



The Wetlands Institute Intern Symposium

Monday, August 8, 2016

3:30 pm



The Coastal Conservation Research Program

The Environmental Education Program

The Marketing and Communications Program

**Thank you for joining us to celebrate the
accomplishments of The Wetlands Institute
2016 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

Christine Mattera, Director of Marketing and Communications

Allison Anholt, Research Scientist

Brian Williamson, Research Scientist

Victoria Musumeci, CCRP Intern Coordinator

Coastal Conservation Research Program Interns

Elliot Fackler, *Bloomsburg University*

Aaron Mitchell, *The University of Southern Mississippi*

Adeline Schluskel, *St. Mary's College of Maryland*

Lauren Seacrist, *Lander University*

Wolfgang Trumbauer, *Widener University*

Charles P. Williams Jr., *Stockton University*

Environmental Education Program Interns

Alexis Arnold, *Lock Haven University*

Anna Caputo, *Green Mountain College*

Emily Colombo, *George Mason University*

Diana Moczula, *Carleton University*

Marketing and Communications Program Intern

Victoria Deever, *Penn State University*

PROGRAM SCHEDULE

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

INTERN PRESENTATIONS

Location dependent egg viability of the Atlantic horseshoe crab, *Limulus polyphemus*: A comparison between salt marsh and Delaware Bayshore spawning sites - Elliott Fackler

Going Batty: Creating a Bat Education Initiative to Increase Awareness and Appreciation - Emily Colombo

Interspecific interactions between American Oystercatchers, *Haematopus palliatus*, and colonial nesting birds at Stone Harbor Point - Aaron Mitchell

The Power of Plants: Establishing a Deeper Connection to Nature through Environmental Education - Alexis Arnold

Diamondback terrapin (*Malaclemys terrapin*) and predator activity at artificial nesting sites or "terrapin gardens" - Adeline Schlussek

INTERMISSION WITH LIGHT REFRESHMENTS

Visitor Trends: Observing who is visiting the Wetlands Institute during the Spring and Summer months to identify trends - Victoria Deever

Estimating Hatchling Sex Ratios in Diamondback Terrapins (*Malaclemys terrapin*) from Nest Cavity Temperature - Wolfgang Trumbauer

Helping Hands: Using Service Learning Programs to Teach People about the Importance of the Marsh - Diana Moczula

The Influence of Nesting Success on the Habitat Selection of the American Oystercatcher *Haematopus palliatus* - Lauren Seacrist

Cameras Rolling... and ACTION: Reaching a Broader Audience through Social Media - Anna Caputo

Evaluating the population characteristics of Diamondback Terrapins (*Malaclemys terrapin*) within saltmarsh tidal creeks of Southern New Jersey - Charles P. Williams Jr.

ABSTRACTS

Location dependent egg viability of the Atlantic horseshoe crab, *Limulus polyphemus*: A comparison between salt marsh and Delaware Bayshore spawning sites

Elliott Fackler, *Bloomsburg University of Pennsylvania*

The Atlantic horseshoe crab, *Limulus polyphemus*, is an ecologically, economically, and biomedically significant species of marine arthropod which inhabits the eastern shore of the United States and Mexico. The Delaware Bayshore is home to the largest horseshoe crab spawning events in the world, and their reproductive success here has been the subject of many investigations. However, horseshoe crabs also spawn in small patches of habitat found on Atlantic-side back bay marshes. Spawning here has been poorly documented, but success is assumed to be low. In 2014, a beach-nesting bird habitat was constructed from dredged sandy material on Ring Island, a salt marsh island. This habitat features a grain size smaller than the bayshore beach. To compare the reproductive success of horseshoe crabs spawning at the sites, I dug 104 randomly placed pits on beach sections at the constructed habitat and the bayshore from late June through July and classified the development of found egg clusters. The proportion of eggs showing development was found to be lower on the constructed habitat than on the bayshore ($\chi^2=32.23$, $p<0.01$), while eggs from the habitat had a higher proportion of development than those from the bayshore when kept in controlled conditions in tanks ($F=4.81$, $p=0.04$). My findings confirm that spawning is occurring on marsh habitats and show that eggs laid here are fertilized and viable. However, something, perhaps low oxygen availability, is preventing these eggs from developing as well as those laid on the bayshore.

Going Batty: Creating a Bat Education Initiative to Increase Awareness and Appreciation

Emily Colombo, *George Mason University*

The Wetlands Institute's education programs inform the public about many different animal species within the marsh, including birds, fish, and diamondback terrapins to only name a few. While there is limited mention of any of the mammals that live within the marsh, there is one order of mammals that thrives in wetlands: bats! Bats are an important part of many ecosystems, and provide several benefits to humans including eating copious amounts of nuisance insects, producing fertilizer via guano, and pollinating hundreds of fruits and flowers around the globe.

