



PROCEEDINGS OF THE THIRD ANNUAL COASTAL ECOLOGY SYMPOSIUM

Hosted by the College of Coastal Georgia

3 November 2017
9:00 a.m. – Noon
Southeast Georgia Conference Center

WELCOME

Welcome to the 3rd Annual Coastal Ecology Symposium at the College of Coastal Georgia, where students, faculty, scientists, coastal managers, and community members gather to share research results and explore ways to conserve Georgia’s coastal environment and natural resources. This year’s program includes a talks by distinguished guest speakers, poster presentations and a film screening by CCGA students, mentors, and collaborators, and an information fair featuring exhibitors from public agencies, environmental NGOs, and academia, with opportunities for student and community engagement.

Thank you for participating and for supporting CCGA and our Georgia coast!

Organizing Committee:

Tate Holbrook, Holly Nance, Traesha Robertson, and David Stasek

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SYMPOSIUM PROGRAM

Lobby

8:30 Registration and light refreshments

Auditorium

9:00 Welcome

Tate Holbrook, Organizing Committee

Meg Amstutz, Interim President

Kay Hampton, Interim Provost and Vice President for Academic Affairs

9:15 Will a changing climate affect Georgia fisheries?

Rachel Guy, Research Coordinator, Sapelo Island National Estuarine Research Reserve

9:45 Microplastics in Georgia's estuaries: distributions and interactions with life

Jay Brandes, Professor, Skidaway Institute of Oceanography, University of Georgia

10:15 An overview of the Georgia Coastal Management Program

Jan Mackinnon, Program Manager, Georgia Coastal Management Program, Georgia Department of Natural Resources

10:45 Film Screening: Tackling Trash in the Golden Isles

Aria Colangelo, Student/Intern, College of Coastal Georgia and University of Georgia Marine Extension and Georgia Sea Grant

Jerico, Altamaha, and Satilla Rooms

11:00 Poster Presentations

Lobby

11:00 Information Fair

ORAL PRESENTATION ABSTRACTS

Will a changing climate affect Georgia fisheries?

Rachel Guy, Sapelo Island National Estuarine Research Reserve

The effects of climate change on estuarine-based fisheries are largely unknown. Focusing on coastal Georgia, this research explores the intersection of the ecological and social changes to fisheries that might be anticipated with a changing climate and rising sea levels. The question of climate-induced system change is approached by analyzing the social and ecological vulnerability of the fisheries. This is accomplished by determining the influencing factors of the temporal and spatial variability of species distributions and using these factors to forecast species distributions under different scenarios of sea level rise. Finally, the social systems that support or limit fisheries are considered in tandem with the potential effects of climate change on these systems.

Microplastics in Georgia's estuaries: distributions and interactions with life

Jay Brandes, Skidaway Institute of Oceanography, University of Georgia

Marine debris and associated plastic contamination of the marine environment has become an ever-increasing source of concern for scientists and the public. Over the last decade, focus has begun to be placed on the issue of microplastics (plastic contaminants smaller than 5 mm in length) and their impacts upon the environment. Such microplastics can come from many sources: breakdown products from larger plastic debris, microbeads used in cosmetics, and fibers found in clothing and other textiles. Dr. Brandes and colleagues have begun a preliminary assessment of the distribution and types of microplastic contamination in Georgia's estuaries, biota and sediments during the last two years. Microplastics are very unevenly distributed in the environment, yet are found in nearly every location sampled along our coast. The most surprising result of this research is the dominance of microfibers over other plastic forms in the environment and in marine life.

An overview of the Georgia Coastal Management Program

Jan Mackinnon, Georgia Department of Natural Resources

It is the mission of the Georgia Coastal Management Program (GCMP) to balance economic development in Georgia's coastal zone with preservation of natural, environmental, historic, archeological, and recreational resources for the benefit of Georgia's present and future generations. The GCMP offers technical assistance to local governments, property owners, developers, and the public to provide expertise on coastal issues, minimize environmental impacts, clarify regulatory requirements, and identify agency contacts. GCMP provides information on Best Management Practices and technical guidance on planning and design as well as information on habitat and endangered species. GCMP serves as a liaison among various agencies and institutions and maintains a list of contacts. GCMP provides forums for local governments, developers, and citizens to discuss potential resource issues and permit requirements with the appropriate agencies. The goals of GCMP Coastal Specialists are to promote sustainable development, to work with local governments to address natural resource issues, and to create a central source of information on coastal management issues.

