SEERS

Southeastern Estuarine Research Society

2021 ANNUAL MEETING

PROGRAM & ABSTRACTS

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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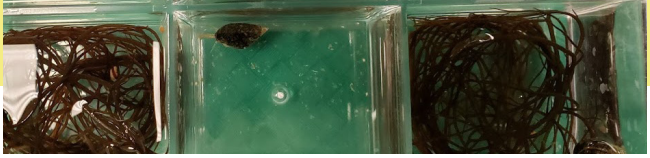

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THANK YOU!

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

Our Sponsor:

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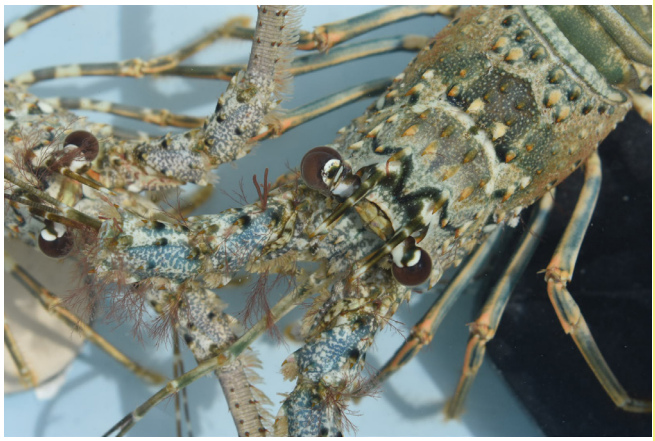


Cover Photo:

Thank you to Amara Davis for the photograph used in this year's program cover!

And all the anonymous judges for our student presenters!

Our Local Hosts/Virtual Facilitators:

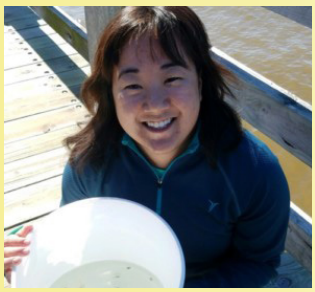
Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)

The Coastal Training Program (CTP) provides the most up-to-date scientific information and skill building tools, such as training and workshops, to key professionals responsible for making decisions about coastal resources. CTP regularly engages with local officials, land managers, natural resource managers, community leaders, coastal business owners, non-governmental organizations, and researchers.

Kaitlyn Dietz

Coastal Training Program Coordinator
GTMNERR

Kaitlyn Dietz graduated from Jacksonville University with a M.S. in Marine Science in 2015 and Georgia College and State University with a B.S. in Biology in 2012. Her Master's research focused on carbon and nitrogen stable isotope analysis of hatched sea turtle eggshells to understand relative foraging locations of loggerhead and green sea turtles that nest in northeast Florida. Kaitlyn has been the Coastal Training Program Coordinator at the GTMNERR since 2017. Prior to being coordinator, she served in positions including an environmental educator, an oyster intern, and a training specialist.



Abigail Kuhn

Coastal Training Program Specialist
GTMNERR

Abigail Kuhn graduated from the University of Southern Mississippi with a M.S. in Coastal Sciences in 2017 and the University of North Carolina Wilmington with a B.S. in Marine Biology in 2015. Her Master's thesis research focused on determining the effects of elevated temperature on growth and molting in two species of blue crabs. Abigail has served as the Coastal Training Program Specialist at the GTMNERR since 2018.

SCHEDULE AT-A-GLANCE

Day 1, Thursday, April 22, 2021	Day 2, Friday, April 23, 2021
09:00 - 09:30 Welcome Address Dr. Enrique Reyes President, SEERS	**09:00 - 09:15** Welcome to Day 2
09:30 - 09:45 Introduction to the National Estuarine Research Reserves (NERR) Special Session and Keynote Speaker	**09:15 - 10:45** Morning Oral Presentations
09:45 - 10:30 Keynote Address Dr. Denise Sanger Research Coordinator at ACE Basin NERR	**10:45 - 11:00** Morning Break
10:30 - 10:45 Morning Break	**11:00 - 12:00** Career Panel Moderated by Mariko Polk Student Representative, SEERS
10:45 - 12:00 NERRS Special Session 1	**12:00 - 13:00** Lunch Break
12:00 - 13:00 Lunch Break	**13:00 - 14:15** Afternoon Oral Presentations
13:00 - 14:15 NERRS Special Session 2	**14:15 - 14:30** Afternoon Break
14:15 - 14:30 Afternoon Break	**14:30 - 15:30** SEERS Business Meeting and Closing Remarks
14:30 - 16:30 Poster Session	**15:30 - 15:45** Late Afternoon Break
	15:45 - 16:30 SEERS Governing Board Meeting

Photo taken by William Vervaeke

Letter from the President

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

I wanted to take the opportunity to extend my warmest welcome to the 2021 SEERS Meeting. This marks the 47th year we have hosted this meeting and the second time we have hosted this meeting virtually. This is also the first year where our meetings will become annual (rather than biannual) in concurrence with the membership vote from 2020. We think that this new format will enhance attendance and will better our scientific interactions.

It goes without saying that 2020 was a challenging year. We see this challenge as an opportunity for growth and create new ways to rebound stronger. Most of you have been working remotely for almost a year now, but together have persevered and learned in many ways, and in some respects, this pandemic has brought our community closer together. While we are all disappointed that we could not meet in person this year, our conference team has been working diligently to ensure we will be able to foster the same sense of connectiveness and collaboration as we have experienced in past meetings. I'm sure you'll agree with me that they have done an extraordinary job and join me in thanking them for their hard work.

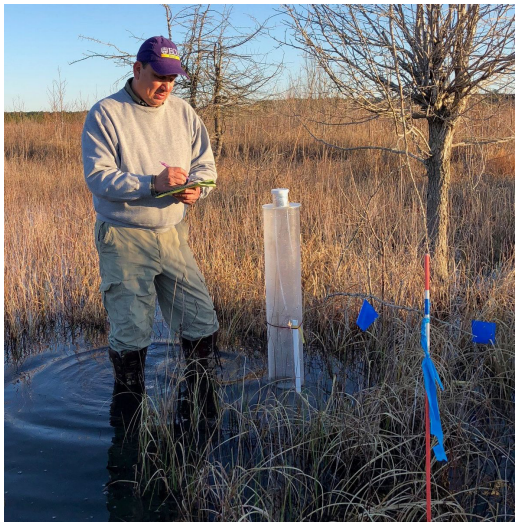
You'll find this year's program interesting and engaging, I'm sure. I urge you to make the most of the great variety of topics (the poster session titles are fantastic). This year's presentations cover important topics such as the challenges our regional NERRS are facing to how science interacts with policy (The Keynote Presentation).

I want to thank you for joining us and I sincerely hope you'll learn and enjoy this year's SEERS Meeting.

Safe environments,

Enrique Reyes

President
Southeastern Estuarine Research Society



SEERS Awards Honorary Membership to Dr. Geno Olmi

I am truly honored to be selected as an honorary member of the Southeastern Estuarine Research Society (SEERS). I enjoyed the professionalism, collegiality, and mentorship that I found at SEERS meetings. SEERS always seemed to offer a safe space for presenting information and trying out new ideas. Honestly, when I look at the list of SEERS Honorary Members, I am humbled to join the list of outstanding professionals, a few of whom were mentors to me in my early days.

I have been a member of SEERS and the Estuarine Research Federation (ERF) since 1979 when as a young biologist I presented on my work on blue crabs with the SC Department of Natural Resources.

In 1986, I left SEERS territory to enter the PhD program at VIMS/College of William and Mary and became a member of the Atlantic Estuarine Research Society (AERS). I served on the Board as Member at Large and was elected President-elect of AERS, a position I resigned when I returned to SEERS territory in 1995.

I served as Program Chair for SEERS 2000-2002, organizing the program for meetings in Tampa (Fall 2000), Charleston (Spring 2001), and Savannah (Spring 2002) and writing articles for the ERF Newsletter. I enjoyed serving on the Board and interacting with participants to develop robust programs, including a special session on "Managing Freshwater Inflow to Estuaries" (Fall 2000). I also served on the "web committee" and the "student promotion committee' for several years.