Despite their importance, bats are not a common sight at The Wetlands Institute. Everywhere in the world, bats are suffering due to anthropogenic effects and, specifically in North America, from a disease called White Nose Syndrome. The Wetlands Institute can help by creating a bat education initiative to increase awareness and appreciation of bats. This new initiative contains components specifically aimed at attracting bats to the Institute grounds, including the construction and installation of several bat boxes to give bats a place to roost and the addition of night-blooming flowers to Marion's Gardens to encourage nocturnal moth visitors that bats like to eat. Attracting bats to the area is only one step in a comprehensive bat education program. In addition to these practical measures, the creation of educational signage installed in the Institute's observation tower and a new Science Feature program dedicated to bats will round out the initiative. Understanding bats and coming to appreciate them, instead of stigmatizing them, is the first step toward the recovery of their populations.

Interspecific interactions between American Oystercatchers, *Haematopus palliatus*, and colonial nesting birds at Stone Harbor Point

Aaron Mitchell, *The University of Southern Mississippi*

On Stone Harbor Point, New Jersey American Oystercatchers share beach nesting habitat with colonial nesting Black Skimmers (*Rynchops niger*), Least Terns (*Sternula antillarum*) and Common Terns (*Sterna hirundo*). Oystercatcher nests may or may not occur near colonial birds. In contrast to the pair-based defense strategies of oystercatchers, colonial birds defend territories as a group against disturbances such as predatory gulls and raptors. I hypothesized oystercatchers should show higher reproductive success and decreased response to disturbances when nests are located near tern colonies than those without colonial birds nearby due to the colonial defense strategy. I conducted 40 30-min behavioral observation surveys on oystercatcher pairs at sites with and without colonial nesting birds to compare the level of antipredator response, time to return to neutral behavior, and reproductive success. After 20 surveys at each site, I found no significant difference in the number of disturbances at sites with (N=33) or without (N=23) colonies. Behavioral responses to all disturbances did not differ regardless of the presence of a colony (t-critical = 2.02, p = 0.23). Hatching success at each site was assessed to evaluate reproductive success. No significant difference in hatching success was observed for pairs nesting in sites with (82%, N=17) or without (75%, N=8) colonial birds ($\chi^2 = 0.07$, p=0.79). My results suggest that nesting near bird colonies did not have a significant effect on oystercatcher fitness and antipredator behavior.

The Power of Plants: Establishing a Deeper Connection to Nature through Environmental Education

Alexis Arnold, *Lock Haven University*

The Wetlands Institute serves as an environmental education hub for all members and visitors to Stone Harbor and the surrounding community. The importance of environmental education is generally overlooked in the public and private schooling system, and for this, and a myriad of other reasons, many parents choose to homeschool their children rather than enrolling them in the formal education system. To provide homeschool parents and children with a more robust curriculum, The Wetlands Institute created the Nature Education for Homeschool Students and Teachers (NEHST) program. The NEHST program provides two lessons a month for children ages 5 to 13. These workshops explore a wide range of environmental topics with the technique of hands-on learning. Environmental education is vital to providing the necessary tools for students to gain a deeper connection with nature as well as understanding their impact on the environment.

I have created three sections of NEHST lessons based around the importance of plants found in New Jersey. The subjects include Plant Adaptations, Invasive vs. Native Plants, and How Humans and Animals Use Plants. There will be two similar sets of each of these three lessons; one for ages 5-8 and one for ages to 9-13+. For each lesson, students will get an introduction to the subject, participate in a hands-on learning activity, and receive homework to further reinforce the material they just learned. Each of these lessons will allow students to understand why plants are essential to the salt marsh ecosystem and necessary for their lives.

Diamondback terrapin (*Malaclemys terrapin*) and predator activity at artificial nesting sites or "terrapin gardens"

Adeline Schlussek, *St. Mary's College of Maryland*

Coastal development is threatening the nesting habitat of diamondback terrapins. One approach to restore this lost habitat is the construction of "terrapin gardens," areas of sand preferred by nesting terrapins. Although terrapins have been found to nest in terrapin gardens, research has also suggested that nests in terrapin gardens may attract more predators than those in other nesting areas. To evaluate the costs and benefits of terrapin gardens, I used trap cameras and in-person observations to monitor two gardens in Sea Isle City, New Jersey. I compared terrapin and predator activity in the gardens to that in control plots in

nearby grassy lawns. I also used the cameras to evaluate the effectiveness of Predator Guard, a predator deterrent that mimics predators' nighttime eyeshine. The camera footage indicated that both terrapin and predator activity was higher in the gardens than in the grassy lawns. Most terrapins nested in the less vegetated garden ($Z = 2.5$, $P = 0.01$), while predators visited both gardens more frequently than the grass plots (all $P < 0.03$). These results suggest that gardens could benefit the terrapin population, but only if paired with an effective predator deterrent. Moreover, Predator Guard did not significantly decrease predator activity ($Z = -0.35$, $P = 0.73$); although Predator Guard seemed initially effective, the predators appeared to acclimate to the presence of the deterrent over time. Consequently, further research into different predator deterrents would help to determine how to make terrapin gardens more beneficial to local terrapin populations.

