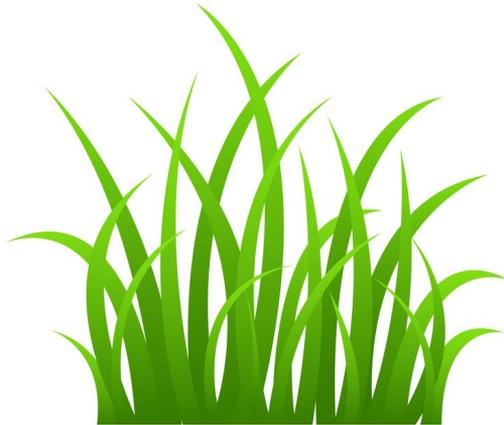




The Wetlands Institute Intern Symposium

Monday, August 6, 2018

3:30 pm



The Coastal Conservation Research Program

The Environmental Education Program

**Thank you for joining us to celebrate the
accomplishments of The Wetlands Institute
2018 Summer Intern Programs!**

The Wetlands Institute Staff

Lenore Tedesco, Ph.D., Executive Director

Lisa Ferguson, Ph.D., Director of Research and Conservation

Brooke Knapick, Director of Educational Program Development

Brian Williamson, Research Scientist

Brittany Morey, Research Associate

Steven Luell, CCRP Intern Coordinator

Coastal Conservation Research Program Interns

Kirstine Grab, *University of Minnesota*

Jamie Infanti, *University of Connecticut*

Sarah Kerr, *Clemson University*

Amanda Lillie, *Tufts University*

Amanda Lyons, *Brown University*

Daniel Stoner, *Kutztown University*

Environmental Education Program Interns

Gregory Fischer, *Stockton University*

Joseph Hernandez, *Stockton University*

Diana Moczula, *Carleton University*

Samantha Najarian, *College of Charleston*

PROGRAM SCHEDULE

Welcome and Introductory Remarks – Lenore Tedesco
Coastal Conservation Research Intern Program – Lisa Ferguson
Environmental Education Intern Program – Brooke Knapick

INTERN PRESENTATIONS

Evaluating efforts to decrease Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) mortality rates along a coastal causeway - Amanda Lillie

Terrapins Crossing through the Marsh: Translating The Wetlands Institute's Terrapin Tracking Data into an Educational Display - Diana Moczula

Characterizing Head-started and Juvenile Diamondback Terrapin (*Malaclemys terrapin*) Habitat and Movement Using Radio Telemetry - Kirstine Grab

An Inside Look at the Salt Marsh: Using Aquaria and Interactive Exhibits to Highlight the Importance of Salt Marsh Organisms to the Habitat and to People - Joseph Hernandez

Understanding Mass-Specific Physiological and Metabolic Differences in Head-Started Diamondback Terrapins (*Malaclemys terrapin*) - Sarah Kerr

INTERMISSION WITH LIGHT REFRESHMENTS

Hatching Success of Laughing Gull (*Leucophaeus atricilla*) based on Habitat Use and Characteristics - Daniel Stoner

Dredging Up Dredged Materials: Creating a Science Feature to Educate the Public about Soils and their Importance - Gregory Fischer

Behavior and Nest Site Selection in a Mixed-Species Colony of Black Skimmer (*Rynchops niger*) and Common Tern (*Sterna hirundo*) - Jamie Infanti

Who Exactly Are We Catching?: Enhancing Various Boathouse Activities to Promote Environmental Education for All Ages - Samantha Najarian

Comparison of methods for surveying diamondback terrapin (*Malaclemys terrapin*) populations in tidal creeks - Amanda Lyons

ABSTRACTS

Evaluating efforts to decrease Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) mortality rates along a coastal causeway – Amanda Lillie, Tufts University

During the summer months, northern diamondback terrapin populations are vulnerable to increased road mortalities as nest-seeking females venture to find higher nesting grounds near roadways. This study aimed to assess the effectiveness of a new terrapin nesting and activity sign placed in front of The Wetlands Institute on Stone Harbor Boulevard, a major coastal causeway in Cape May County, New Jersey. This road was driven seven times a day between 6:00am and 10:00pm to gauge terrapin activity in relation to time of day and tidal patterns. Three cameras monitored activity on The Wetlands Institute property from 4:00pm through 10:00am. Road patrols found that 93.7% of terrapin road encounters occur diurnally, but camera traps detected an average of two turtles per night. Data was run through hot spot analysis using ArcGIS, finding that in summer 2017 there was a significant road mortality hotspot out front of The Wetlands Institute. During the same time frame in summer 2018 when the sign was in place, that hot spot was no longer observed. A survey conducted to gauge how the public has responded to the sign showed that in 480 responses, 66.0% reported they drove 10 with more caution after seeing the sign and 66.7% believe that flashing lights or bright colors would be most eye-catching for road signs. These results suggest that terrapin nest-seeking activity is not strictly diurnal and that though dynamic signs may change driver behavior, they may not completely eliminate road mortality.

