state and federal agencies, local governments, and the media was established. One of their major goals was to work toward clear, widely applicable, and scientifically accurate definitions of flood terminology. Information from Taskforce discussions and two surveys was used to develop two Glossaries of Flood terms for professionals and the public. The Georgia Flood Literacy StoryMap provides a visually appealing resource for professionals to use, and for local governments and the public to learn about project results and flood-hazard communication. This resource includes text, photos, videos, visual plots, and infographics to present information in a clear, engaging way. The project has made some significant impacts as we continue to reach various groups of professionals and the public to work toward flood resilience through effective communication and education.

24. Territoriality of the Atlantic Ghost Crab, *Ocypode quadrata,* Based on Anthropogenic Impact of Private and Public Beaches

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Research has proven that anthropogenic impact has the ability to irrevocably change our world's environments, including ecosystems and animal behavior. The Atlantic Ghost Crab, *Ocypode quadrata*, is no exception to this unfortunate fact. This study aims to evaluate how territoriality of ghost crabs are influenced by anthropogenic impact of activity level on sandy beaches. The objective of this research was to compare human populations on two beaches, one remote and one more populated, and compare the density and spatial distribution of burrow holes found as well as the characters of the respective burrows. The data collected included the number of burrows, burrow sizes, surrounding burrows, and the depth of the burrows. Then the data was compared between two sandy beach locations with different levels of human impact in order to elucidate any effects of disturbance. The two locations that were utilized in this study were Waties Island, a remote Barrier Island located in Horry County, South Carolina, under the jurisdiction of Coastal Carolina University, which is strictly protected. The second beach was within a state park located in Georgetown County, South Carolina. The hypothesis of this study was that the *Ocypode quadrata* would be more territorial, evidenced by burrow spacing, in locations that had more human impacts as a result of higher competition for undisturbed parts of the beach. Because ghost crabs play a vital role in beach ecosystems, these results have implications for long-term effects of beach disturbance and coastal development.

25. Combining maternal effects and environmental factors for nest incubation and hatchling success of loggerhead sea turtles (*Caretta carretta*) on Ossabaw Island, GA, USA.

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Loggerhead sea turtles (*Caretta caretta*) are the most common nesting sea turtle in Georgia, but remain globally vulnerable to extinction due to a combination of natural predators, climate change, and anthropogenic effects. Understanding, predicting, and managing the complex factors and threats that determine their survival, especially during reproduction, is critical to the long-term recovery of this valuable protected species. Incubation duration and hatchling sex, size, and success are determined by a combination of well-studied abiotic environmental conditions and lesser-known biotic contributions, including maternal effects. This study will build from previous incubation research exploring nest characteristics, including temperature, moisture, elevation, and vegetation, by incorporating genetic identification of females, nesting experience, and variation in egg and clutch size and contents, allowing a simultaneous investigation of the relationships between environmental and maternal variables and hatching success at a critical loggerhead nesting habitat in Georgia's barrier islands. We hypothesize that differences in female nesting behaviors, nest site selection, and maternal investment can be correlated with female identity and experience, which can be used to predict the environmental conditions and hatching success of the nest. Results will serve to focus future studies on maternal contributions and refine conservation efforts to protect nesting females and populations that are most successful or intervene for nests with higher risk factors and hatchling mortality. This study is another step towards understanding nest incubation and will help to guide focused management of ecological stressors, natural threats, and anthropogenic effects for the next generation of loggerhead sea turtles.

26. *Crassostrea virginica* recruitment dynamics in Southeast Georgia: A habitat suitability model evaluation.

Caitlyn R. Napier**, Kimberly K. Takagi

College of Coastal Georgia Department of Natural Sciences

The eastern oyster (*Crassostrea virginica*) is a vital organism in salt marsh ecosystems. Without them, critical ecosystem services such as water filtration and coastal erosion mitigation would significantly decline. Hence, understanding *C. virginica* habitat suitability along the Georgia coast is critical to ensuring the maintenance of healthy salt marsh ecosystems. Atkinson and Deemy (2019) previously established a *C. virginica* habitat suitability model in an effort to identify possible oyster reef restoration locations. The purpose of this study was to evaluate the accuracy of the Atkinson and Deemy (2019) model for a number of regions along the Georgia coast. Preliminary conclusions suggest that the Atkinson and Deemy (2019) model is appropriate in some regions, however the inclusion of additional parameters (such as nitrite and phosphate) would further refine its predictability.