I was elected SEERS Secretary in 2011. In this position, I recorded the minutes of SEERS business meetings, served on the Board, and undertook a major cleansing of the membership files.

In Spring 2012, I was elected President-elect of SEERS, starting a six-year engagement on the SEERS Board (as President-elect, President, and Past-president). During my tenure as President, we revised the SEERS Bylaws and experimented with some changes to the "traditional" meeting format to be more welcoming and helpful to our student participants. Somewhere along the way (2013 or 2014, I think), I was asked to serve as SEERS Historian. I worked closely with our webmaster, Joan Sheldon, to add an "Archives" section to the SEERS website. The Archives contains a record of SEERS Meeting History (incomplete), the SEERS Boards, and Honorary Members since the beginning of the organization. I still have some work to do here before I hand it off to another SEERSite.

Finally, in addition to SEERS responsibilities, I served on the Governing Board of the Coastal and Estuarine Research Federation 2005-2009 as Member-at-large and again Nov 1999 – Nov 2001 as SEERS Representative on the Board. I also served on the editorial board of the Coastal and Estuarine Science News (CESN) for several years and on two different nominating committees. I have organized special sessions and served on the Conference Attendee Experience Committee for three conferences, including leading the Career Mentoring Event.

Geno Olmi

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KEYNOTE SPEAKER

Denise Sanger, PhD

Dr. Denise Sanger is the ACE Basin National Estuarine Research Reserve Research Coordinator and a Marine Scientist at the South Carolina Department of Natural Resource's Marine Resources Research Institute. She obtained her Doctorate in Marine Science from the University of South Carolina in 1998 and her Bachelor's degree in Marine Biology from the University of California at Santa Cruz in 1993. She is an applied scientist and has experience in coastal and estuarine ecology and coastal zone management. Over the last 25 years she has worked on assessing the impacts of man on estuarine and coastal environments. She has been a member of SEERS and CERF since about 1994. She served as the SEERS Program Chair about 15-16 years ago as well as the three President positions. She is also a member of the CESN editorial board.

SPECIAL SESSION:

The National Estuarine Research Reserves

The National Estuarine Research Reserve System (NERRS) includes 29 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 is 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 at https://coast.noaa.gov/nerrs/!

CAREER PANEL

The Career Panel brings together individuals from a variety of backgrounds to discuss their personal career journeys. Each panelist will be asked a range of questions pertaining to their careers in the field of estuarine science and to provide general mentorship and guidance for success. We are hoping for this to be a casual and honest dialogue between these individuals and any students or young career professionals attending this special session.

Kerri Allen

Coastal Advocate
North Carolina Coastal Federation

As the Coastal Advocate for the North Carolina Coastal Federation, she is the "voice" of our coast, working at local, state and federal levels to ensure that actions are taken to safeguard North Carolina's water quality, coastal environment and economy. She received a master's degree in coastal geology and a bachelor's in geosciences with minors in environmental studies and geospatial technologies from the University of North Carolina Wilmington.
Kerri believes there is no place in the world more productive, diverse, resilient or just plain beautiful than the estuary and she considers it an honor and privilege to help protect and restore these habitats that bring so much life into our oceans.

Scott F. Eastman

Regional Program Administrator
Florida Dept. Of Environmental Protection's Office of Resilience and Coastal Protection

Scott oversees the management of the Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR) and thirteen Florida Aquatic Preserves throughout Florida's NE Region. He received a MS in Interdisciplinary Ecology from the University of Florida and a BA in Psychology from Florida Atlantic University, with a focus on the biological basis of behavior. Prior to this he served as the NE Region's Assistant Regional Administrator and Stewardship Coordinator for the GTMNERR. Scott's expertise lies mainly in the field of spatial ecology, the biology of sea turtles, and coastal restoration. Scott currently serves as the Chair of the Northeast Florida Estuarine Restoration Team (NERT) and he is a member of the University of Florida's Archie Carr Center for Sea Turtle Research. Scott has worked and lived by the coast for most of his life and he has watched these coastal ecosystems change significantly over the years. He is passionate about gaining a better understanding of how these systems are changing and applying science-based management to protect and conserve these habitats.

Devon Eulie

Assistant Professor, Graduate Coordinator
Dept. of Environmental Sciences, University of North Carolina Wilmington

Dr. Eulie studies coastal process and policy, including coastal resilience, shoreline management, and ecosystem impacts of sea-level rise. She has a PhD from East Carolina University in Coastal Resources Management, an MS in Geology, and a BS in Environmental Studies (both from UNCW). Her graduate research has ranged from wetland accumulation and sea-level rise in the Cape Fear River Estuary to shoreline erosion mapping using GIS in the Albemarle-Pamlico Estuarine System. Dr. Eulie's main focus today is understanding the impact of coastal management strategies, such as living shorelines, and planning for hazards such as sea-level rise and storms. She formed an early attachment to the coast while visiting family every year in the Outer Banks of NC and later a passion for research and education at UNCW. She now shares her love for coastal research as an educator, mentor, and graduate program coordinator at her alma mater.

Anna Braswell

Assistant Professor
School of Forest, Fisheries, and Geomatics Sciences, University of Florida
State Specialist, Florida Sea Grant

Dr. Braswell's position combines research through University of Florida with extension work at Florida Sea Grant. She is macrosystem ecologist, thinking about the connections between watersheds and coastal ecosystems. She has a PhD from Duke University, MS from the University of Alabama, and BA from Washington University in St. Louis. Completing a postdoc at the University of Colorado, she gained addition experience in earth science data analytics. Dr. Braswell is passionate about understanding coastal wetlands as the interface between upland, coastal, and human systems, and educating others about the benefits provided by these important and complex systems.

DAY ONE: Thursday, April 22, 2021

Time	Presentation	Presenter(s)
09:00 - 09:30	Welcome Address	Enrique Reyes, PhD
09:30 - 09:45	Introduction to the National Estuarine Research Reserves (NERR) Special Session and Keynote Speaker	Shannon Dunnigan and Nikki Dix, PhD
09:45 - 10:30	**KEYNOTE:** Science Informing Policy: Lessons from the SC Coast	Denise Sanger, PhD
10:30 - 10:45	**Morning Break**	
10:45 - 11:00	Understanding Controls on the Morphological Response of Masonboro Island, North Carolina to Hurricane Florence	Jesse Beckman*
11:00 - 11:15	Overwinter intertidal movements and the impacts of sea level rise on Saltmarsh and Seaside Sparrows in North Carolina	Marae Lindquist*
11:15 - 11:30	Understanding Visitor Use and Its Impacts on Key Resources at the ACE Basin National Estuarine Research Reserve	Tyler W. Cribbs*
11:30 - 11:45	Effects of increasing tidal inundation on nutrient availability in salt marsh porewater in North Inlet estuary	Julie L. Crask
11:45 - 12:00	Long-term trends in water-column nutrients and chlorophyll at North Inlet-Winyah Bay NERR	Robert P. Dunn, PhD
12:00 - 13:00	**Lunch Break**	
13:00 - 13:15	A comparison of the influences of dredging and storm events on water quality in a barrier island estuary system (GTMNERR) in Northeast Florida	Matthew T. Brown, PhD
13:15 - 13:30	Causes of spatial variation of resource allocation in juvenile oysters across the Guana Tolomato Matanzas National Estuarine Research Reserve	Allison E. Noble**
13:30 - 13:45	How big changes are affecting the marsh's smallest residents: How warming and shifting Vegetation can affect benthic algae in coastal marshes	Gabriela Canas*
13:45 - 14:00	*Avicennia germinans* establishment elevations in coastal salt marshes at Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR Florida, USA)	William C. Vervaeke*
14:00 - 14:15	Characterization of a Scalloped Hammerhead (*Sphyrna lewini*) Nursery Habitat in Portions of the Atlantic Intracoastal Waterway	Bryanna Wargat*
14:15 - 14:30	**Afternoon Break**	
14:30 - 16:30	**POSTER SESSION**	See page 25 for more information