Visitor Trends: Observing who is visiting The Wetlands Institute during the Spring and Summer months to identify trends

Victoria Deever, *Pennsylvania State University*

The ebb and flow of visitation to The Wetlands Institute (TWI) has been directed by the changing seasons. Typically, the winter months produce little visitation, as the beach towns clear out and students return to school; however, during the spring and summer months, the Institute blossoms again as vacationers come to explore the wetlands once more. The changing flow of visitor traffic has been observed in the past, but I wanted to learn all I could about these seasonal visitors through personal interaction with them. Throughout the duration of my project I had the opportunity to interact with people and gain a better perspective on the seasonal increase of visitation and the draw for these visits.

My project focuses on the who, the when, the what, and the how. Who is visiting TWI, when are they visiting, what brings them here, and how can we motivate similar people to also visit. I was able to gather information to help me answer these four questions through a number of different avenues. They include; comparing adult to children visiting ratios, comparing last year's data to this year's data, and talking one on one with individual visitors. The marketing efforts made by TWI in the past have led to an increase in interest and participation within the Institute and my goal through this project was to delve deeper into the visitor trends, developing and changing throughout the summer months and how the Institute might be able to capitalize on those trends.

Estimating Hatchling Sex Ratios in Diamondback Terrapins (*Malaclemys terrapin*) from Nest Cavity Temperature

Wolfgang Trumbauer, *Widener University*

Diamondback terrapins undergo temperature dependent sex determination. We can infer the sex of a particular clutch of eggs from incubation temperature during a critical period of embryonic development. In terrapins, males are produced below 28°C, whereas female development is triggered at temperatures around or above 30°C. Furthermore, incubation temperature can be influenced by plant cover, shade, proximity to roadways, and substrate type. Using this information, I measured the temperature and relative humidity of a stratified sample of naturally occurring terrapin nests (N=13) with iButton temperature loggers at shallow and deep depths. Paired control buttons were also measured (N=7). I planted these loggers inside the nest cavity for a seven day period (starting day 8-11) to capture the temperature sensitive period. I predicted the predominant sex of hatchlings in each nest by evaluating the measures of central tendency for upper and lower cavity temperatures. A chi-squared analysis determined no significant difference from the expected 1:1 ratio ($X^2=1.92$, $df=1$). Furthermore, the average incubation temperature in nest cavities remains relatively constant despite fluctuations in ambient highs and lows. Additionally, I found significant differences in temperature amongst some of the substrate types for both the upper and lower nest cavity ($P<0.01$). Lastly, the relative humidity in the lower nest cavity was significantly lower than in paired plots ~25cm away from the nest cavity at comparable depth ($P<0.01$). Further investigation is needed, but my results have improved understanding of terrapin nesting activities at The Wetlands Institute.

Helping Hands: Using Service Learning Programs to Teach People about the Importance of the Marsh

Diana Moczula, *Carleton University*

The Wetlands Institute thrives on interactive activities that allow for people to physically touch and learn. This physical aspect of hands-on learning allows for a stronger connection to the subject matter and this connection is what allows for people to realize the importance of our marsh ecosystem. Following these experiences, if you ask someone what they want to change they may list many things, but this desire to change will remain just a desire until they act on it. However, if you ask someone what they want to change and then give them the opportunity to do so, they act on their desire. Service learning is a unique way for

people to learn that incorporates an additional aspect of community service intended to not only enhance the learning experience, but also incite change.

My project, *Helping Hands*, consists of six complete service learning programs focused on the following topics: marsh biodiversity, marsh birds, marsh plants, food from the marsh, marsh protection, and wetland pollinators. Each *Helping Hands* program begins with a PowerPoint presentation seeking to generate a connection between people and different aspects of the marsh. Once this connection is formed the audience is offered the opportunity to physically go out and make change; hence the “service” aspect of service learning. Program participants receive the opportunity to help what keeps them safe, or feeds them, or provides recreational enjoyment to them. Ultimately, people who participate in service learning programs are able to act on their desire for change and are more likely to spread their newfound knowledge.