27. Habitat Partitioning of Aquatic Animal Species in Florida Marinas

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Flagler College

Human-made structures in aquatic ecosystems can often provide a habitat for animals that live in a given ecosystem. How animals use man-made structures and divide resources within these structures has become an area of great interest for research. The Camachee Cove Yacht Harbor in St. Augustine, Florida was the focus of this study because there is ample habitat for aquatic fauna. It is situated next to salt marsh and the Intracoastal Waterway areas near the St. Augustine. Habitat baskets — repurposed crab traps with a volume of 1500 cm3 and filled with oyster shells — were installed hanging off the docks to attract marine life. For underwater filming, a GoPro Hero 8 Black was used which was stabilized by a hand-made PVC pipe rig aimed in the direction of the baskets. Footage was gathered 1-2 times a week for when this sampling began: September, 2021. Analysis of 200 minutes of footage allowed us to identify an average of 3 species per outing including (but not limited to) the gray snapper (*Lutjanus griseus*), tarpon (*Megalops atlanticus*), and green sea turtles (*Chelonia mydas*). Numerous schools of juvenile fish (~1cm in length) were also observed in the footage, suggesting that fish species are utilizing marinas as a nursery for their offspring. Marinas are able to support a biodiverse range of animal species that mirrors the fauna observed in the surrounding salt marshes and Intracoastal Waterway.

28. Marina Observation of Sea Turtles (MOST): Establishing a Database of North Florida Green Sea Turtles

Avery Cogley **, Leslie Palmer **, Erin Buell**, Trisha McCaul **, Lilli Longo **, Dr. Ed McGinley

Flagler College

Juvenile green sea turtles (*Chelonia mydas*) are known to feed on various types of aquatic vegetation and crustaceans. Because of a lack of submerged aquatic vegetation in the Guana Matanzas Tolomato (GTM) estuary, green sea turtles have been observed feeding on the biofouling community at marinas. There is little information on the population size, seasonality, and the duration of foraging of sea turtles within marinas. The objective of this study is to acquire this information by photographically identifying individual sea turtles at two marinas: Camachee Cove Yacht Harbor (CC) and Conch House Marina (CH), so that they can be tracked over time. The perimeter of each marina was walked and the head scale patterns of each turtle encountered were photographed using a Canon 4000D and TRebel7 camera. Data collection began in June 2020 and is still ongoing. Photographs are uploaded to the software, Hotspotter, to aid in photo matching. Data analysis from June 2020 - June 2021 from the two marinas have shown 162 unique individuals. Sightings ranged from 89 turtles, sighted once, through one turtle, sighted 21 times. The longest duration between the first and last sighting of a turtle was 500 days. A total of 10 turtles have been tracked for a minimum of one year.

29. Creating Food Webs of the Satilla River Estuary Using PCR and Gene Sequencing

Lakshya Karnati**, Dr. Jessica Reichmuth, Dr. Amy Abdulovic-Cui

Augusta University

In 1910, Noyes Cut was dug in the Satilla River Estuary to facilitate the movement of lumber. Over the years, that cut has deepened due to erosion and has had a major ecological impact on the estuary's wildlife by allowing salt water to remix with brackish water. The purpose of this study is to determine effects of the cut on the distribution of organisms in different sites of the estuary. From the stomachs of 96 blue crabs, DNA was isolated and a 600bp length of mtDNA amplified using PCR. Blue crabs were used because they are both predators and prey, making them key players in the food web of the estuary. As benthic feeders, their diet is varied, allowing for a larger pool of potential samples. The DNA was sequenced using Sanger Sequencing because of the technique's high fidelity. By comparing the sequence to a database of known organisms, food webs can be created for each of the sampling sites. The food webs show the difference in the diversity and distribution of organisms in each of the sites. Using this data, we can help fishery managers take the next steps to restoring this and other estuaries.

