

# **The Wetlands Institute Intern Symposium**



Monday August 5, 2013

3:00 pm



*The Coastal Conservation Research Program*

*The Education Naturalist Intern Program*

**Thank you for joining us to celebrate the  
accomplishments of The Wetlands Institute  
2013 Summer Intern Programs!**

**The Wetlands Institute Staff**

Lenore Tedesco, Ph.D., Executive Director

Lisa Ferguson, Ph.D., Deputy Director Research & Conservation

Brooke Knapick, Director of Educational Program Development

Ralph Boerner, Ph.D., Coastal Conservation Research Program  
Director

Ben Atkinson, Coastal Conservation Research Program Associate  
Director

Katie Sellers, Conservation Scientist

**Coastal Conservation Research Program Interns**

Alexandra Kontra, *Hamilton College*

Brianna Lowey, *Haverford College*

Jennifer Teson, *Millersville University of Pennsylvania*

Jillena Yeager, *The Richard Stockton College of New Jersey*

Sarah Zollner, *Boston University*

**Education Naturalist Intern Program Interns**

Kimberly Bullock, *Ursinus College*

Jill Burgy, *Rowan University*

Elizabeth Rizzo, *Sweet Briar College*

Zachary Schober, *Delaware Valley College of Science & Agriculture*

## **Program Schedule**

Welcome and Introductory Remarks – Dr. Lenore Tedesco

Citizen Conservationist Award to Dr. Mark Logan – Ben Atkinson

Education Naturalist Intern Program – Brooke Knapick

Coastal Conservation Research Program – Dr. Ralph Boerner

### INTERN PRESENTATIONS

Calibrating Tide Gauge Data to Analyze Changes in  
Biologically Significant Flooding Events - Brianna Lowey

Interactive Trail Mapping at The Wetlands Institute -  
Zachary Schober

Atlantic Mole Crab Population Dynamics Along New Jersey's  
Southernmost Barrier Islands - Alexandra Kontra

Revamping Public Programs: Creating a Resource for a  
Naturalist Intern - Elizabeth Rizzo

The Effects of Beach Raking and Refilling on Ghost Crab  
Burrow Density in Cape May County - Sarah Zollner

*Intermission with Light Refreshments*

### INTERN PRESENTATIONS

Wetlands: Creating, Evaluating and Educating about  
Environmental Sustainability - Jill Burgy

Diamondback Terrapin Escape Behavior in Commercial-style  
Blue Crab Traps with Functional Biodegradable Panels -  
Jennifer Teson

Child Exploration: A Simple Look at Complex Science -  
Kimberly Bullock

Body Size and Reproductive Potential of the Northern  
Diamondback Terrapin - Jillena Yeager

Visiting Scientist Research: Investigating the Demographic Impacts of  
Ghost Traps on Diamond-Backed Terrapins - Benjamin Atkinson

Closing Remarks – Dr. Lenore Tedesco

## ABSTRACTS

### **Calibrating Tide Gauge Data to Analyze Changes in Biologically Significant Flooding Events**

Brianna Lowey, *Haverford College*

Climate change is causing a rise in sea level through a combination of melting ice and expanding ocean waters. Sea level rise results in greater flooding due to storm surges today than in the past century. To explore the biological significance and changing frequency of flooding, I calibrated USGS tide gauge data to the marsh surface surrounding The Wetlands Institute, Stone Harbor, NJ. As the water level rose during a full moon high tide, I marked the water's edge with flags and recorded the location. Throughout that high tide event, I also measured the depth of tidal water in many marsh locations. I used these data to create a GIS (Geographic Information Systems) model that mapped the location and depth of tidal flooding over time. I then calibrated these measurements to corresponding tide gauge heights, and used them to examine the changing frequency of flooding events of particular depths. In particular, I analyzed flooding frequencies between May and August from 2000 to 2011. These months are especially important biologically as they include the nesting seasons of diamondback terrapins (*Malaclemys terrapin*), clapper rails (*Rallus longirostris*), and Forster's terns (*Sterna forsteri*), among others. The number of days of flooding at various elevations in The Wetlands Institute marsh increased significantly over my study period. This result suggests that, even given the most conservative estimates, one impact of sea level rise over the next few decades will be increased flooding of marsh areas used as nesting habitat by ecologically important species.

### **Interactive Trail Mapping at The Wetlands Institute**

Zachary Schober, *Delaware Valley College of Science and Agriculture*

Education about wetlands is vital to the ecosystem's survival. With growing populations and the rise in demand for coastal housing, wetland areas and their inhabitants are experiencing new threats. In efforts to conserve these areas, education to the general public about the importance of wetland ecosystems must be on the front lines of the

conservation movement. Fortunately, environmental educators have one weapon in their arsenal that can be very beneficial: the World Wide Web. Many people are not able to physically visit The Wetlands Institute and witness its beauty first hand. For my project, I utilized Google Maps to create a virtual tour of The Wetlands Institute's Salt Marsh Trail. This interactive tour is readily accessible to anyone with internet access via computer, phone or hand-held device and includes on-site photos, interpretive videos, learning questions and even an appearance from Scute, The Wetland Institute's Diamondback Terrapin mascot. This application is very valuable as an education tool since it can be used by any classroom teacher or non-formal educator outside of The Wetlands Institute's grounds.

