



---

# The Wetlands Institute Intern Symposium

Monday, August 5, 2019

3:30 pm



*The Luing Family Internship Program*

**Thank you for joining us to celebrate the accomplishments of  
The Wetlands Institute  
2019 Luing Family Internship Program!**

**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  
Sam Collins, Research Scientist  
Brittany Morey, Research Associate  
Victoria Musumeci, CCRP Intern Coordinator

**Coastal Conservation Research Program Interns**

Tully Frain\*, *University of Connecticut*  
Zachary Hulmes\*, *University of Rhode Island*  
Jamie Infanti\*, *University of Connecticut*  
Emilie Karovic\*, *University of Connecticut*  
Jessica Klein#, *Stockton University*  
Aileen Lavelle#, *University of California, Berkeley*

**Environmental Education Program Interns**

Brandon Henry\*, *Stockton University*  
Reilly McFoy\*, *Lebanon Valley College*  
Sarah O'Sullivan\*, *University of Rhode Island*  
Madison Sandquist\*, *University of Miami-Rosenthal School of Marine and  
Atmospheric Science*

**Undergraduate Visiting Researcher**

Amanda Lyons, *Brown University*

We would like to thank the following supporters who are helping to ensure our future:

\*Position supported through The Larry Luing Family Foundation

+Position supported through The Barbara and Jim Summers Intern Endowment Fund

#Position supported through The Leff Family Foundation

Special Thanks to Quest for the Best Foundation for Program Support

## **PROGRAM SCHEDULE**

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

## **INTERN PRESENTATIONS**

Ongoing Study: Expanding Our Knowledge of Diamondback Terrapin  
(*Malaclemys terrapin*) Populations Using Novel Molecular Techniques - Amanda  
Lyons

Factors affecting spatial and temporal trends in diamondback terrapin  
(*Malaclemys terrapin*) road crossings – Zachary Hulmes

Portable Knowledge: Creating Educational Activity Boards to Bring Awareness to  
'Behind the Scene' Creatures - Sarah O'Sullivan

Diamondback terrapin nesting mound usage and barrier fence effectiveness –  
Jessica Klein

Let's Get Interactive on the Internet! Updating Creature Feature Presentations  
using Nearpod - Reilly McFoy

Factors Impacting Nest Survival of a Common Tern (*Sterna hirundo*) Nesting  
Habitat- Jamie Infanti

## **INTERMISSION WITH LIGHT REFRESHMENTS**

Examining diamondback terrapin (*Malaclemys terrapin*) use of salt pannes –  
Emilie Karovic

Keeping Up With the Climate: Designing a Science Feature and New Aquarium  
Exhibits to Educate the Public on Climate Change - Madison Sandquist

Predicting Water Level and Temperature of the Wetlands and Possible  
Implications for Diamondback Terrapins (*Malaclemys terrapin*) - Aileen Lavelle

Getting Lit: Ultraviolet Induced Fluorescence in Saltmarsh Biota - Brandon Henry

Secretive Marsh Sparrows: Understanding Nest Site Selection and Risk to  
Population on Ring Island - Tully Frain

## ABSTRACTS

### **Ongoing Study: Expanding Our Knowledge of Diamondback Terrapin (*Malaclemys terrapin*) Populations Using Novel Molecular Techniques**

*Amanda Lyons, Brown University*

Widespread habitat fragmentation due to coastal development has cast uncertainty as to how diamondback terrapin populations interact across geographic distances and perceived barriers such as urban areas and roads. Moreover, our knowledge of individual populations is limited due to terrapins' idiosyncratic life history, as male terrapins do not leave the marsh to nest and must therefore be sampled in the water via trapping, which provides imperfect snapshots of population composition. In order to better understand both inter-population and intra-population trends, tissue samples have been collected for two genetic analyses: a study of relatedness among terrapins from nine sites across the northeastern U.S., and an investigation of male biodiversity within the terrapin population in Stone Harbor, NJ. The relatedness analysis will employ restriction site-associated DNA sequencing (RADseq), a form of next generation sequencing targeting thousands of sites across the genome. This will allow us to identify the extent to which populations are interacting, which will inform decisions to protect particular habitats and/or corridors between habitats. Moreover, comparing the degree of genetic variation present at different sites will enable us to assess the relative status of individual populations. The assay of male biodiversity will be conducted by comparing maternal DNA from roadkilled terrapins and offspring DNA sampled noninvasively from eggshells after hatching. Processing will utilize microsatellite markers, which identify specific sections of the genome where variation is expected, and will determine whether noninvasive sampling of eggshells can provide a proxy for male biodiversity, another significant indicator of population health.