Asterisks indicate student presenters: (*) graduate student, (**) undergraduate student

DAY TWO: Friday, April 23, 2021

Time	Presentation	Presenter(s)
09:00 - 09:15	Welcome to Day 2	Shannon Dunnigan
09:15 - 09:30	Patterns of phytoplankton biomass in a cut estuary	Loren Mathews, PhD
09:30 - 09:45	Invasion of the body snatchers: the role of parasite introduction in host distribution and response to salinity in invaded estuaries	April M.H. Blakelsee, PhD
09:45 - 10:00	Evaluating the long-term success of oyster reef restoration: parasites provide insight into trophic complexity	Christopher Moore*
10:00 - 10:15	Fortnightly Effects Of Urea Additions on Cyanobacteria in a Stormwater Detention Pond	Halley Carruthers*
10:15 - 10:30	A Comparison of Fisher Opinion on the Status of the Caribbean Spiny Lobster, *Panulirus argus* Fishery in Florida, USA and The Bahamas	Amara Felecia Davis*
10:30 - 10:45	Assessing thermal tolerance of Eastern Mudsnail *Tritia obsoleta* in the presence of invasive alga *Agarophyton vermiculophyllum*	Timothy S. Lee*
10:45 - 11:00	**Morning Break**	
11:00 - 12:00	**CAREER PANEL**	Mariko Polk
12:00 - 13:00	**Lunch Break**	
13:00 - 13:15	March of the Mangroves: Marine fauna biodiversity and distribution as a response to saltmarsh decline and mangrove expansion	Rachel McDonal**
13:15 - 13:30	Connecting to estuaries with virtual public programs	Kayla A. Clark*
13:30 - 13:45	Flatfish Habitat Use of a Small Southeastern US Tidal Creek: Long- and Short-term Occupancy Patterns	Mary Carla Curran, PhD
13:45 - 14:00	Changing with the Times: Investigation of the composition and persistence of temperate and tropical seagrasses located at a transition zone	Amy Bartenfelder
14:00 - 14:15	The near-complete loss of submersed aquatic vegetation (SAV) in the St. Johns River following Hurricane Irma in 2017	Robert Virnstein, PhD
14:15 - 14:30	**Afternoon Break**	
14:30 - 16:30	**SEERS Business Meeting and Closing Remarks**	Enrique Reyes, PhD

Asterisks indicate student presenters: (*) graduate student, (**) undergraduate student
Not included in the schedule for Day Two is the SEERS Board Meeting which is by invitation only.

Oral Presentation Abstracts

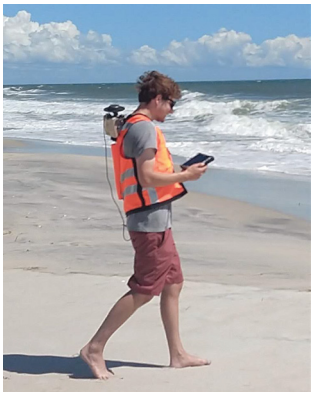
All abstracts are in order of presenting author's last name. Asterisks indicate student authors: (*) graduate, (**) undergraduate.

Changing with the Times: Investigation of the composition and persistence of temperate and tropical seagrasses located at a transition zone

Amy Bartenfelder[1], Jessie Jarvis[2], W Judson Kenworthy[2], Brandon Puckett[3], Charles Deaton[3]
[1] Institute of Marine Sciences, University of North Carolina at Chapel Hill
[2] Department of Biology and Marine Biology, University of North Carolina Wilmington
[3] North Carolina National Estuarine Research Reserve

Seagrasses provide critical ecosystem services to coastal areas, including nursery habitat for fisheries species, improvement of local water quality conditions, and coastal protection. In North Carolina, USA, these ecosystem services are primarily provided by *Zostera marina*, a temperate seagrass at its southern boundary and *Halodule wrightii*, a tropical seagrass at its northern limit. NC is a transition zone where two species exist at their geographic distributions, making both *Zostera marina* and *Halodule wrightii* vulnerable to changes in environmental conditions. Water temperatures in the study location within and proximal to the Rachel Carson National Estuarine Research Reserve near Beaufort, NC, have gradually increased the length of the summer season since 1962 and the frequency of extreme water temperatures since 1995 (beginning of record). This increase in thermal stress can alter the local composition and persistence of seagrasses on a temporal scale, often inhibiting the presence of stressed species and shifting dominance. At its southern distributional range, the increase in summer length is correlated to a temporal decline in *Z. marina* biomass during the summer months. *Halodule wrightii* was observed to steadily increase in biomass during the summer months, concurrent with the decline in *Z. marina* biomass, becoming the dominant species by July. Using biomass and aerial imagery data from 1962-2019, temporal changes in species biomass dominance show changes in meadow composition but stable meadow area and biomass over time. Without observed severe declines, the effects of climate-induced increases in water temperatures are likely being mitigated by local water quality conditions, characterized by low values of chl a and turbidity, and good water clarity, which may bolster the persistence of seagrasses when experiencing increased thermal stress.

Understanding Controls on the Morphological Response of Masonboro Island, North Carolina to Hurricane Florence



Jesse Beckman*, Joseph Long, Andrea D Hawkes, Lynn Leonard
University of North Carolina Wilmington, Department of Earth and Ocean Sciences

Over short periods of time, extreme storms can significantly alter barrier island morphology, increasing the vulnerability of coastal habitats and communities to future storms, while offsetting coastal management actions intended to promote resiliency. The main goal of this research was to better understand how water level variations, grain size characteristics, and variations in topography and land cover influence geomorphic change and habitat alteration during storms. A 2D XBeach model was developed to study the impacts of Hurricane Florence on the Masonboro Island National Estuarine Research Reserve. Masonboro is a 13.5-kilometer-long undeveloped barrier island located off the coast of Wilmington, North Carolina south of where the storm made landfall in 2018. Beachface and dune water levels were obtained from two cross-shore pressure sensor arrays, one in a high dune elevation area (northern section) and the other in a low dune elevation area (southern section). A land cover classification was generated using pre-storm Sentinel-2 satellite imagery to account for vegetation which can reduce overland flow and cross-shore sediment transport during storms. The high spatial and temporal resolution of the Sentinel-2 imagery provided an efficient method to incorporate pre-storm spatially varying land cover and increase model accuracy. The use of local median grain sizes was also critical to reducing modeled overwash extents making them more representative of observed changes. The combination of observations and a high-fidelity numerical model have identified the importance of key storm processes, and the developed model is now being used to explore potential management actions to enhance island resiliency.

Invasion of the body snatchers: the role of parasite introduction in host distribution and response to salinity in invaded estuaries

April MH Blakeslee[1], Darby L Pochtar[2], Amy E Fowler[2], Chris S Moore[1], Timothy S Lee[1], Rebecca B Barnard[1], Kyle M Swanson[1], Laura Lukas[1], Matthew Ruocchio[1], Mark E Torchin[3], A Whitman Miller[4], Gregory M Ruiz[4], Carolyn K Tepolt[5]
[1] Biology Department, East Carolina University, Greenville, NC, USA
[2] Department of Environmental Science and Policy, George Mason University, Fairfax, VA, USA
[3] Smithsonian Tropical Research Institute, Panama City, Panama
[4] Invasion Ecology Laboratory, Smithsonian Environmental Research Center, Edgewater, MD, USA
[5] Biology Department, Woods Hole Oceanographic Institution, Woods Hole, MA, USA

In highly dynamic systems like estuaries, organisms are faced with variable selective forces that may elicit tradeoffs. Salinity is a strong driver of diversity gradients, while parasites can strongly shape species distributions and demography across these same scales. Here, we investigated an invasive, body-snatching parasite (*Loxothylacus panopaei*) and its host crab (*Rhithropanopeus harrisii*) along salinity gradients in two North Carolina rivers. Over a three-year period, we performed field surveys every 6-8 weeks to determine the driving factors of parasite prevalence, host abundance, and associated taxa diversity. We found salinity and temperature significantly affected parasite prevalence, with low salinity sites (<10 PSU) lacking infection, while populations in moderate salinities and warmer temperatures reached infection prevalence as high as 60%. Further, host population abundance was negatively associated with parasite prevalence. Additionally, because hosts may have a refuge from infection in low salinity waters, we carried out a lab experiment to investigate host response (time-to-right and transcriptomics) to salinity. Crabs from the lowest salinity source had a marginally slower righting response. Host gene expression was highly plastic to acclimation salinity, with a handful of

osmoregulatory and immune-related genes demonstrating source-dependent salinity response. Also, support for selection on standing variation was found in a genetic marker whose allele frequency was strongly correlated with salinity across both rivers. Altogether, our study illuminates the selective tradeoffs that may exist in natural systems and how they can shape host evolutionary ecology.

