COASTAL SCIENCE SYMPOSIUM 2021 PROCEEDINGS

Hosted by the College of Coastal Georgia

Friday, November 12
9:30 am – 11:30 am
Stembler Theatre, Campus Center

WELCOME

Welcome to Coastal Science Symposium 2021, hosted by the College of Coastal Georgia. The annual event brings together students, faculty, collaborators, and community partners to explore coastal and marine science research and applications to society. This year's program features a virtual keynote address by Erin Rivenbark, Biologist and Decision Analyst, U.S. Fish and Wildlife Service. Coastal Georgia students will then present posters showcasing their research and experiential learning in coastal ecology, conservation, environmental science, and more.

Thank you for participating and for supporting our students!

Symposium Organizers: Tate Holbrook, Deborah Browning, Joshua Clark, Kelly Clark, James Deemy, Heather Farley, Janet Gannon, Robin McLachlan, Holly Nance, Traesha Robertson, David Stasek, and Kimberly Takagi

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SYMPOSIUM PROGRAM

Stembler Theatre
The Welcome and Keynote Address will be livestreamed on Microsoft Teams. Click this link to virtually join the presentation: https://bit.ly/3mRZsOs.

9:30 Welcome
Tate Holbrook, Associate Professor of Biology, Department of Natural Sciences
Andrea Wallace, Dean, School of Arts & Sciences
Joshua Clark, Lecturer of Biology, Department of Natural Sciences

9:45 Keynote Address: Working Together for Conservation
Erin Rivenbark, Biologist & Decision Analyst, U.S. Fish & Wildlife Service
Followed by Q&A

Campus Center Lobby
10:30 Student Poster Presentations

KEYNOTE ADDRESS ABSTRACT

Working Together for Conservation

Erin Rivenbark, Biologist & Decision Analyst, U.S. Fish & Wildlife Service

Like the southeastern U.S., the species in need of conservation attention are varied and their challenges are complex. Erin Rivenbark, biologist and decision analyst for the U.S. Fish and Wildlife Service, will share her journey from Brunswick, Georgia, to working on complex conservation decisions all over the U.S. while learning the value of diversity and inclusion in this space. She will also share information on how species are evaluated now and opportunities to engage in conservation going forward.

POSTER PRESENTATION ABSTRACTS

Presenter(s) in bold

Prehistoric Shark Teeth and Marine/Estuarine Fossils of Coastal Georgia from the Miocene, Pliocene, and Pleistocene Epochs

Benjamin J. Angalet[1], Joshua Clark[1], & Lisa Whitenack[2]
[1]College of Coastal Georgia, Department of Natural Sciences; [2]Allegheny College, Department of Natural Sciences

Shark paleoecology is a subject matter that often yields indecisive conclusions based on the limited fossilization of their anatomical structures, with the exception of their teeth. The majority of the Atlantic coast has been studied regarding the presence of certain prehistoric shark species from the Miocene, Pliocene, and Pleistocene epochs. However, the information pertaining to the Georgia coast seems relatively understudied, leaving room for the analysis of its potential community structure during this time. A study was conducted in which thousands of fossil shark specimens and subsequent marine fauna were collected from dredge spoils created by the US Army Corps of Engineers: Savannah District (USACE). A total of 5,127 fossil shark teeth were collected, of which 4,981 were identified. 23 potential species are believed to be included in this assemblage. Additional research conducted by Weems and Edwards (2001) shed light on the fossil formations beneath Brunswick, including their specific depths below sea level. Communication with the USACE detailed their annual dredging depths of 36, 38, and 41 feet below the Mean Lower Low Water (MLLW). Combining this information with the known life histories of each of the 23 species of prehistoric sharks, it was determined that all specimens coexisted during a time period from the late Miocene to early Pliocene (8.0-3.0 Ma). Additional vertebrate fossil specimens collected include but are not limited to toothed whales, dugongs and manatees, sawfish, eagle and bonnet rays, and barracuda. Further research regarding the ecological roles of all identified shark species can create an even more precise outlook on the community structure of coastal Georgia during the late Miocene and early Pliocene.