Terrapins Crossing through the Marsh: Translating The Wetlands Institute's Terrapin Tracking Data into an Educational Display

Diana Moczula, *Carleton University*

Embedding in-situ research findings into education programs is one aspect that makes public education programs at The Wetlands Institute (TWI) unique. We believe that without research the education realm ceases to grow, while without education the importance of research fails to reach the public. Therefore, there must be a balance between education and research for conservation initiatives to be successful. With constant threats facing terrapins, researchers at TWI diligently conduct research to better understand these threats and the species. Microchipping terrapins is critical to mark and recapture research, by providing researchers with information about terrapin nesting, behavior and the progress of rehabilitated terrapins. Unfortunately, as research remains largely unseen, many members of the public fail to realize its importance to terrapin conservation.

Each terrapin comes with a story; a story, which often does not leave the realm of the researchers who learn about it. However, if the public becomes aware of these stories it could generate a deeper connection between them and the terrapins. This can be accomplished by translating years of terrapin tracking research data into an educational terrapin tracking display located in TWI's Terrapin Station. The goals of this interactive display are to generate a connection between the public and terrapins, ignite a desire to conserve this species, learn about the importance of mark and recapture research, and ultimately understand the threats terrapins endure. These goals will be achieved by creating a display that consists of terrapin profiles (including the terrapin's biography) and an interactive microchipping and mapping activity.

Characterizing Head-started and Juvenile Diamondback Terrapin (*Malaclemys terrapin*) Habitat and Movement Using Radio Telemetry

Kirstine Grab, *University of Minnesota*

For many turtle species, the hatchling and juvenile life stages remain a mystery that leaves parts of populations unmonitored and vulnerable to threats. To better understand the young life stages, I used new radio telemetry technology to track head-started diamondback terrapins and gather data on their movement and habitat choice using a combination of stationary and mobile receivers. Sixteen turtles (82.4 – 145.4g) were outfitted with radio transmitters (5.4 – 5.9g) and released in the salt marsh at The Wetlands Institute. From July 9 – 26, we relocated 13 turtles (81.25%) at least once, for a total of 33 locations. When individuals were relocated, I recorded the turtle's position, behavior, and characterized light levels and vegetation in a 1-m² quadrat. Distances travelled from the release points varied among individuals and light levels below vegetation were significantly lower than above the vegetation across all days and individuals. For individuals located more than once, vegetation height did not change with time since released. All, but one individual, were relocated in the marsh and the outlier relocated along the densely vegetated trail edge. From these results, we can begin to understand where and how far young turtles go and their habitat preferences which will allow us to have more life stage focused conservation practices.

An Inside Look at the Salt Marsh: Using Aquaria and Interactive Exhibits to Highlight the Importance of Salt Marsh Organisms to the Habitat and to People

Joseph Hernandez, *Stockton University*

Aquariums are a powerful tool for representing an aquatic habitat and bringing animals normally not accessible to people into view. Throughout the world, aquariums are successfully constructed to represent coral reefs, oceanic deserts, and even habitats nearing unbearable conditions for humans to dive. At The Wetlands Institute (TWI), aquariums showcase marine vertebrates and invertebrates found in the back bays and ocean. However, one habitat that few people think to replicate is the salt marsh channel; a murky, smelly, and often unsightly world hidden between the blades of *Spartina* grasses. Few people know that this estuarine habitat is filled with some of the most incredible and important organisms on the coast.

To bring the salt marsh to life, a 125-gallon brackish water tank, located in Wetlandia will house several salt marsh creatures, representing species caught from TWI's channel waters. The aquarium will be designed to not only cater to fully aquatic animals, such as the schooling fishes and shrimps, but also semi-aquatic animals like Diamondback Terrapins and fiddler crabs. Educational signage will highlight animal's basic facts and their importance to the ecosystem. There will also be information on how people benefit from the salt marsh and how human encroachment on the salt marsh threatens its survival. Additionally, visitors of all ages will be able to test their newly gained knowledge by matching pictures of local salt marsh wildlife with their biological descriptions. By making an interactive display of salt marsh animals, in a model of their habitat, I hope to unveil the beauty of the salt marsh and its creatures.