A comparison of the influences of dredging and storm events on water quality in a barrier island estuary (GTMNERR) in Northeast Florida

Matthew T Brown[1], Nicole Dix[2], Todd Osbourne[3,4], Joel Steward[5], Alicia Castle[1], Westly Woodward[1], Allison Hartnett[1]
[1] Department of Natural Sciences, Flagler College
[2] Guana Tolomato Matanzas National Estuarine Research Reserve
[3] Whitney Lab for Marine Bioscience, University of Florida
[4] Soil and Water Sciences Department, University of Florida
[5] The Estuaries Foundation

Previous studies have demonstrated that both anthropogenic dredging disturbances and storm events can have profound impacts on water quality, particularly increases in nutrients, sediment loads, and shifts in phytoplankton community biomass. This study provided the opportunity to assess potential relative impacts of a several month-long barrier island maintenance dredging operation and shortly-following storm events on water quality in a well-flushed Northeast Florida estuary within the Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR). Twice-a-month monitoring of turbidity, total suspended solids, chlorophyll-a, and major nutrients (ammonium, nitrate+nitrite, and ortho-phosphate) was carried out at multiple sites from November 2016 through October 2018. This timeframe sampled both the January 2017-September 2017 dredging project associated with the re-opening of the Summer Haven River on the barrier island side of the Matanzas River estuary in the southern portion of the GTMNERR as well as two storm events--Hurricane Irma in September 2017 and a five-day nor'easter in October 2017. The results highlight how natural storm events can have much more profound impacts on water quality in a well-flushed estuary as compared to the dredging project where the type of sediment removed and rapid estuary flushing times likely kept the effects of this sediment removal to a minimum.

How big changes are affecting the marsh's smallest residents: How warming and shifting Vegetation can affect benthic algae in coastal marshes

Gabriela Canas*[1], Samantha Chapman[2], Dale Casamatta[1], Nicole Dix[1,3]
[1] University of North Florida
[2] Villanova University
[3] Guana Tolomato Matanzas National Estuarine Research Reserve

The GTMNERR community is aware that mangroves are continually encroaching into salt marshes across the reserve. Though we are beginning to understand some consequences of more mangroves, the implications of this shift, and of sustained climatic warming, for the resilience of wetland habitats and their associated communities remains unknown. Primary producers such as benthic microalgae (BMA) are important food sources in both mangrove and saltmarsh communities and can provide insights into how changes can affect community dynamics. Algal community biomass and composition was measured within three different marsh vegetation types (*Batis maritima, Spartina alterniflora, Avicennia germinans*) and compared to assess if vegetation is a potential driver for algal community differences. Existing WETFEET warming chambers (pvc boxes surrounded by clear film) deployed on both marsh-dominated and mangrove dominated plots

were used to also investigate how warming could potentially drive algal community change. Warming chambers have warmed the air temperature by an average of 2°C, which is similar to the climate change that is predicted for northeast Florida. Abiotic parameters were also measured to assess how abiotic conditions associated with vegetation can act as potential structuring forces on algal communities. It was found that algal communities differ between different vegetation types and can vary drastically by season. Certain abiotic factors like temperature and light were also found to be drivers of algal biomass. These findings suggest that changes in BMA communities should be investigated further as potential bottom up drivers of community shifts resulting from the marsh to mangrove transition.

Fortnightly Effects of Urea Additions on Cyanobacteria in a Stormwater Detention Pond

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Increased urban and suburban population growth along the South Carolina (SC) coast has led to a rise in impervious surfaces, altering the course of stormwater runoff events. The construction of stormwater detention ponds (SDPs) is one of the many ways to best mitigate the flow of this water. In their function as natural pollutant traps, SDPs often contain increased levels of nutrients (nitrogen, N and phosphorus, P), which can lead to eutrophication. Under these high eutrophic conditions, primary production is overstimulated, and the formation of phytoplankton blooms, including harmful algal blooms (HABs) can occur. In recent decades, the forms of nitrogen (N) exported to coastal waters have changed, with more than half of all N fertilizers being urea-based. Research has also shown species-specific differences to various concentrations and forms of fixed N. More specifically, cyanobacteria seem to thrive under higher concentrations of ammonium and urea. This proposed work aims to examine the seasonal variability in phytoplankton communities in a single SDP over a short-term period in response to urea. These effects were tested using nutrient addition bioassays under a 72 h incubation conducted every 14-days. Phytoplankton community composition varied throughout the season, coinciding with changes in nutrient concentration. Cyanobacteria made up a small percentage (<30%) of the total phytoplankton community and it was concluded that they exhibited an insignificant, and weak response to urea additions.

Connecting to estuaries through virtual public programs

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Public programs led by UGA Marine Extension and Georgia Sea Grant connect Georgia residents and visitors with estuaries through lecture, field, lab and aquarium-based activities. Due to the COVID-19 pandemic our education team transitioned to all virtual public programming during the summer and fall. Between June and November 2020, we developed and hosted 28 new virtual public programs, serving 860 participants, including 365 children and 495 adults. Coordination of the event was also part of a community leadership challenge for the Project Dragonfly Global Field Program. This presentation shares lessons learned for others interested in virtually connecting learners of all ages to southeastern estuaries. Our series offered events designed for adults and families with children aged 4-14 years old. All participants received information about coastal ecology, however we found that differentiating the delivery of that content

was important for providing age appropriate activities. We found art projects, live animal encounters, showing bio facts, filming in the field and cooking demonstrations to be engaging. Each program was also paired with an at-home activity sheet designed to encourage intergenerational nature exploration.

Understanding Visitor Use and Its Impacts on Key Resources at the ACE Basin National Estuarine Research Reserve

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The ACE Basin National Estuarine Research Reserve (ACE Basin NERR) contains unique habitats and natural resources, which makes the reserve one of the most ecologically diverse locations in all of the U.S. Atlantic Coast. The overall purpose of this project is to characterize visitor use and understand its impact to key natural resources at the ACE Basin NERR. These efforts will help achieve the objectives to provide baseline data on: 1) visitor use, visitor attitudes, and visitor perceptions of impacts, 2) indicators and thresholds for the visitor experiences, 3) visitor attitudes towards management alternatives, 4) recreation-related impacts to key resources at sites of concern, and 5) visitor use levels and distributions throughout the ACE Basin NERR and how they overlap with key environmental areas and processes. The outcome and benefit of this research is to create reliable visitor-based data and results necessary to better understand and manage visitor use at ACE Basin NERR. These data are also intended to help inform and guide visitor use management decisions at the ACE Basin NERR and to allow future monitoring of the area to proactively protect both the visitor experience and key resources.