Analysis of Migratory Butterfly Activity along the Atlantic Flyway in Georgia

David Armstrong, **Maggi Veiga**, **Shelley Prestridge**, **Anne Sanford**, **Carlie Blackburn**, & C. Tate Holbrook, College of Coastal Georgia, Department of Natural Sciences

The Butterflies of the Atlantic Flyway Alliance (BAFA) aims to document seasonal migration activity and guide habitat management for butterfly conservation along the Georgia coast. As part of a BIOL 4020 Conservation Biology service-learning project, we are working with the St. Simons Land Trust (SSLT) and other BAFA partners to conduct butterfly surveys and analyze preliminary results. Standardized fall migration surveys and nectaring surveys are being conducted weekly from mid-August through mid-November in various habitats at Cannon's Point Preserve and other sites. Using BAFA data collected from 2019-2020, we will describe seasonal and habitat-related patterns of migration activity for three focal species—the monarch, Gulf fritillary, and cloudless sulphur—and summarize observed associations between species of butterflies and nectar plants. The overall goal of this study is to inform coastal management plans that will sustain migratory butterfly populations. This work has contributed significantly to the development of our field research skills and demonstrated how to involve the community through citizen science. Future directions of this project may include the conservation of specific flowering plants along with studies on the importance of migratory butterflies in ecosystem functions.

Estimating White-tail Deer Population Density at Cannon's Point Preserve, St. Simons Island, GA

Madison Barnard, Kaylee Clayton, Ricky Livermore, Dan O'Keefe, Trent Williams, & C. Tate Holbrook, College of Coastal Georgia, Department of Natural Sciences

Cannon's Point Preserve (CPP) is a 640-acre peninsula that is protected and managed by the St. Simons Land Trust, with the overarching goal of enhancing the health of rare species, natural communities, biodiversity, and ecological processes. White-tailed deer, *Odocoileus virginianus,* are active herbivores that are highly adaptable, reproduce rapidly, and readily browse on CPP's native vegetation, including sensitive maritime forest species. Intense herbivory pressure can prevent recruitment of plant populations, making it important to determine deer population density to guide conservation management. For our service-learning project in BIOL 4020 Conservation Biology, we established a trail camera deer survey at CPP. We set up six cameras at roughly 100-acre intervals. Each location was baited with corn before and during 10 days of camera operation in late September-early October. The photos were organized into four categories: fawn, doe, buck, and mixed. Individual bucks will be identified based on body size, antlers, and markings. The number of bucks will be used to estimate the numbers of does and fawns and the total population size of deer. Estimates from the camera survey will be compared to spotlight surveys conducted in November, and repeated annual surveys will be used to detect population trends over time. Accurate estimates of deer population densities aid land managers in determining the best plan for ecological management. This project has given us insights into the importance of population estimates for the health of ecosystems, as well as hands-on survey experience that will benefit us in our future careers.

Internship at UGA Marine Extension Coastal Ecology Lab

Joshua Billings, College of Coastal Georgia, Department of Natural Resources

The UGA Marine Extension and Georgia Sea Grant Coastal Ecology Lab contributes to the persistence of healthy native ecosystems and their resident wildlife populations through the field of applied conservation. During my internship this summer, I worked with the Coastal Ecology Lab to mitigate the effects of surface mining operations on wildlife in Southeast Georgia. We focused on removing gopher tortoises from pre-mining sites and safely relocating them to other locations where they could be monitored. The gopher tortoise is listed as a threatened species in the state of Georgia, and protecting viable populations is important in preventing them from being listed under the Endangered Species Act in the eastern part of its range. My time spent with the lab has given me great experience in applied research and taught me a variety of valuable skills that will benefit me in my future. This internship has helped me clarify my academic goals and strengthened my desire to pursue a career in conservation and ecology.