### **Factors affecting spatial and temporal trends in diamondback terrapin (*Malaclemys terrapin*) road crossings**

*Zachary Hulmes, University of Rhode Island*

Diamondback terrapins are the only North America species of turtle to live their entire life in the salt marsh. During the nesting season females must leave the salt marsh to find high ground to lay their eggs. This study aimed to find whether tide, time of day, creek distance from the road, or presence of a barrier fence were associated with when and where terrapins crossed Stone Harbor Boulevard. For this study data were collected from 2017-2019 by driving Stone Harbor Boulevard five times a day, during the nesting season, to search for dead and alive terrapins. The time, date and location of all terrapins were recorded when found. Using ArcGIS, spatial and temporal analyses identified a

large hotspot of activity in front of the Wetlands Institute, due mainly to live encounters. Increased activity was found during, falling and rising tides, between 8-10 am ( $p < 0.01$ ). Inconclusive results were found on the effect of barrier fencing on crossing locations along Stone Harbor Boulevard and no significant correlation was seen between creek distance from road and crossing frequency. Going forward continuous stretches of fence may prove more effective than fragmented sections and adding another road patrol to the day when falling and rising tides are at times of day when terrapins are most active.

### **Portable Knowledge: Creating Educational Activity Boards to Bring Awareness to 'Behind the Scene' Creatures**

*Sarah O'Sullivan, University of Rhode Island*

Each year, The Wetlands Institute works with over 12,000 school children and 20,000 visitors, engaging them in educational programs as a supplement to their school learning or general interest. For some of these children and visitors, it is the first time they are visiting and getting to experience all the wonders the marsh has to offer. Living in the dormitories above the Institute, and being able to observe a plethora of groups, I have witnessed that, not only are these visitors eager to learn, they have a passion for what they are being taught. It is more important now, than ever, to educate the younger generation about the environmental issues we face, not only as a community, but as an entire planet.

Since finding time to teach about all the important aspects of our wetlands during a single visit is challenging, my project will keep children and visitors occupied and engaged during program breaks through the creation of interactive activity boards. These portable educational activity boards will be placed around the Institute near specific rest areas such as picnic tables and benches. The five boards include themes such as, Osprey Hunting, I-Spy, Word Search, Marsh Filtration Cartoon, and, finally, a collaborative piece, with Education Intern, Madison Sandquist to bring awareness to climate change. These boards encompass many different aspects of the marsh and will allow students and visitors to continue to gain additional knowledge and build upon the information they received during the other educational program components.

### **Diamondback terrapin nesting mound usage and barrier fence effectiveness**

*Jessica Klein, Stockton University*

The northern diamondback terrapin (*Malaclemys terrapin terrapin*) is facing population destabilization, due in part to additive mortality from roadways. Artificial nesting mounds and barrier fencing can encourage females to nest without facing danger from roadways. Both conservation strategies were

employed at a site in Avalon, NJ known as a hotspot for terrapin activity. To learn if terrapins were successfully using a newly constructed nesting mound, and if nests were being predated, five Moultrie camera traps were placed onsite from June 19 to July 14. The corrugated tubing barrier fence used in Avalon and surrounding areas was tested against a flexible plastic barrier material, Animex, in 10-minute escape trials. Detections indicated that terrapins were accessing and nesting on the mound (N), though predators and disturbances were also detected. Relative abundance index was calculated for species seen on the mound, showing that humans and terrapins were the most abundant species present at the site. Chi square analysis of terrapin behavior revealed that despite human disturbance, terrapins were choosing to utilize the mound. Analysis of arena trial escape attempts did not find a clear difference in effectiveness, but found that the individual terrapins used in each trial, as well as the order in which the trials took place did have an effect. Nesting mounds can be effective conservation tools to prevent a high density of terrapin nests, but they must be maintained properly. While no clear difference in effectiveness was found between barrier fence materials, Animex was more expensive than the corrugated tubing and harder to install, but may be harder to climb over or under.

## **Let's Get Interactive on the Internet! Updating Creature Feature Presentations using Nearpod**

*Reilly McFoy, Lebanon Valley College*

Providing information and educating the general public has successfully taken place here at The Wetlands Institute (TWI) for 50 years. The success of educating the public on wildlife conservation is credited to the many wonderful programs that TWI has to offer. During the summer, the public has two opportunities in the day to attend a Creature Feature presentation. During a Creature Feature, a PowerPoint presentation is used, in conjunction with live animals and artifacts, to introduce the audience to different groups of animals, including turtles, fish, and horseshoe crab, to only name a few.