Flatfish Habitat Use of a Small Southeastern US Tidal Creek: Long- and Short-term Occupancy Patterns

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Many flatfish species utilize coastal areas during at least one of their life-history stages. Estuaries on the eastern US Atlantic coast provide important settlement and nursery habitat for flatfishes. Small tidal creeks serve as transition zones between upland and estuarine environments and are a consistent settlement and nursery habitat for flatfish. Flatfish habitat use in Wylly Creek, a southeastern US tidal creek, was examined to determine whether assemblage composition has changed over a decadal time period (2004-2007 vs. 2016-2019). In addition, the potential effect of cold winters on juvenile flatfish recruitment and subsequent spring flatfish assemblage composition were examined. Flatfish assemblages have undergone subtle shifts in composition between initial and recent time periods, with decreases (5–16-fold) in abundance occurring for ocellated flounder Ancylopsetta quadrocellata, summer flounder Paralichthys dentatus, and southern flounder Paralichthys lethostigma, while abundances of more common species, bay whiff Citharichthys spilopterus and blackcheek tonguefish Symphurus plagiusa, remained relatively consistent. Bay whiff recruitment into the creek occurred in early spring, but was delayed in most years with colder winters. Minimum residency for bay whiff within an approximately 350 m stretch of creek was estimated to be approximately 5-10 days. Flatfish habitat use in this small tidal creek adjacent to a relatively undeveloped coastal area may reflect a shifting baseline against which potential assemblage shifts in developed areas can be assessed.

A Comparison of Fisher Opinion on the Status of the Caribbean Spiny Lobster, *Panulirus argus* Fishery in Florida, USA, and The Bahamas

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The Caribbean spiny lobster *Panulirus argus* is the most economically valuable fishery in Florida and the Caribbean and provides food security, job opportunities, and global trade pathways. Lobster recruitment to the fishery may be affected by the prevalence of Panulirus argus virus 1 (PaV1), which causes juvenile mortality 30-90 d post-infection. Clinical PaV1 incidence varies throughout the region, but prevalence in Florida can measure up to 70% in some areas, and prevalence in the Bahamas is significantly lower (0.5%). The objective of this study was to compare lobster fisher opinion of spiny lobster fishery health in Florida and The Bahamas. Fisher surveys were conducted between August 2019 and February 2020. Fishers were asked about their PaV1 knowledge and to rank fishery health using a 6-point Likert scale. Demographic information was also analyzed. Most Floridian and Bahamian fishers were unaware of PaV1 (91.43% and 83.33%, respectively), but the few fishers that were aware were 40-70 years old and had been fishing for 26-55 y. Floridian fishers rated fishery health at 3 ± 1.4 (variable) compared to Bahamian fishers who rated the fishery at 4.82 ± 1.20 (very stable). Floridian fisher opinion is influenced by declining lobster landings, whereas Bahamian fishers have experienced economic success in the past two decades. There may not be a direct relationship between PaV1 prevalence and fishery health, but decreased recruitment due to PaV1 may be a factor in fishery decline. Effective collaboration between fishers, management agencies, and other stakeholders is imperative to ensure a sustainable fishery.

Long-term trends in water-column nutrients and chlorophyll at North Inlet-Winyah Bay NERR

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Long-term monitoring of coastal environments can provide key insights into 'short-term variability and long-term change' of these valuable ecosystems. The System-Wide Monitoring Program (SWMP) of the National Estuarine Research Reserve (NERR) System uses standardized data collection protocols to measure numerous parameters describing the environmental conditions within estuaries nationwide. One focus of SWMP is water-column nutrient and chlorophyll-a concentrations, which are measured approximately monthly at each NERR. We analyzed 18 years of data, including ammonium, orthophosphate and chlorophyll-a concentrations, collected every 20 d from four monitoring stations in the North Inlet-Winyah Bay NERR. We fit generalized additive models to these non-linear time series and found that concentrations of ammonium, orthophosphate and chlorophyll-a generally increased over our study period, though the magnitude of those increases varied across monitoring locations. Analysis of intra-annual concentrations demonstrated the expected peak in summer for some parameters (e.g., [chl-a]) and surprising variability in others (e.g., [PO4+]). We calculated instantaneous slope values to pinpoint locations within the time series when significant positive or negative trends occurred; increasing periods generally occurred in approximately 2010 and/or 2014, depending on the focal parameter and station. Given the relatively undisturbed nature of the North Inlet estuary, trends in these water quality parameters may be indicative of larger-scale processes.

Effects of increasing tidal inundation on nutrient availability in salt marsh porewater in North Inlet estuary

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Long-term monitoring of estuarine biogeochemical processes provides critical insight into the health and function of coastal ecosystems, particularly in the face of changing climatic and hydrologic regimes. To assess the effects of accelerating sea level rise on coastal marshes in North Inlet estuary (South Carolina, USA), the North Inlet-Winyah Bay National Estuarine Research Reserve implemented a series of permanent monitoring plots along 6 transects on the salt marsh platform of Crabhaul Creek. Parameters measured since 2008 include plant species composition, stem density, canopy height, percent cover, surface elevation, inundation, as well as porewater nutrient concentrations and salinity during the growing season (May - September). Resulting data indicate considerable increases in tidal inundation over the marsh platform, which are coincident with significant trends in porewater nutrient concentrations along the marsh elevation gradient. In plots experiencing greater increases in inundation time, particularly in the low marsh, porewater ammonium and orthophosphate concentrations have increased substantially, rising at rates as high as 27 µM/year and 3 µM/year, respectively. Given such rates of increase, and that nutrient concentrations in porewater are often orders of magnitude higher than in ambient creekwater, these findings likely have relevance for larger scale biogeochemical dynamics occurring throughout the North Inlet estuary. We suggest that increasing inundation time due to rising sea level has enhanced chemical exchange in the marsh soil as well as marsh flushing, therefore influencing nutrient cycling in adjacent subtidal creeks. Given the central role of nutrient availability in ecosystem productivity, these changes have important implications for overall ecosystem condition and community structure.

Assessing thermal tolerance of Eastern Mudsnail *Tritia obsoleta* in the presence of invasive alga *Agarophyton vermiculophyllum*

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The red alga *Agarophyton vermiculophyllum* (AV) has invaded many temperate coastlines but is considered a foundation species because of its novel structural complexity. A common macroinvertebrate co-occurring with AV in the Northwest Atlantic is the eastern mudsnail *Tritia obsoleta* (TO). This gastropod prefers to deposit eggs on AV, and its abundance and association with AV make it a model study organism to examine lethal and sublethal responses to rising sea temperatures in the presence of invasive seaweeds. We ran two three-week trials at 27, 32, 36°C temperatures to assess snail survival and fecundity rates. Per temperature (n=100), we randomly assigned snails to two treatments: with- and without-AV. Snails were placed into individual chambers of 18-well component storage boxes, and one low tide was simulated each day. We assessed survival twice daily and counted egg capsules. Survival was highest at 27°C. At 36°C, most TO perished within the first two days. The 32°C treatment was the only temperature where we observed major survival differences between presence and absence of AV. We also observed that TO deposited more eggs on AV than bare walls. Contrary to expectations, mortality of TO was higher with AV than without. This may be because under stressful conditions (e.g., high temperature), AV may release prostaglandins that increase environmental toxicity. Thus, under increasing thermal stresses, survivability of macroinvertebrates could be impeded by macroalgal chemical responses via defensive mechanisms. Though AV adds habitat complexity, it may ultimately be harmful to native macroinvertebrates during stressful conditions.

Overwinter intertidal movements and the impacts of sea level rise on Saltmarsh and Seaside Sparrows in North Carolina

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There are large gaps in knowledge regarding the wintering movements of Saltmarsh Sparrows (A*mmospiza caudacuta*, SALS) and Seaside Sparrows (*Ammospiza maritima*, SESP). Marsh species are losing essential habitat due to sea level rise, development, and other anthropogenic forces. Both 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 2023. Understanding winter movements and habitat utilization of SALS and SESP 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 through 2022 we are researching SALS and SESP at five sites in Southeastern 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. We are using SLAMM (Sea Level Affecting Marshes Model) to determine habitat loss through 2060. This study will provide information about habitats that must be maintained to conserve wintering grounds for SALS and SESP.