Oyster Spat Recruitment at Cannon's Point Preserve and Horton House

Nicholas Hamilton, Benjamin Angalet, Cheyenne Osborne, Caitlyn Napier, & Kimberly K. Takagi, College of Coastal Georgia, Department of Natural Sciences

Crassostrea virginica or the Eastern Oyster plays a vital role in salt marsh ecosystems. They filter out chemicals in the water as well prevent shoreline erosion. It has many benefits to the salt marsh ecosystem. Examining water quality parameters that make benthic organisms like oysters successful is important in determining oyster recruitment. Thus, this study focuses on the change in the water quality parameters (salinity and temperature) overtime in relation to oyster spat recruitment. Salinity and temperature were collected from two sites. During February through April, oyster spat recruitment was not observed at both sites. When spring and summer arrived along with rising water temperatures, oyster spat recruitment started to appear at both sites.

Environmental Injustice in Atlanta, Georgia: Local Climate Zones, Environmental Inequities, and Urban Climate

Lily Heidger[1,2], François Leconte[3], Rafael Quirino[4], & Mathieu Pétrissans[3]
[1]College of Coastal Georgia, Department of Natural Sciences; [2]Georgia Southern University, 2I-CEMITURE Program; [3]INRAE, Université de Lorraine, LERMaB; [4]Georgia Southern University, Department of Chemistry

Marginalized communities are more often at risk of health detriments due to environmental burdens, heat mortality, and other location-specific hazards. This is the basis behind environmental justice: recognizing and bettering the health of these communities by addressing the environmental concerns. Maps are often used as visual proxies in environmental justice research to provide a spatial analysis of environmental hazards. Urban mapping schemes specifically depict the relationship between location and environmental hazards in and around cities. Such schemes are an important part of the climate change adaptation field, especially in urban contexts. The Local Climate Zone (LCZ) scheme has recently provided a way for researchers to further classify urban and rural areas for the use of urban climate studies. This study uses the opensource geospatial toolbox Geoclimate (https://github.com/orbisgis/geoclimate/wiki) to generate LCZ maps for the area of Atlanta, Georgia, combining this with census-block sociodemographic data from the EPA's EJscreen tool. The open source tool QGIS is used to combine and further analyze GeoClimate outputs and EJscreen data, and statistical analyses are performed with R-studio. With these tools and datasets, the study aims to underline the correlation between local climate zone types and three sociodemographic factors: race, income level, and education. Understanding the correlations among these factors can help to provide insights and new potential methods for analysis for urban planning, policymaking, and environmental justice campaigns in the area of Atlanta and other cities like it.

Ecological and Educational Benefits of a Georgia Living Shoreline

C. Tate Holbrook[1], Cameron Atkinson[1,2], Jordan Fountain[1,3], Stephanie Knox[4], and Jan Mackinnon[1,3]
[1]College of Coastal Georgia, Department of Natural Sciences; [2]Savannah State University, Department of Marine and Environmental Sciences; [3]Georgia Department of Natural Resources, Coastal Resources Division; [4]St. Simons Land Trust

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.

Monitoring Invasive Plant Species at Cannon's Point Preserve and other St. Simons Land Trust Properties

Caitlyn R. Napier, **Chris Pscholka**, **Rebecca Cushing**, **Victoria Martin**, & C. Tate Holbrook, College of Coastal Georgia, Department of Natural Sciences

Invasive species are defined as non-native species that have negative impacts on the environment and/or economy. Invasive species can be found in almost every region on Earth, oftentimes spreading rapidly and dominating the landscape in place of the area's native species. One of Georgia's largest barrier islands, St. Simons Island, is no exception. Members of the St. Simons Land Trust (SSLT) have worked tirelessly to prevent overdevelopment of the island's rare and biodiverse maritime forest, with the 600+ protected acres at Cannon's Point Preserve being one of their greatest accomplishments. However, several invasive plant species have spread at Cannon's Point Preserve and other SSLT properties, threatening the habitat and resources that native species rely on. Our service-learning project for BIOL 4020 Conservation Biology serves as a pilot study for future citizen science efforts to monitor and report the spread of invasive species. We are conducting visual surveys of invasive plant species on SSLT properties, reporting their exact locations and recommended removal method to an online database, and mapping their distributions using ArcGIS. We are also utilizing widely accessible, free software including iNaturalist and EDDMapS that could be used by members of the community with the shared goal of conserving our natural environment.