The Influence of Nesting Success on the Habitat Selection of the American Oystercatcher *Haematopus palliatus*

Lauren Seacrist, *Lander University*

Since 2004, New Jersey biologists have banded American Oystercatchers (AMOY) to track their populations. Approximately 130 banded AMOYs annually migrate to Stone Harbor Point (SHPT) beach in Cape May County. However, a significant number are first observed post-breeding season with their breeding habitats unknown. I hypothesized that some are nesting in the less-monitored surrounding marsh, due to isolation from humans and mammalian predators. I determined the number relocating from beach to marsh mid-breeding season using field data and the AMOY Working Group banding database. The number of beach-banded birds returning to breed in that habitat (N = 9 in 2013 & 2014, 11 in 2015, 10 in 2016) was significantly lower ($p=0.01$) than those not observed (N = 21 in 2013 & 2014, 21 in 2015, 26 in 2016) or observed in the marsh over multiple years (N = 1 in 2013, 2014, & 2015, 5 in 2016). I also calculated the success rate of banded AMOYs both nesting at SHPT from 2013 to 2016 and all nearby marsh nesting birds during 2016 only. In 2016, 33% of all pairs successfully nested in the marsh, falling within the range of success observed for beach habitats (31% in 2013, 18% in 2014, 57% in 2015, 83% in 2016). Although these results oppose the hypothesis, a lack of data from the marsh in previous years makes these rates difficult to compare. However, the significant numbers of undetected individuals during the breeding season indicate the need for increased observation of the salt marsh.

Cameras Rolling... and ACTION: Reaching a Broader Audience through Social Media

Anna Caputo, *Green Mountain College*

The Wetlands Institute crafts general admission programs that give visitors a sense of place, which is a vital step towards environmental stewardship and wetlands conservation. However, the success of these programs rely on a visiting audience willing to hear the message. Traditionally, people who seek out places like The Wetlands Institute are those who are already environmentally inclined and/or vacationers who are looking for something local to do with their families. Our anthropocentric realities are intertwined in the natural world around us, and in order to invoke true environmental stewardship, it is crucial that environmental education be accessible to everyone. Unfortunately, equal accessibility to environmental education is a loftier concept to actualize than it seems. Increased use of technology can help bridge the gap between environmental education and accessibility.

Widespread use of social media platforms is currently at the forefront of environmental education because it can reach anyone who has access to the internet. My project aims to create a conservation education web series consisting of three complete episodes for The Wetlands Institute's YouTube channel. Each of three episodes focused on northern diamondback terrapins, ospreys and horseshoe crabs is written, directed and edited in-house using Adobe Premiere Pro and features scientist interviews, animal facts and conservation education issues. Using technology and social media in this way increases the accessibility of environmental education for all, creates positive publicity, reaches a wider demographic and broader audience, and allows for visitors to continue learning at their own pace past their initial visit.

Evaluating the population characteristics of Diamondback Terrapins (*Malaclemys terrapin*) within saltmarsh tidal creeks of Southern New Jersey.

Charles P. Williams Jr, *Stockton University*

Knowledge of diamondback terrapin population characteristics in salt marsh tidal creeks can allow impacts from road mortality, habitat loss and drowning in crab traps to be understood. Unfortunately limited data are available on the population and distribution of terrapins within local saltmarsh creeks. My primary objective was to determine the sex ratio of the terrapin population in Josh and Charles Creeks in Cape May County, New Jersey. Modified commercial crab traps were used to capture terrapins in the same localities surveyed during a 2008 mark-

recapture study. Between June 26 -July 22, each creek was surveyed four times with seven baited traps. A total of 71 terrapins were captured (Charles Creek: N = 22, Josh Creek: N = 49), of which three (4.2%) were captured in previous years. Upon capture terrapins were scanned for pit tags, measured, sexed, and microchipped if needed before release. Sex ratios of terrapins in each creek did not differ significantly from 1:1 for 2016 (Josh: $p=0.77$, Charles: $p=0.12$). I compared average carapace length by year for both sexes, using data from 2002-2016. Male carapace length differed by year in both creeks (Charles: $p=0.04$, Josh: $p<0.01$). In Josh Creek, males were significantly larger in 2002 than in subsequent study years. In Charles Creek, males were significantly larger in 2016 than 2003. No significant difference was detected in carapace length by year for females at either site (Charles: $p=0.17$, Josh: $p=0.12$). Results from this study will help researchers at TWI better understand the population status of diamondback terrapins.

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!



Environmental Education Interns:
Diana Moczula, Alexis Arnold, Emily Colombo, Anna Caputo



Marketing and Communications Intern:

Victoria Deever



Coastal Conservation Research Interns:

Lauren Seacrist, Aaron Mitchell, Elliott Fackler, Pat Williams, Wolf Trumbauer,
Addie Schlusel