Patterns of phytoplankton biomass in a cut estuary

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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 they are no longer maintained for their original purposes. Of these, Noyes Cut has been identified as the likely cause of increased sedimentation, disturbed salinity gradients, and decreased water quality in the Dover-Umbrella-Parsons Creek system that it connects to the Satilla River. These hydrological and physical-chemical changes likely influence the abundance and distribution of phytoplankton, which serve as an important food source for commercially and recreationally valued fish, crabs, and shrimp. The goal of this study was to identify spatial and temporal patterns in phytoplankton abundance (as chlorophyll a concentration) at sites impacted by the artificial cuts and compare them to an unimpacted reference site. Monthly integrated water samples were collected and analyzed fluorometrically from June 2014 to September 2019. The 5.5-year data set indicates that phytoplankton abundance is higher on average in the summer and fall with the largest peaks coinciding with increased salinities. This study is part of a collaborative holistic assessment of the ecological effects of Noyes Cut, which is being considered for closure and restoration by state and federal agencies. The implications of the closure on the estuary's structure and function will be examined with respect to bottom-up processes.

March of the Mangroves: Marine fauna biodiversity and distribution as a response to climate-induced saltmarsh decline and mangrove expansion

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Salt marsh ecosystems are currently facing impacts from northward mangrove expansion due to rising temperatures in the northeast Florida region. Northward mangrove expansion plays a role in the biodiversity and distribution of the flora and fauna that reside within these essential systems. As a result, the composition of coastal communities that rely on these vital environments are apt to change. In order to interpret the full extent of these impacts, water quality, species richness and biodiversity will be monitored at three sites; two salt marsh dominant sites and a transition site (mangrove-saltmarsh). Fish species are caught using a 6mm mesh fyke net. Fish are counted, measured and identified. The measurement is recorded for the first 100 of each species. The mean total length of each species is examined for each site and compared.

Evaluating the long-term success of oyster reef restoration: parasites provide insight into trophic complexity

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The eastern oyster (*Crassostrea virginica*) is an ecosystem engineer capable of creating complex habitat for species across multiple trophic levels. Historic declines in oyster abundance have prompted decades of restoration efforts, but how long does it take for restored reefs to resemble natural reefs in terms of trophic complexity? We surveyed natural oyster reefs and a time-series of constructed reefs ranging from 5 to 22 years old in the Rachel Carson Estuarine Research Reserve, part of the National Estuarine Research Reserve System. In addition to conventional methods of sampling for free-living taxa, we also sampled trophically transmitted parasites in reef-resident organisms. Trophically transmitted parasites require multiple hosts to complete life cycles (e.g., mollusks, crustaceans, fishes, shorebirds), and studies have shown that parasite diversity can predict overall community biodiversity. We found that free-living taxa richness in natural reefs was not significantly different from reefs built between 1997 and 2016, whereas parasite richness on these reefs increased over time, particularly between 5 and 10 years post-restoration. Crustacean parasite richness explained 70% and 50% of variance in free-living crustacean richness on natural and “old” reefs, but the correlation was non-significant on “new” reefs. Pairwise comparisons among age groups (Natural, Old, New) showed that host-parasite abundance was significantly different between Natural and New reefs, with seasonal shifts in community composition documented during our project. Parasite diversity can therefore provide evidence of trophic complexity in restored reef habitat not captured by more conventional methods of sampling.

Causes of spatial variation of resource allocation in juvenile oysters across the Guana Tolomato Matanzas National Estuarine Research Reserve

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The Eastern Oyster (*Crassostrea virginica*), found in estuaries along the Atlantic coast, is an economically valuable species that supports diverse, productive ecological communities. Although large-scale anthropogenic stressors such as overharvesting and water pollution have clearly contributed to global oyster reef degradation, it is less obvious how local conditions affect individual oyster traits. Temperature, food availability, and predation risk may each influence oyster shell and tissue development, affecting survival, growth, and marketability. The Guana Tolomato Matanzas National Estuarine Research Reserve (GTM NERR) contains an extensive natural oyster reef system with distinct regions differing in water conditions and predation pressure, creating an ideal environment for examining patterns and causes of oyster trait variation. Because the juvenile stage of oysters is strongly influenced by environmental stress and predation pressure, we collected juvenile oysters from each hydrodynamic region in the GTM NERR and assessed each for a suite of body traits. Using regression techniques, we found that the slope of the functional relationships between shell length and thickness, but not strength, varied across the estuary, with higher shell thickening rates in regions closest to the inlet. Although no single factor fully explains this spatial variation, shell thickening rates were most affected by chlorophyll, temperature, and dissolved oxygen levels. In addition to highlighting important trends for stakeholder interests in the GTM NERR, this research demonstrates that the growing assumption that predation risk (separate from negative selection pressure) drives traits in natural patterns should be met with caution.

Avicennia germinans establishment elevations in coastal salt marshes at Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR Florida, USA)

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Wetlands are expected to be heavily impacted by climate change. Rates of sea-level rise may exceed the flood tolerance of some species, resulting in wetland loss, whereas decreases in frequency and severity of freeze events may favor poleward expansion of tropical woody species, such as black mangrove (*Avicennia germinans*). Such a vegetation shift is occurring at GTMNERR where black mangrove has been advancing northward at the expense of non-woody salt marsh. Data gaps exist in understanding the role of elevation and hydrology in modulating establishment and growth dynamics of black mangrove in these coastal wetlands. To inform coastal managers on how and where this encroachment may occur, elevation studies are being conducted throughout GTMNERR using a highly modified rod surface elevation table (rSET) method. Overlapping static GPS surveys were conducted using the top of the rSET receiver as the vertical point of reference (VPR), resulting in precise North American Vertical Datum of 1988 (NAVD 88) elevations. All elevations were taken relative to the VPR using a DiNi Digital Level. Initial results show differences in mean elevations of mangrove establishment among sites ranging from 0.481 to 0.515 m NAVD88, with a full elevation range across all sites of 0.274 to 0.733 m NAVD88. The mean elevation among non-mangrove marsh sites ranged from 0.475to 0.553 m NAVD88. The ability to use these elevation data to model where in the landscape black mangroves are expanding will improve our understanding of how this ecotonal region may be affected in the future with climate change.

The near-complete loss of submersed aquatic vegetation (SAV) in the St. Johns River following Hurricane Irma in 2017

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Prior to 2017, dense beds of the SAV, dominated by *Vallisneria americana* (Val) (wild celery, tape grass, locally called eelgrass), had existed in much of the St. Johns River, FL. At a site just north of Palatka ('Bob's dock'), Val had existed continuously as dense beds for at least 55 years. Blades had been 1-2 cm wide and up to 1.6 m long. Surprisingly, the Val survived meter-high waves during Hurricane Matthew in October 2016 with no apparent impacts. However, following Hurricane Irma 11 months later, in September 2017, which was followed by stormy wet weather and high water levels, all of the Val disappeared. Low light is assumed to be the primary and proximate cause of the SAV loss. These and other anecdotal observations by six others indicate that this complete SAV loss occurred from Jacksonville through Lake George (over 160 km). At Bob's dock, a few Val seedlings appeared by 2019 in ankle-deep water. However, none of the Val rosettes has grown taller than 6-7 cm, as of Spring 2021. Thus far, recovery of SAV has been feeble.

Characterization of a Scalloped Hammerhead (*Sphyrna lewini*) Nursery Habitat in Portions of the Atlantic Intracoastal Waterway

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The scalloped hammerhead shark (*Sphyrna lewini*) worldwide population has been in sharp decline, and they are currently listed as a globally critically endangered species by the IUCN. This warrants a need to identify and protect critical habitats for the species, such as nurseries, which promote stable populations. A section of the Tolomato River, in northeastern Florida's GTM NERR, has shown to host large and consistent numbers of young of year scalloped hammerhead sharks. This gave cause to determine whether this portion of the Atlantic Intracoastal Waterway (ICW) serves as a nursery habitat for the species and to understand how the sharks used the area. To declare the Tolomato River as a nursery habitat, three criteria needed to be met: the species were more commonly found in the Tolomato River as opposed to other sites, individual sharks stayed in the area for long periods of time, and the species used the habitat repeatedly across years. To address these criteria, a catch composition analysis, habitat preference study, mark-recapture analysis, and acoustic tracking were conducted. The results from these studies indicate that the Tolomato River serves as a nursery habitat for the scalloped hammerhead shark. Due to the established importance of nursery habitats to the welfare of shark populations, the identification of nurseries is often required in various management plans. Thus, data from this project contributes to the management of the scalloped hammerhead shark, a species in need of protection.