Understanding Mass-Specific Physiological and Metabolic Differences in Head-started Diamondback Terrapins (*Malaclemys terrapin*)

Sarah Kerr, *Clemson University*

In response to worldwide turtle declines, head-starting has become a popular conservation strategy for chelonian species, including the diamondback terrapin. Through The Wetlands Institute's program, terrapins are reared in captivity from eggs through their first year, then released into the salt marsh larger than they are at that age in the wild. The objective of this study is to understand the effect of size on head-starter fitness and movements. To answer this question, the physiological and metabolic rates of two groups of eight terrapins were studied. Masses of Group 1 ranged from 23.3 grams to 49.75 grams, Group 2 ranged from 89.8 grams to 145.4 grams. Oxygen consumption was tested on all terrapins using a Sable Systems Oxygen Analyzer. Oxygen consumption of Group 1 averaged $0.405 \text{ mL O}_2 \text{ hour}^{-1} \text{ gram}^{-1}$ while Group 2 averaged $0.683 \text{ mL O}_2 \text{ hour}^{-1} \text{ gram}^{-1}$. Physiological rates were determined using a treadmill paired with Arduino. Acquisition tests using fiddler crabs, and self-righting tests were conducted in two temperatures. Movements of Group 2 were tracked in the surrounding marsh using radio telemetry. Group 1 did not last as long on the treadmill before tiring, and they did not feed on fiddler crabs as aggressively as Group 2. However, Group 1 righted themselves faster. Distance traveled for the smallest terrapin (89.8g) was 49.56m over 8 days, while the largest terrapin (127.4g) traveled 159.906m over 13 days. Overall, larger size may provide a fitness advantage, however a conclusion cannot be made based on small sample size and the short duration of this study.

Hatching Success of Laughing Gull (*Leucophaeus atricilla*) based on Habitat Use and Characteristics

Daniel Stoner, *Kutztown University*

Human disturbance and sea level rise are degrading saltmarshes and their suitability, possibly affecting the reproductive success of Laughing Gulls nesting and rearing their chicks there. My research examined the relationship between nest characteristics and higher hatching success of Laughing Gulls on Ring Island, Stone Harbor, NJ in five plots that included 20 nests inside a 25-meter radius. Edge habitats (N = 3) were plots within 100 meters of larger waterways and center plots (N = 2) were farther than 100 meters of larger waterways. Nest location was marked with a Trimble backpack GPS unit. Factors used to characterize individual nests included distance to waterway, elevation of the nesting site, vegetation cover and species, and proximity to other nests. Distance to waterway was measured using ArcGIS. Elevation was determined using LiDAR data at the nest location, and nest cover was estimated using a light meter. Of 104 nests, 49 were determined to be successful, 16 failed, and fate was undetermined for 39 that were checked multiple times in June and July. Data on elevation, distance to closest waterway, and the nest cover showed no relationship to a higher success or failure rate among all nest ($p = 0.82$). Clustered or single data was not included in the analysis due to the similarity of success and failure in all plots ($p = 0.24$). A multi-year study can be done considering more variables to further analyze their nest success with changing disturbances.

Dredging Up Dredged Materials: Creating a Science Feature to Educate the Public about Soils and their Importance

Gregory Fischer, *Stockton University*

The Wetlands Institute (TWI) has long been a hub of coastal research, conservation, and education. Children, in particular, benefit greatly from the Institute's many educational programs, including Creature Features, Aquarium Feedings, Catch 'o the Day, and Salt Marsh Safaris. In the off-season, when more charismatic wildlife, like terrapins and horseshoe crabs, are difficult to find, Science Features offer older children and adults a guided look at interesting subjects related to coastal ecosystems. These programs typically involve an informative presentation followed by a hands-on activity to help visitors better grasp the subject material.

The goal of my project is to educate the public on soil science, dredging, and the use of dredged materials; topics which visitors and residents alike are curious about, but lack an education in. The program begins with an introduction to the basics of soil science before moving on to discuss dredging. Many questions, such as "Why do we dredge?" and "What are those hills in the marsh?" are answered as a TWI educator uses a PowerPoint presentation to give a general overview of dredging and the use of dredged materials. Also included in the presentation is a discussion of the beneficial use (of dredged materials) program. Following the presentation, participants can closely examine various local soils and their components, as well as other soil related learning materials. Following the presentation, they can walk down the salt marsh trail to the end of the dock to spot birds and site markers with binoculars on the beneficial use site on Ring Island.