POSTER PRESENTATION ABSTRACTS

Conservation and preservation of the eastern indigo snake

Bettie Annable, Department of Natural Sciences, College of Coastal Georgia

Since 1978 the eastern indigo snake has fallen victim to the federally threatened and endangered species list. These snakes are endemic to the southeastern United States and found primarily in Georgia and Florida, although historically their range once expanded through to Alabama and South Carolina. Decades of habitat destruction, illegal pet collection and extirpation have reduced the species population to an all-time low with numbers still declining. Many non-profit organizations and government agencies have taken interest in helping preserve these beautiful creatures which has delivered promising results with capture/relocation programs all across the Southeast. Despite these efforts populations continue to decline. Due to multi-habitat use of eastern indigo snakes, further research into the uses of these ecosystems and how the snakes affect the surrounding biota could help us learn about their adaptive abilities to new surroundings. Although the species is endemic, the overall population could thrive elsewhere if we could delve into how they interact with other species to see if its reintroduction would prove beneficial or invasive. Gopher tortoise populations directly relate to populations of eastern indigo snakes; therefore, more research into this relationship could benefit future conservation plans.

Service-learning internship: Chattahoochee Forest National Fish Hatchery

Johnny Beno, Department of Natural Sciences, College of Coastal Georgia

In the summer of 2017, I worked as a summer intern with the US Fish and Wildlife Service at the Chattahoochee Forest National Fish Hatchery. My responsibilities were participating in the day to day tasks that the permanent staff carries out year round. During my time there, I learned a lot about husbandry and what it takes to raise close to a million fish in a year, as well as the web of cooperation between state and federal agencies that is required to finance and maintain a huge operation like the hatchery. The most important thing that I learned about this summer was the decline of governmental funding for things like wildlife conservation and resource management. This showed me how important it is to get people to care about wildlife conservation so that organizations like the Fish and Wildlife Service have funding to carry out their basic purpose of providing a chance for people to get outside and enjoy nature through activities like fishing, hunting, and hiking.

Burmese python management

Johnny Beno, Department of Natural Sciences, College of Coastal Georgia

The Burmese python invaded southern Florida in the early 1990's and less than ten years later established a large population in the Everglades. Since the introduction of these giant snakes, populations of mammals in the Everglades have decreased more than 90%. Despite many efforts from the Everglades National Park and US Fish and Wildlife Service, the snakes are reproducing at astonishing rates and efforts have now been diverted to stopping the spread of the pythons. There is some debate about how far the pythons will be able to spread; however, the fact that these snakes can warm their eggs through a process called thermogenesis means that they may be able to survive further north than most other tropical species. Coupling thermogenesis with increasing global temperatures, the snakes may pose a threat to southern Georgia, including the Okefenokee Swamp, and cause the same kind of damage it already has in the Everglades.

Lasiurus intermedius, the northern yellow bat, conservation plan
Ashlyn Bone, Department of Natural Sciences, College of Coastal Georgia

The northern yellow bat, though not listed as an endangered species globally, is threatened here in our Georgia Coastal Plain. This large, yellow-haired bat lives in the Spanish moss of live oaks and longleaf pines. The northern yellow bat has a wide distribution that covers most of the east coast of North America, though its density is not well known. Its current biggest population threat is the urbanization and development of its natural habitat. However, this temperate northern bat is also threatened by a rising fungal disease called white-nose syndrome (WNS). WNS disturbs the bat's natural hibernation cycle causing the bat to deplete its stored energy and ensues rapid death during the harsh winter months. Through more WNS research and natural habitat protection, the northern yellow bat can rebuild its population on our coast and continue its ecological importance as a nocturnal predator.