30. Small but Mighty? Grass shrimp behavioral response to climate change conditions

Rebekah Kimbrell**, Dr. Jessica Reichmuth

Augusta University

Palaemonetes pugio, grass shrimp, reside in estuaries along the Atlantic and Gulf coasts of the North America. Being in this type of marine environment directly exposes grass shrimp to changing water conditions due to ocean acidification and warming. This study seeks to observe possible behavior changes through documenting position and motion behavior of shrimp mesocosms exposed to lowered pH and raised temperature. Grass shrimp were collected by seining tidal creeks around Hunting Island, South Carolina, and all observations and data collection took place in the facilities at Augusta University, Georgia. To test if grass shrimp have altered behavior after exposure to altered pH and temperature, each mesocosm was video recorded and behaviors were noted using an activity budget, as well as observations based on positions along a grid at the back of the tank. Abnormal behavior or movement was not found after exposure to acidic conditions or increased temperatures. If grass shrimp are able to tolerate these and other abnormal conditions, the estuarine ecosystems that this species is a part of could be better equipped for future climate change.

31. He, She, It: Vitellogenin (VtG) Expression in Male Blue Crabs, *Callinectes sapidus*: An Indication of Intersex?

Shannon Gregory, Dr. Jessica Reichmuth, Dr. Jennifer Cannon

Augusta University

The blue crab, *Callinectes sapidus*, is an economically and ecologically valuable organism, generating millions in revenue along the eastern coast of the United States. However, potential contaminants including endocrine disrupting compounds found in runoff and wastewater threaten the livelihood and future of this valuable fishery. The detection of contaminants in aquatic systems and organisms can be costly, creating a need for cost effective methods to determine exposure. Exposure to endocrine disrupting compounds could potentially cause males to express the gene encoding vitellogenin (VtG), a protein precursor to egg yolk production. We hypothesized that vitellogenin production could be detected in male blue crabs, *Callinectes sapidus*, after exposure to a commonly used endocrine disruptor, 17a-ethinylestradiol (EE2) using polymerase chain reaction (PCR). The hepatopancreas was dissected from eight male blue crabs collected from the Hunting Island, SC estuary after ingesting 10 doses of EE2 injected shrimp over the course of four weeks. RNA was extracted, reverse transcribed, and used in a real time PCR to determine VtG expression. Results indicated variability among the exposed crabs indicating that there could be variability among the individuals in how contaminants are processed. Due to the low expression and variability of VtG expression in the absence of a positive control, more estrogen related genes should be investigated.

32. Environmental Justice in North Carolina: Impacts of Swine Concentrated Animal Feeding Operations Activity upon Cape Fear River Basin Communities

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Global and national demand for meat, and subsequently meat production, is rapidly increasing. These demands have been responsible, in part, for shifting farming practices from numerous smaller farms to relatively few, highly compact industrial farms. These industrial-scale farms, known as concentrated animal feeding operations (CAFOs), operate by housing thousands of live animals at high densities. Although CAFOs have significantly increased animal production, the consequences associated with their activity are often detrimental to the surrounding communities. Such concerns are particularly pertinent in North Carolina, the second-largest producer of swine in the United States. The Cape Fear River Basin in North Carolina is home to the majority of swine CAFOs in the state. Our research examines how swine CAFO abundance and proximity impact human wellbeing. For this study, the impact on human wellbeing was examined from the perspectives of human health, socioeconomics, and geography. Specific variables included educational attainment, race, infant mortality, and flood vulnerability, amongst others. Our analysis utilized multivariate regression coupled with geographic weighted regression to examine the degree to which CAFO presence and proximity influenced human wellbeing. Based on preliminary statistical data analyses, socioeconomic disparities and health impacts are expected to correlate to CAFO presence. Additionally, spatial analyses are expected to indicate correlations between human health, socioeconomic problems, and CAFO placement. Our initial analysis suggests that CAFOs proximate to communities leave citizens vulnerable to negative health impacts and overall lower wellbeing.