The Presence of *Crassostrea virginica* Larvae and their Relationship with Turbidity and Ammonia Levels along the Southeast Georgia Coast

Caitlyn R. Napier, Cheyenne Osborne, Nicholas Hamilton, Benjamin Angalet, & Kimberly K. Takagi, College of Coastal Georgia, Department of Natural Sciences

Oysters are directly responsible for the continued existence and maintenance of the world's salt marshes, as well as the other organisms that inhabit them. Their larvae is of particular importance, as unsuccessful settling of the juvenile form will result in significant reductions in oyster populations. In this study, we looked at how turbidity and ammonia levels impacted the settlement of Crassostrea virginica larvae in six different locations along the Southeast Georgia barrier island salt marshes. We then conducted various analyses to determine if there was a correlation between spat recruitment and our parameters. Our results showed that there does appear to be a correlation between spat recruitment and turbidity levels, however, there does not appear to be a correlation between spat recruitment and ammonia concentrations. Further studies should be conducted to affirm these results.

The Effects of Salinity, pH and Carbon Dioxide on *Crassostrea virginica* Oyster Spat Recruitment along the Georgia Coast

Cheyenne Osborne, Caitlyn Napier, Nicolas Hamilton, Benjamin Angalet, & Kimberly K. Takagi, College of Coastal Georgia, Department of Natural Sciences

Salt marshes on the South Georgia coast are critical to protecting the mainland from natural erosion from the ocean and storms. The salt marsh in turn, is protected by barrier islands and reinforced by organisms such as *Spartina alterniflora*, or smooth cordgrass, and the Eastern oyster (*Crassostrea virginica*). *C. virginica* also plays a massive role in filtering the saltwater rivers where they settle. This study focused on the ideal salinity and pH parameters for *C. virginicia* spat recruitment in Glynn County, Georgia at Horton House Historical Site (HOR), Cannon's Point Preserve (CAN), and UGA Marine Extension (UGA) developed by Atkinson and Deemy (2019). CO_2 was observed for a relationship with oyster spat settlement. Results for habitat quality were against predictions across all sites. CO_2 was confirmed to influence recruitment, though further studies are necessary to determine how.

What Trees Are Argentine Ants Sweet On?

Gabriela Welch[1,2] & Joshua D. Gibson[3]
[1]College of Coastal Georgia, Department of Natural Sciences; [2]Georgia Southern University, Interdisciplinary Research Experiences in Coastal Plain Science Program; [3]Georgia Southern University, Department of Biology

Argentine ants are an invasive species that outcompete native ants in their territories. Their mutualism with honeydew-producing insects results in negative impacts to agriculture and plants. I hypothesized that due to the host-tree preferences of honeydew-producing insects, Argentine ants visit and collect honeydew from some genera of trees more frequently than others. We visually identified ants on certain genera of tree (*Quercus*, *Pinus*, *Acer*, *Lagerstoemia*, *Taxodium*) on the Georgia Southern Statesboro campus and scored them with the presence or absence of Argentine ants. Additionally, we photographed ant trails on the trees. We will use an image analysis software (ImageJ) to measure the head-to-gaster size ratio of the ants. Using a normalized gaster size, we will then compare the size of ants moving up versus down the tree and compare gaster sizes across tree genera. These comparisons will show whether ants are carrying honeydew back to their nest and if so, from which tree genera. The preliminary results indicate that Argentine ants visit *Quercus* and *Lagerstroemia* in a higher proportion than other genera. We predict that we will also observe a larger normalized gaster size in ants moving down trees versus those moving up and that gaster size difference will vary across tree genera. The data obtained through this study can be used to inform landscaping decisions to minimize resources for Argentine ants to help control their population and to curb populations of homopteran pests.

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