Due to my background in early childhood education, I have been introduced to a program called Nearpod. Nearpod is a website that allows a presenter to give interactive presentations to their audience. The audience can log into Nearpod using their smart devices and insert a code that will link them to their presentation. Nearpod's features allow the creator of the presentation to add in activities such as games, polls, drawings, multiple choice questions, and more. On average, young children are able to focus their attention for anywhere between 4 and 20 minutes maximum, making it difficult to keep them interested for the whole 45 minute Creature Feature presentation. Through the use of Nearpod components, my project makes Creature Feature presentations more

child friendly, while also keeping it possible to deliver the same important information to adult visitors in the audience.

## **Factors Impacting Nest Survival of a Common Tern (*Sterna hirundo*) Nesting Habitat**

*Jamie Infanti, University of Connecticut*

Human development and sea level rise have placed added pressure on coastal nesting birds as their nesting habitat is being restricted to smaller areas. Common Terns are a species of special concern in the state of New Jersey due to being at risk from this habitat loss. To help offset this loss, an elevated nesting habitat was constructed on Ring Island for use by numerous coastal nesting birds. These man-made habitats are increasing in importance and proper management will allow for greater nesting success. To better understand the factors that influence nest survival rates at the Ring Island site, a study comparing predation, elevation, vegetation and nest density in a colony of nesting terns was completed. Longevity of 115 nests in 2019 was compared throughout 6 transects with a diverse range of conditions. Predation levels were higher in 2019 than 2018 and added predation pressure caused significant nest loss that increased throughout the season. Differing nest site conditions had varying effects on how protected nests were from predators. Vegetation growth also exceeded previous levels. A significant relationship between immediate area vegetation cover and survival length of nests was found ( $p=.0019$ ) with more cover associated with a longer survival length. Extended area vegetation did not have a significant relationship with survival length ( $p=.0631$ ). Average distance to 5 nearest neighbors also did not have a significant relationship with survival length ( $p=.5652$ ).

## **Examining Diamondback Terrapin (*Malaclemys terrapin*) Use of Salt Pannes**

*Emilie Karovic, University of Connecticut*

Salt pannes are depressions of mud in a salt marsh that are devoid of vegetation and can be flooded with water or evaporated depending on tide and time of year. Salt pannes are scattered throughout the marsh, creating pockets of abundant life. These pockets of water, food, and shelter may serve as safe havens for diamondback terrapins as they are also free of predators, boats, and crab traps. They may be key areas for female terrapins during travels from distant creek homelands to nesting sites. The objectives of this initial study were to determine if *Malaclemys terrapin* were present in pannes (N=4) at The Wetlands Institute and explore trends among terrapins using these pannes. I conducted head-count surveys each morning and afternoon and used hoop and dip nets to capture terrapins. Air temperature, water temperature, weather, and salinity were also

recorded. Captured terrapins were sexed, approximately aged, and palpated to determine gravidity. Terrapins were documented in all pannes, though the probability of presence varied among pannes ( $p < 0.001$ ). Temperature, weather, and salinity were not significant indicators of terrapin presence ( $p > 0.05$ ). One factor that significantly affected terrapin presence ( $p < 0.001$ ) was date, with presence decreasing as the nesting season ended. Similarly, adult gravid females were the majority in all pannes. A recommendation for future studies is to start just before nesting season begins. This should give a clearer view on the significance of nesting to panne presence, while also providing a larger sample size of terrapins.

### **Keeping Up With the Climate: Designing a Science Feature and New Aquarium Exhibits to Educate the Public on Climate Change**

*Madison Sandquist, University of Miami*

A well-known statement reads: "Knowledge is power." I believe that with power comes the potential for monumental change. The Wewalds Institute educates the public on many diverse topics from local wildlife to global environmental challenges, using a diverse range of programming. One such program, occurring during the winter months, Science Features are tailored to older children and feature guided presentations, followed by interactive activities related to the Science Feature theme.

Climate change is one of the most challenging and complicated problems this world has ever faced, calling for global action. By creating a climate change Science Feature, the public can learn what climate change is, why it is happening, and what can they do to minimize their carbon footprint. To appeal to younger children, the Science Feature will include various live animals to exhibit the direct effects of climate change on wildlife. Additionally, fellow Education Intern, Sarah O'Sullivan and I will create an interactive board game where children will learn to make environmentally friendly choices that directly affect climate change. Lastly, I will add a 3-panel informative poster series related to climate change and an exhibit to the aquarium that displays a consequence of climate change: coral bleaching. The coral bleaching exhibit allows people to compare living coral to bleached coral, emphasizing the realities of the problem at hand. Through the combination of these programs and exhibits, I hope to educate the public on climate change and to inspire a change in their lifestyles.