Poster Presentation Abstracts

All abstracts are in order of presenting author's last name. Asterisks indicate student authors: (*) graduate, (**) undergraduate.

Using Hotspotter to identify American alligators in a northeast Florida retention pond

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The American alligator has been increasing in numbers since the Endangered Species Act was passed in 1973. The increase in awareness has led to better alligator management practices. Their native range is distributed around the southeastern United States. In Jacksonville Florida, development is at an increase as well. Increase in both alligator populations and development has created more interactions between people and alligators. Alligators will inhabitant developed wetlands such as canals, lagoons, impoundments, streams, and ponds. In the Everglades, alligators are used as indicators for the health of the ecosystem. The ability to monitor and track alligators in the Jacksonville area will be beneficial for preserving and tracking the health of our natural ecosystems. Previous alligator identification has involved capturing and handling of the animals which can be dangerous for both researchers and alligators. The solution is a noninvasive method such as photo-identification. Every Thursday at 9:00 AM for eight weeks, we went out and photographed alligators for one hour at a retention pond in Duval County, FL. After photographs were taken, the Hotspotter program was used to identify alligators. Hotspotter compares pictures of the different organisms and returns a subset of most likely matches. We used the scutes on the alligators backs for identification. For our eight weeks of data collection, eighteen alligator sightings were recorded. Identification of alligators is currently ongoing.

Marina Observation of Sea Turtles (MOST): Establishing a database of North Florida green sea turtles

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Within the Matanzas River Estuary, there is a lack of submerged aquatic vegetation which provides juvenile sea turtles with nutrition. This requires sea turtles to utilize alternative forage grounds. Observed forage for green sea turtles is the biofouling community present on marinas, pilings, and boats. Little information is known about the population sizes marina support, or if the same turtles remain at a marina for extended time periods. The goal of this research was to photographically document green sea turtles to catalogue individual's unique dorsal scale pattern on their head. to identify individuals through time. Green sea turtles at Camachee Cove Yacht Harbor (CC) and Conch House Marina (CH) were photographed beginning on 3 June 2020. The entire perimeter of the marina was walked to search for turtles. Photographs were taken of the top and sides of the head. As of 31 December 2020, 207 turtles were spotted at CC in 25 trips. A total of 133 were recaptures.

At CH, 159 turtles were spotted in 23 trips, of which 57 were recaptures at CH. The population estimate using the Schnabel method at CC was 73.8 (63.1 – 88.9) while the population estimate at CH was 157.4 (125 – 212.6). Only one turtle was documented at both marinas and represented an injured turtle that was released by a local sea turtle hospital. This database will potentially help track sea turtles before and after injury and subsequent release from rehabilitation centers.

Modeling the Effects of Closed Cuts in the Satilla River Network

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The Satilla River system in southeast Georgia has seen its waterways and estuarine wildlife negatively affected by manmade cuts in the river that resulted in unnatural exchanges of water. The cuts date back more than one hundred years, when the surrounding land was being cleared of timber. The cuts made transportation of timber easier, bypassing the natural serpentine twists of the river, but would subsequently prove detrimental to the estuarine system by introducing unnatural intersections which cause increased erosion and sediment deposits, as well as disturb the natural salt gradient. After years of campaigning by Satilla Riverkeeper, and a feature in Georgia Water Coalition's "Dirty Dozen" list in 2015, the Army Corps of Engineers committed to closing and filling the cuts in the river to begin a restoration process. To test and visualize the effects of the proposal, we set out to make a digital 3D model of the area in ArcGIS and apply the appropriate hydrologic analysis tools. The process started by using a drone to capture aerial imagery in the summer of 2018, however the software's processes required a larger interconnected dataset. 2011 LIDAR data from NOAA was substituted, resulting in a much larger but less detailed model. Once the data was processed, industry-standard hydrologic tools were used to analyze current and proposed scenarios. Creating a model of the Satilla River and its cuts in ArcGIS enables easier visualization of the changes in water flow between scenarios and definitively communicates that closing cuts will reduce deposition.

Success of cement as an alternative substrate for eastern oyster recruitment

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The growing need for oyster reef restoration has led to the creation of thousands of restoration projects across the US. Oyster shell has shown to be the most successful substrate for oyster spat recruitment and growth, due to the release of conspecific chemical cues. Increasing scarcity and cost of oyster shell has led to the use of alternative substrates for oyster reef restoration, including concrete, limestone, and granite. In this study we're comparing eastern oyster (*Crassostrea virginica*) recruitment on oyster shell coated in cement against untreated oyster shell. Data has been collected from September 15th, 2020 to November 25th, 2020 at the Kingsley Plantation within the Timucuan Ecological and Historic Preserve. Mean spat per shell has not differed significantly ($p = 0.2 > 0.05$) between cement-coated ($n = 112$, $\bar{x} = 10.9$, $s = 12.3$) and untreated shells ($n = 112$, $\bar{x} = 8.4$, $s = 9.2$). Our current results suggest that cement is comparable to oyster shell as a recruitment substrate. Cement can be utilized to coat, and bind engineered artificial reefs. With the use of cement, artificial reefs can sustain high levels of oyster spat recruitment while increasing surface complexity and interstitial space, therefore promoting microbial activity and enhancing fish and benthic invertebrate utilization. The use of cement can also limit the need for shell as scarcity and cost increase. This idea has been applied to the novel "Pervious Oyster Shell Habitat" (POSH), which will be evaluated as an artificial reef method in a future study.

Analysis of the fish and crab communities at marinas in the Matanzas River Estuary

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Biodiversity is a key measurement used to assess environmental health in all ecosystems, estuaries included. Anthropogenic structures such as marinas alter the available space for colonization and interaction between species. Because of this, marinas frequently attract non-native species due to the high boat traffic associated with them. Invasive species can negatively impact the ecosystem by competing with native species for resources and may disrupt the energy flow or function of the system. Three cylindrical habitat baskets (0.015 m3 with 6.45 cm2 square openings) filled with sun bleached oyster shells were deployed at four marinas in the Matanzas River Estuary (MRE) to create an artificial habitat for crabs and fishes. We hypothesize that marinas will harbor more invasive crab species than native species and that more crabs will be present in the habitat baskets than fish. Baskets were opened every two weeks to analyze and identify their contents. Observations are still ongoing, but we have seen thirteen different species with the most common being mud crab and hairy blenny. River's Edge had the highest average fish per trap at 5.2 while Camachee Cove had the lowest at 2. For crabs, Conch House had the highest crab count at 8.5 per trap while River's Edge marina had the lowest at 1.5. Further research is needed to fully understand the dynamics of the four different habitats and to conclude if there is an impact of non-native species.

Establishing baseline data on how vegetation presence in an estuary influences juvenile marine communities

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Climate change is causing a shift northward in mangrove ecosystems and this shift has the potential to irrevocably alter salt marsh ecosystems. As the vegetation changes, the resident fish community can also be changed. This project represents a one-part study to evaluate the biodiversity differences between mangroves and salt marsh. A fyke net, 0.6 m X 0.9 m with 6.35 mm stretched mesh, was deployed at two mangroves dominate sites and one transition site. The transition site contained a mix of both mangrove and smooth cordgrass. These sites were chosen in specific to determine if vegetation presence in an estuary influences these nursery communities. The net was deployed for a max of 20 minutes and checked every five minutes. A total of 15 tide-independent sample days have been recorded at three separate sites with 3,582 total individuals recorded. For mangrove site one, 1,735 individuals and 13 species were observed during 115 minutes of sampling. Mangrove site two had 1,434 individuals and 12 species observed during 97 minutes of sampling, and the transition site 3 saw 413 individuals observed and 12 species in 121 minutes. Spot and mullet were the dominant species at all sites. The total population percentage of Brevoortia tyrannus were the same at both mangrove sites, 1.959654% (site 1) and 1.95258%. The total population of Brevoortia tyrannus is lower in mangrove dominate sites than our transition site, catch makes up to 2.179177% of total individuals. Data is still being analyzed, but these results suggest that even small changes in the habitat can potentially influence species composition.