Gopher tortoise conservation
Sarah Buckley, Department of Natural Sciences, College of Coastal Georgia

The gopher tortoise (*Gopherus polyphemus*) is a terrestrial species typically found in longleaf pine forests. They can be identified by their dark oval shaped shells and their hook-like front legs which they use to create their burrows. These burrows are why they are considered a keystone species, because over 350 species use them for refuge. Considered to be Vulnerable on the IUCN Red List, people are beginning to take note and look at what they can do to help this species that plays a vital role in the success and stability of other species living around them.

Service-learning internship in biology at UGA Marine Extension and Georgia Sea Grant
Aria Colangelo, Department of Natural Sciences, College of Coastal Georgia

During the 2016-2017 school year, I was provided with the opportunity to work with the University of Georgia Marine Extension and Georgia Sea Grant in Brunswick, Georgia. The Water Quality Program Coordinator, Katy Smith, brought me on board as an intern to help manage a NOAA-funded project called *The Salt Marsh Soldiers Tackle Marine Debris in Coastal Georgia*. Throughout the project, we visited two seventh grade classes at Glynn Middle School with the determination to teach them all about marine debris. By performing quarterly lessons throughout the school year, we taught the students about their coastal environment and how they can help protect it. We used hands-on activities and guest speakers to show the students the threats marine debris poses and solutions they can use to help reduce debris that ends up in our ocean. The environmental club, Salt Marsh Soldiers, were also key to the project in their hard work of cleanups around the school and local community. After the school year, we participated in public outreach engaging the community in the importance of our project by participating in cleanups, conferences, and film festivals. My experience with UGA MAREX has allowed me to find my passion of protecting our beloved coastal ecosystems by pushing forward with my work of understanding our coast and the resources it has to offer.

The North Atlantic right whale: How much longer do they have?

Aria Colangelo, Department of Natural Sciences, College of Coastal Georgia

Being in a community along the coast inhabiting the breeding grounds for the North Atlantic Right Whale (*Eubalaena glacialis*), we have become the species greatest threat. Development along the Georgia/Florida coast has contributed to entanglement and pollution in these coastal waters the whales favor for breeding. The right whale is one of the largest marine mammals in our oceans today that has been classified as endangered. The feeling of being splashed with stinging saltwater by the tail of a huge right whale will soon disappear if we are unable to come up with successful conservation techniques protecting this organism. Reading the current efforts and laws put in place, such as the Marine Mammal Species Act, to help protect this species from going extinct, it inspired some of my own conservation strategies. Targeting the public through the power of knowledge would be my first step. Public awareness would then lead me to working closely with environmental engineers to create an app allowing citizens to contribute to science efforts with the use of images creating awareness of where these organisms are within our oceans for local boaters and oceans explorers to avoid. Together as a community, as a species, we can help save these magnificent creatures.

Sciurus niger niger: A conservation plan

Jonathan Erickson, Department of Natural Sciences, College of Coastal Georgia

Sciurus niger niger, the southern fox squirrel, dwells in longleaf pine and mixed hardwood forests with open understory ranging from northern Florida to North Carolina in the coastal plains and piedmont. The species status is not listed in Georgia as of 1993. Conservation plans include assisted colonization to islands in the Southeast, prescribed burns of existing pine forest to clear understory brush, and using artificial tree cavities. Research should focus on the range and density of populations around the coast, maybe using trail cameras pointed at squirrel feeders to identify individuals. Spreading feeders out around Glynn county and identifying squirrels that travel between feeders can help establish barriers to movement and home ranges. Citizen scientists can photograph and GPS-tag squirrels on www.inaturalist.org to crowd-build a range map. A local solution to isolated populations in Glynn County would be reintroducing southern fox squirrels to Jekyll Island and St. Simons Island, where their natural and artificial habitats can be found. This effort would take time to understand the ecological and socioeconomic impacts of southern fox squirrels on the islands. A good territory candidate for assisted colonization could be the Jekyll Island Golf Club.

Red-cockaded woodpecker conservation

Ryan Hagadone, Department of Natural Sciences, College of Coastal Georgia

The red-cockaded woodpecker (*Picoides borealis*) was put on the endangered species list back in 1970 due to the massive loss of habitat. They primarily live in mature longleaf pine forest that have low understory and are accustomed to annual fires. Typically, the pine has to be 60-80 years old and have red heart fungus which allows them to bore out a cavity to nest in. I am trying to come up with some conservation ideas to help increase population sizes. The ideas that I have use some of the things that are already being done and also some new strategies. I would like to do more research to find out if red-cockaded woodpeckers can utilize an alternative pine tree species if they do not have access to longleaf pine. One of the major ideas that I have is to use reforestation processes on longleaf pine forest.