### **Predicting water level and temperature of the wetlands and possible implications for Diamondback Terrapins (*Malaclemys terrapin*)**

*Aileen Lavelle, University of California, Berkeley*

The wetlands provide ecological stability, protecting coastal communities from storm surges and flooding and serving as home to unique species such as diamondback terrapins. Greenhouse gases such as CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O are released into the atmosphere from anthropogenic fossil fuel use at a higher rate than ever before. This increase in greenhouse gases is leading to warmer atmospheric temperatures, rising sea levels, and increased flooding. As the sea levels and water temperature continue to rise, diamondback terrapins and other wetland organisms are being exposed to more extreme conditions. To understand changing conditions in the marsh and potential implications for juvenile terrapins, I conducted interpolation analysis by creating a heat map of maximum weekly water temperature and water level data collected July – October 2017 and 2018 at four wells on The Wetlands Institute property. Conditions varied within and between years (all  $p < 0.01$ ), with weeks 2, 4, 5, 7, 8, 11, 12, and 13 having significantly different water levels. There was a strong correlation of high water levels and new/full moon occurrences. Weeks 11 and 12 had significantly different water temperatures between 2017 and 2018, where 2018 was hotter than 2017. My findings indicate that high water temperatures occur farthest from Scotch Bonnet Creek while high water levels occur closest to Scotch Bonnet Creek. The distribution of radio-tracked terrapins did not vary significantly by water temperature ( $\chi^2=2.23$ ,  $p=0.69$ ) or water level ( $\chi^2=3.20$ ,  $p=0.53$ ), however they tended to be found in warmer, shallow water.

### **Getting Lit: Ultraviolet Induced Fluorescence in Saltmarsh Biota**

*Brandon Henry, Stockton University*

Ultraviolet (UV) induced fluorescence is an ancient trait in lifeforms, but still very unknown and shrouded to humans. Integrating this concept into The Wetlands Institute's A Night at the Aquarium program will introduce visitors to this fascinating topic. Currently, A Night at the Aquarium consists of bringing live animals for behind-the-scenes into the public space to allow visitors to engage directly with animals not commonly found on display or in the aquarium teaching and touch tank.

For my project, I will enhance this program by including a short presentation on UV induced fluorescence to briefly introduce and familiarize audiences to the topic. Then in the aquarium, animals on display as well as others brought from behind the scenes, will be set up. Visitors will be given laminated sheets with non-toxic markers that feature a bingo-like arrangement of animals. Lights will be turned off and visitors will be handed 365 nanometer UV lights and safety goggles. Following a brief safety talk stating that UV light of this sort is harmless in brief doses, should be used carefully, not shined at eyes, and only in short

bursts for aquarium animals, visitors can go about shining the lights at different animals, and checking off whether they glowed or not, how intense the glow was, and what part of the animal glowed. By the conclusion of this activity, visitors can be left well-informed and mesmerized by this incredible natural phenomena.

## **Secretive Marsh Sparrows: Understanding Nest Site Selection and Risk to Population on Ring Island**

*Tully Frain, University of Connecticut*

Saltmarsh (*Ammodramus caudacutus*) and Seaside Sparrows (*Ammodramus maritimus*) have experienced population declines in recent years with higher rates of coastal land loss and increased flooding. There are limited data on local nest site selection and nest success for these secretive species but this information is necessary for restoration and conservation plans. Point counts and nest surveys were conducted on Ring Island between June 25-July 17, 2019 to locate and characterize nest sites and territories. Nest characteristics included species, GPS location, nest height, vegetation composition, elevation, and distance from water. The study area was found to support over 10 pairs of Seaside Sparrows and at least one pair of Saltmarsh Sparrows. Active nests were checked weekly to investigate nest success but all monitored nests failed when tides reached over 1.56 m. The majority of nests (83%) were found within 15 m of the water, at elevations 0.59-1.12 m, and all were less than 15 cm off the ground. Nest sites had higher percent cover of >18 cm *Spartina alterniflora* compared to control sites ( $P=0.56$ ) but no differences were detected for elevations between sites ( $P=0.89$ ). Results from this study indicate that sparrows are limited by the amount of suitable nesting habitat on the island in areas where the nest is less prone to flooding. Further investigation is needed to supplement results from this study to better understand the nesting requirements and limiting factors for these species within this region.

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 and Undergraduate Visiting Researcher:  
Zach Hulmes, Emilie Karovic, Jess Klein, Aileen Lavelle, Tully Frain, Jamie Infanti and Amanda Lyons



Environmental Education Interns:  
Reilly McFoy, Madison Sandquist, Sarah O'Sullivan and Brandon Henry