Behavior and Nest Site Selection in a Mixed-Species Colony of Black Skimmer (*Rynchops niger*) and Common Tern (*Sterna hirundo*)

Jamie Infanti, *University of Connecticut*

Coastal birds are being restricted to smaller habitats in denser conditions due to shrinking available habitat from human development and sea level rise. Black Skimmers, currently listed as endangered in New Jersey, and Common Terns are at risk from these threats. When nesting closer together, these species may benefit from protection against predators by their neighbors, but may expend more energy defending territory against neighboring birds. To better understand how these species are impacted by dense habitats, this study was completed at a mixed species colony on Ring Island in Stone Harbor, NJ that compared the success of differing site compositions for nesting Black Skimmers and Common Terns. Frequencies of behaviors deemed beneficial (preening, sleeping, etc.) and disadvantageous (barking, flushing, etc.) were compared for five focal territories. It was determined that site composition affected the behavior of Black Skimmers, but may not have impacted Common Terns as greatly. Sites with higher density of Black Skimmers had the highest counts of detrimental behavior (33.17 ± 4.12). Sites with an increased number of Common Terns had a better balance between detrimental and beneficial behaviors. The site with a medium density (4-5 nests) and an equal distribution of species provided the most benefit to Black Skimmers (7.93 ± 1.64) and saw the greatest nesting success in this area. Common Tern activity levels remained consistent across the varying densities, but Black Skimmers had large fluctuations based on site composition. These findings will be important for better managing these vulnerable species and ensuring their long-term success.

Who Exactly Are We Catching?: Enhancing Various Boathouse Activities to Promote Environmental Education for All Ages

Samantha Najarian, *College of Charleston*

Reaching the end of The Wetlands Institute's (TWI) salt marsh trail provides an area for exploring and hands on learning. The trail leads to the Herd Building (boathouse), as well as access to the tidal channel via the dock and floating dock. These areas allow for the public to directly engage with local wildlife through the various education programs we run down at the dock, including Catch o' the Day, Hooked on Fishing, and Crabbing. By facilitating ways for the public to get involved in each of these programs, it allows for appreciation and motivation to preserve the salt marsh and encourages environmental stewardship in other aspects of their lives.

My project focuses on bolstering the learning components of these programs by creating new visual resources and complimentary activities. In order to enhance all boathouse-based programs, I have created a species chart to be displayed in the Herd Building that illustrates the common species we are catching at high and low tide. This species chart will help the public see what they will be catching or what they might be seeing in the waters surrounding TWI. To promote the involvement of younger members of the community, or those that may not be able to participate, I have created complimentary activities including sorting regulation blue claw crabs (for Crabbing), magnetic fishing game (for Hooked on Fishing), and mock seining (for Catch o' the Day). Lastly, I am updating the appearance of the Herd Building to create a more inviting place to perform each of these activities.

Comparison of methods for surveying diamondback terrapin (*Malaclemys terrapin*) populations in tidal creeks

Amanda Lyons, *Brown University*

The diamondback terrapin is known to inhabit coastal ecosystems, but within these ecosystems it proves challenging to sample. Since 2016, researchers at The Wetlands Institute in Stone Harbor, NJ, have performed a mark-recapture project in two tidal creeks to better understand terrapin population composition and trends in this environment. Results of the 2016-2017 study, which used modified commercial crab traps to capture turtles, suggested a population that was female-biased ($\chi^2=35.02$, $p<0.01$), included mostly smaller terrapins (90% of terrapins <13cm carapace length), and demonstrated a consistently low rate of recapture (3.6% in 2016 and 3.7% in 2017). To evaluate the accuracy of these trends, the tidal creek study was continued in 2018 utilizing a fyke net in addition to prior trapping methods. Results obtained using the net, which could remain deployed through multiple tide cycles and which possessed a wide mouth permitting entry to larger terrapins, challenged the findings of previous research, as fyke net turtles demonstrated a less biased sex ratio ($\chi^2=0.06$, $p=0.81$), a greater proportion of large terrapins (39% of terrapins >13cm carapace length), and a substantially higher rate of recapture (19.0%). Furthermore, a comparison of catch per unit effort (CPUE) for the modified crab traps and the fyke net in each of the two creeks revealed that the latter method yielded a considerably greater number of terrapins for a comparable amount of personnel effort. The results of this study indicate that the fyke net is the optimal method for surveying terrapin populations in tidal creeks.

The Wetlands Institute staff and interns would like to extend a heartfelt ***THANK YOU*** to the many collaborators, volunteers and docents who helped make our programs a huge success!



Coastal Conservation Research Interns:
Kirstine Grab, Amanda Lyons, Amanda Lillie, Jamie Infanti, Sarah Kerr, and
Danny Stoner



Environmental Education Interns:
Diana Moczula, Samantha Najarian, Greg Fischer, and Joe Hernandez