Conservation of swallow-tailed kites, *Elanoides forficatus*

Rachel James, Department of Natural Sciences, College of Coastal Georgia

The swallow-tailed kite, *Elanoides forficatus*, is a rare bird in Georgia. They rely on the critical breeding habitat provided by forested areas in the coastal plain. Conservation of this species will involve researching their habitat selection behaviors and selecting the best areas to protect from development and logging.

West Indian manatee, *Trichechus manatus*, conservation in coastal Georgia waters

Megan Lovell, Department of Natural Sciences, College of Coastal Georgia

The West Indian manatee, *Trichechus manatus*, inhabits our Georgia coastal waters, estuaries, and major rivers during the months March to November. They have no natural predators, but they are threatened by anthropogenic factors. Boat collisions are the primary cause in mortalities; though, destruction and fragmentation of their habitat is also a major threat. Therefore, I propose designating manatee reserves with lessened speed limits, and/or only allowing jet propelled vessels or troll motorized vessels, or no boating periods in site specific areas of coastal Georgia. In addition, whether on a reserve or where there are manatee populations in distress, I suggest finding alternative ways to warm waters to increase their habitat. Also, I recommend including West Indian manatee and other endangered Georgia wildlife awareness and restrictions in boating license courses and on tests.

Georgia's newest annoyance: the tawny crazy ant

Ayron Moleen-Smith, Department of Natural Sciences, College of Coastal Georgia

The tawny crazy ant (*Nylanderia fulva*) is one of Georgia's newer invasive species, but has the potential to be very impactful. It is currently outcompeting another very successful invasive species, the red imported fire ant, by using a unique acid that leaves them immune to fire ant venom. This along with their use of sheer numbers has been the key to their success. Their colonies have multiple queens and do not compete with one another, rather they join forces and exhibit 'unicolonial' qualities. While these insects do not bite or sting, they do cause pain in the wallet. They have cost Texas and Columbia quite a bit through damage to personal and commercial property. These small ants have an affinity for electronics which can grow expensive quickly. They have spread from both Florida and the port of Savannah into our area and are currently expanding their impact. The most promising solutions available are biological in nature and need further study.

Revisiting Fortson Pond: assessing hydrology through modeling for strategic restoration planning
Yank Moore and Ben Carswell, Jekyll Island Authority

During the development of Jekyll Island, Georgia in the first half of the 20th century, construction of hard infrastructure resulted in hydrologic alteration and fragmentation of a tidal system that was historically known as First Creek. These alterations were drastic enough that First Creek no longer appears on modern maps. The modification of this system has impacted modern ecology, hydrology, and visitor experiences. The current state is an expanse of unvegetated mucky sediment of dead non-toxic colonial cyanobacteria species, *Aphanothece stagnina*, which has been determined to be the dominant over-abundant species.

This effort was a follow-up to a previous CIG grant and the main purpose was to use modeling techniques to compare these different strategies to improve tidal inflow and outflow as well as flushing within Fortson Pond and how these strategies affected other areas of the system. We ultimately chose three alternatives that we believed would show the largest amount of improvement while keeping the cost of restoration to an obtainable level. Through a calibrated model, we were able to predict that adding a culvert under Ben Fortson Pkwy. and restoring flow back to the system would improve the overall flushing capabilities of the system.

Management plan: flathead catfish (*Pylodictis olivaris*)

Katie Mulkey, Department of Natural Sciences, College of Coastal Georgia

The flathead catfish is an invasive species that is native to the Mississippi River and central U.S. It has been in nonnative areas since the 1950s and was first documented in the Satilla River in the 1990s. They grow very large, reproduce quickly, and are ferocious eaters. They overwhelm the ecosystem and devour many of the native fish species. The flathead catfish is responsible for the decline in native species such as the redbreast sunfish and the bullhead catfish. The DNR in Waycross, GA has begun electro-fishing, which is the method of sending volts electricity at a high frequency through the water to stun the catfish and bring them to the surface for removal. This method of removal has seen a 50% decrease in the population. Educating the public on correct identification of the flathead catfish will help with the continued management of this species.