Microplastic Prevalence in the Matanzas River Estuary Between Trophic Levels

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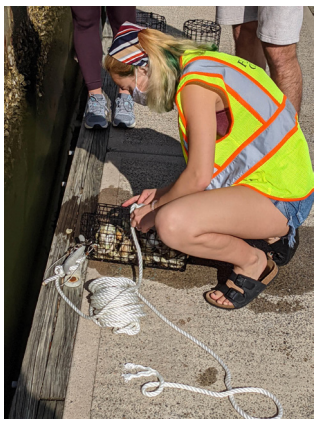
Microplastics are prevalent in the aquatic habitat and their full range of effects on organisms are not known. In previous studies, microplastics have been found in several species, including birds, mammals, reptiles, and fish. In every organism, it has had negative effects, such as reduced energy and behavioral changes. Therefore, we investigated microplastic in the digestive tracts of fish and crabs from the Matanzas River Estuary (MRE) in northeast Florida and how this varied between trophic levels. All microplastics were identified via chemical digestion using potassium hydroxide and hydrogen peroxide, 30 mL of potassium hydroxide and 5 mL of 30% hydrogen peroxide, and then observed under a dissecting scope, with plastics being classified by type and color. Observations confirmed most organisms in the MRE have ingested plastic. Preliminary findings also supported our hypothesis that tertiary organisms tend to have more plastic in their digestive tract than secondary organisms, every tertiary organism having plastic in their digestive tract while some secondary organisms did not contain any plastic. Out of 15 samples with five controls, nine samples contained plastic while every control contained no plastic. The average amount of plastic found in secondary organisms was 2.6 ± 3.4 SD pieces. The average amount of plastic found in tertiary consumers was 9 ± 10.9 SD pieces. While the effects of plastic ingestion are currently unknown in the MRE, research needs to be done to determine whether behavioral changes are occurring, as well as metabolic changes.

Fun in the Field

Top: Amara Davis, **Bottom**: Hunter Mathews

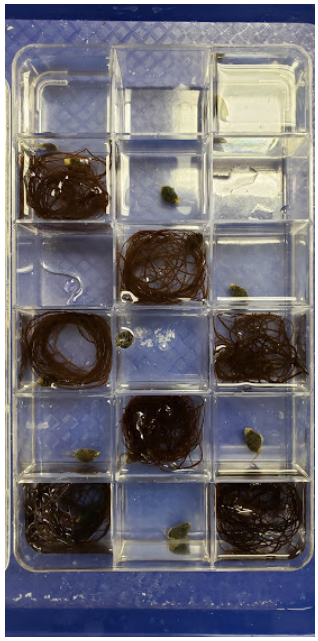
Top: Dr. Matthew Brown **Bottom**: Rachel McDonal

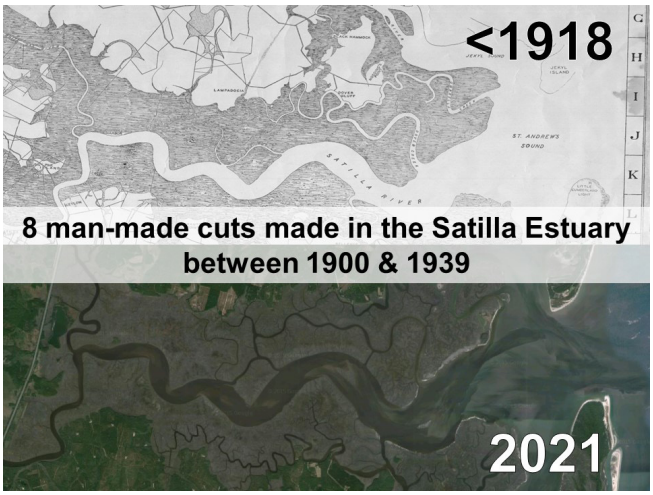
Bottom Left: Ally Bish, **Bottom Right:** Byron Scofield

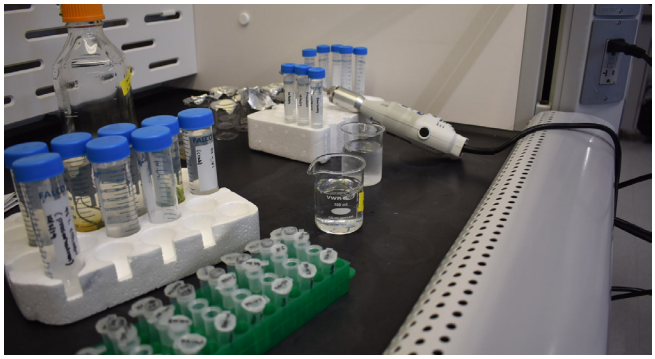


SEERS Science

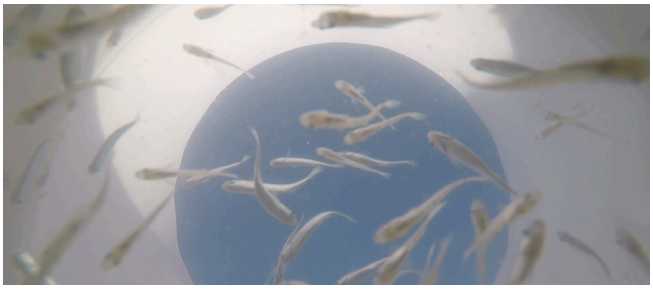
Clockwise starting in top left corner: Marae Lindquist, Dr. April Blakeslee, Julie Krask, Dr. Loren Mathews, Timothy Lee (also pictured on page 5), Amara Davis

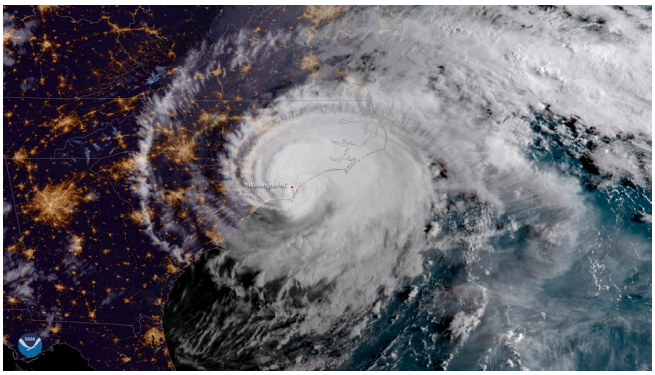




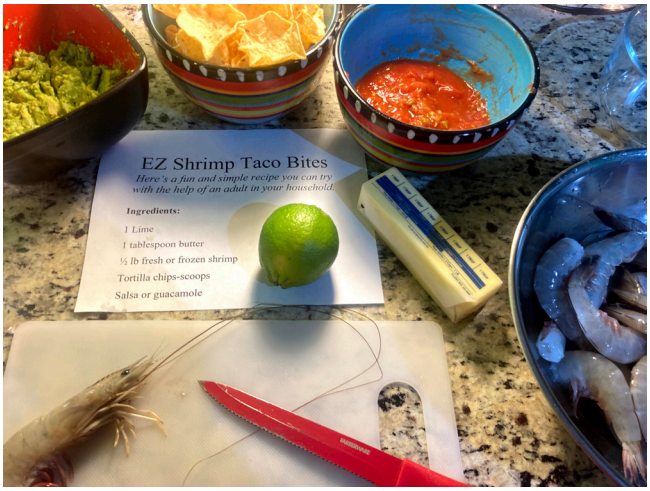


Top: Amara Davis, **Middle:** Jasmine Silvennoinen,
Bottom: Dr. Robert Virnstein





Top: Gabriela Canas (also pictured on page 2), **Middle:** Jesse Beckman, **Bottom:** Kayla Clark



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