Service-learning internship: Savannah National Wildlife Refuge

Laurel Nason-Wheeler, Department of Natural Sciences, College of Coastal Georgia

I was able to spend my summer at the Savannah National Wildlife Refuge in Hardeeville, South Carolina. This refuge is made up of seven territories that stretch from Hardeeville all the way to Townsend, Georgia. During my internship I visited almost every territory and assisted in an array of areas: visitor services, environmental education, wildlife biology, sea turtle conservation, archeology department, and the mechanic shop. This summer I was able to see and truly understand how important the refuge system is for our country – and for the safety of many threatened animals! They do so much more than point you to the best walking trails – these people have a passion for keeping nature wild and sharing that passion with others. They actually sparked a passion in me and I am now pursuing a career in the refuge system.

Elliosia sapina (Altamaha spiny mussel) conservation

Laurel Nason-Wheeler, Department of Natural Sciences, College of Coastal Georgia

Elliosia sapina, the Altamaha spiny mussel is an endangered species of freshwater mussel that is native to the Altamaha River basin. Once abundant, they are now limited to the Coastal Plain and the major tributaries. Habitat loss due to increased sedimentation, development of residential structures, and salinity changes are suspected in their 70-80% population decline. By conducting a controlled breeding experiment, the population can be revived as well as receive a boost in genetic diversity, giving the spiny mussels a chance to fight extinction. Mussels would be collected and kept in a stretch of the river using wire mesh as protection from larger predators. They would be able to reproduce and grow without the majority of outside threats, and then the new mussels can be released into the Altamaha upon sexual maturity. Such experiments have already been conducted on other species like salmonid fishes, though they were raised in hatcheries and thus had fitness related complications upon their release into the wild. This should not be an issue with the spiny mussel breeding since the experiment would be held in their native waters.

Detecting invasive lionfish (*Pterois volitans* and *Pterois miles*) in Georgia estuaries using eDNA

Charis Peterson and Holly Nance, Department of Natural Sciences, College of Coastal Georgia

Native Indo-Pacific lionfish (*Pterois volitans* and *Pterois miles*) were introduced to waters off south Florida in the 1990s, and since then have expanded their range as far north as North Carolina. As habitat and diet generalists, lionfish established themselves in the Caribbean and south Atlantic coast of the United States, and have caused declines in the abundance of native reef fishes. Given their tolerance for a broad range of salinities and successful invasion into estuarine ecosystems in Florida, we aim to assess whether lionfish are present in coastal Georgia by amplifying environmental DNA (eDNA) from water samples collected in estuaries between Brunswick and Savannah. Successful amplification of mtDNA control region from our water samples, using primers designed for lionfish, could indicate this highly invasive species is present in our area and could potentially impact native species.

Lionfish management plan

Charis Peterson, Department of Natural Sciences, College of Coastal Georgia

The lionfish, *Pterois volitans*, is native to warm tropical waters in the Indian and South Pacific Oceans. *P. volitans* was introduced to the southeastern United States in the early 1990's. Lionfish are one of the most destructive invasive species in the Atlantic Ocean. They are a top predator in all of the ecosystems they live in and eat much more than native Caribbean predators. *P. volitans* has a very high reproductive rate; females can spawn every 4 days and produce 10,000-40,000 eggs each time. Their fast reproduction rate has made them nearly impossible to manage. Several solutions have been proposed but none seem to manage this problem.

The prevalence of hookworms in our area

Sarah Siekkinen, Department of Natural Sciences, College of Coastal Georgia

Community Partner: Integrity Animal Hospital

In our area hookworms are an underlying issue that could cause future problems if not controlled now. It is through our household pets that we can start the prevention of these parasites becoming a pest. Some animals, when infected, can die and others can be hospitalized for days. During my research, I wanted to find if there was a way to predict whether a dog would be predisposed to a hookworm infection. I looked at location, age, breed, and weight as factors that correlated to the presence of hookworms. Working at Integrity Animal Hospital allowed me to obtain positive results as they were examined and keep up with my results using the veterinary software, Cornerstone. My study started in March and ended in July where during that time I came across 59 positive cases. I was not able to find a correlation between location, breed, or weight, but age played a factor in the presence of hookworms. Young puppies seemed to be predisposed to hookworm infection along with other parasites. My research not only found a correlation with age, but also brought up another set of issues. Taking small steps to avoid transmission and using prevention can aid in not only our safety, but our household pets as well.

Management and prevention of further expansion of the Cuban tree frog (*Osteopilus septentrionalis*)

Khalil Smith, Department of Natural Sciences, College of Coastal Georgia

The Cuban tree frog has been a resident of the Florida Keys since the 1930's but they have been anything but a welcome guest. The Cuban tree frog outcompetes most other species of its size in this hot humid habitat. Because of this fact, as well as its voracious appetite, the Cuban tree frog has become a threat to native species in the ecosystems it has taken over. Due to the global increase in temperature caused by climate change the Cuban tree frog's range in the United States is pushing farther north. To prevent their spread, we must ask for the help of citizens in the areas the population is pushing towards. By providing information identifying this species as well as information on ways to humanely euthanize them it is possible to slow their spread north and keep them within the range they maintain now. This is crucial to maintaining the balance within the ecosystems we have now and in preventing the loss of native species.

Wild hog management

Calvin Thigpen, Department of Natural Sciences, College of Coastal Georgia

Wild hogs, *Sus scrofa*, are a highly invasive species that were introduced to North America from Europe and Asia. The reason this species is highly invasive is because of their diet variety which can consist of seeds, plant material, animal matter, and fungi. They compete with native species of the areas where they are introduced. The amount that wild hogs affect native species needs to be studied more. There are some studies, but not all the authors agree on the effects. Some of the damages that this species causes are destruction of forests, private property and other natural areas. Also, wild hogs are predators of loggerhead sea turtle eggs. We need to manage this species by working with local agencies and the community like the Department of Natural Resources and hunters.

DNA methylation in *Fundulus heteroclitus* in response to mutagens at EPA Superfund sites

Joshua Wasdin¹, Marielis Nieves¹, Anthony Sowers², Holly Nance¹

¹Department of Natural Sciences, College of Coastal Georgia

²US Fish and Wildlife Service

Epigenetics is the study of heritable changes in an organism's gene expression without altering their DNA sequence. DNA methylation of cytosine nucleotides in the promoter region of genes can alter gene expression, effectively turning those genes 'off'. Promoter regions rich in cytosine and guanine (CpG islands) are hotspots for such methylation and altered gene expression. Increasing evidence suggests environmental factors, including toxins, can alter DNA methylation, and therefore, gene expression. This study examines epigenetic differences among the target species *Fundulus heteroclitus* (mummichog or Atlantic killifish) collected near two Superfund sites (impacted by several contaminants including toxaphene and the PCB mixture Aroclor 1268) in Brunswick, GA, relative to control *F. heteroclitus* collected from uncontaminated sites near the Harris Neck National Wildlife Refuge in Townsend, GA and Appledore Island, ME. Specifically, we are looking for differences in methylation of the promoter regions of two aryl hydrocarbon receptor (AHR) genes in *F. heteroclitus*. AHR genes encode proteins involved in regulatory responses to toxins in mammals and fish. Results from this study could provide new insight regarding how these two Superfund sites may be impacting coastal communities.

EXHIBITORS

Coastal WildScapes
Georgia 4-H Tidelands Nature Center
Georgia Department of Natural Resources Coastal Resources Division
Glynn Environmental Coalition
Georgia Sea Turtle Center
Jekyll Island Authority
Keep Golden Isles Beautiful
One Hundred Miles
Sapelo Island National Estuarine Research Reserve
Satilla Riverkeeper
The Dolphin Project
The Nature Conservancy
UGA Applied Wildlife Lab
UGA Marine Institute
UGA Marine Extension and Georgia Sea Grant

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Aladdin Food Management Services
Guest Speakers
Community Partners
Student, Faculty, and Staff Participants and Volunteers

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