### **Atlantic Mole Crab Population Dynamics Along New Jersey's Southernmost Barrier Islands**

Alexandra Kontra, *Hamilton College*

The Atlantic mole crab, *Emerita talpoida*, inhabits the shores of New Jersey's barrier islands. The distribution of *E. talpoida* is strongly influenced by beach characteristics including wave energy and sand moisture content, as well as restorative processes such as beach replenishment. I collected sand core samples in fifty-meter blocks in the swash zone and lower beach, sieved the samples, and recorded the number, length and width of mole crabs at six different Cape May County beaches in Avalon, Stone Harbor, and North Cape May. Analyzing the swash and lower beach samples as one, as well as the swash samples alone, the mole crab population on the North Cape May south beach was significantly greater than those found at 49<sup>th</sup> and 55<sup>th</sup> Streets in Avalon and at Stone Harbor Point. However, the populations at 91<sup>st</sup> Street in Stone Harbor and at the North Cape May north beach had an intermediate mole crab population size, indicating no significant difference from any other beach. In the lower beach samples, there was no significant difference among beaches in the mole crab populations because mole crabs were especially sparse here. Among swash samples, there were significantly more mole crabs on natural beaches than on beaches that had recently been replenished, but among lower beach samples, average population was zero for both natural and

replenished beaches. Analysis of sand moisture content in the swash zone and lower beach indicated that mole crabs are almost exclusively found in the swash zone where moisture content averaged 21-23%.

### **Revamping Public Programs: Creating a Resource for a Naturalist Intern**

Elizabeth Rizzo, *Sweet Briar College*

One of the goals of The Wetlands Institute is to “teach people of all ages the value of wetlands and coastal ecosystems for the survival of life on earth.” Through the many education programs offered, we strive to educate the public, not only about the importance of the wetlands around them, but the incredible animals that live on or in it. One of the most popular programs offered at The Wetlands Institute are Creature Features. Each day, a new creature is highlighted and families often return daily to learn exciting facts about each species. My project had three different components: rewriting and editing the Creature Feature Compendium, organizing the prop bins and education tools, and creating a new Creature Feature presentation based on the popular movie “Finding Nemo.” The goal of my project was to create a factual guide for future Naturalist Interns and to replace the SpongeBob Creature Feature with a new presentation. My work will be very beneficial to the Wetlands Institute in the future, not only for the Naturalist Interns, but also for the public. My hope is that the new Creature Feature will be a success and draw in more families, the way the film did in the box office.

### **The Effects of Beach Raking and Refilling on Ghost Crab *Ocypode quadrata* Burrow Density in Cape May County**

Sarah Zollner, *Boston University*

The ghost crab inhabits burrows in the supralittoral zone and dunes of beaches ranging from Rhode Island, USA to Brazil. The density of ghost crabs can be estimated by counting their burrows. I estimated ghost crab density on seven beaches in Cape May County, New Jersey

that differed in factors that impact their populations: mechanical raking and beach fill operations. Beaches at 49<sup>th</sup> and 55<sup>th</sup> Street in Avalon and North Cape May South had significantly greater ghost crab burrow density than did North Cape May North, 61<sup>st</sup> Street (Avalon), 91<sup>st</sup> Street (Stone Harbor), and Stone Harbor Point. Unraked beaches had 35 times as many ghost crab burrows as raked beaches. Similarly, beaches with recent beach fill operations had 12 times fewer crab burrows as unfilled beaches. Because larger/older and smaller/younger ghost crabs construct burrows of different size and complexity, I recorded small and large crab holes on each beach and found that the significant differences among beaches extended to small, large, and total ghost crab holes. I mapped the location of ghost crab burrows in 144 m<sup>2</sup> quadrats on two beaches to determine the distribution and spacing of different size burrows. Burrow density was concentrated closer to the high tide (wrack) line than the dunes, and each burrow was usually occupied by only one crab. This gave me confidence that the number of burrows was a valid estimate of the crab population. Ghost crab populations in Cape May County are negatively impacted by human induced changes to the beaches.

### **Wetlands: Creating, Evaluating and Educating about Environmental Sustainability**

Jill Burgy, *Rowan University*

Sustainability is a word that we hear frequently in our communities these days. In many ways it has only risen to the attention of some due to our high capacity need for resources. Our basic needs for food, water and shelter have been surpassed by the monetary value of these commodities; it is institutes such as The Wetlands Institute that are responsible for leading our community in a truly sustainable direction. Setting out to re-evaluate, improve and expand on the sustainable efforts of the Wetlands Institute were a few of the main objectives that I wanted to complete with my project. One of the main goals that I set out to achieve while having this opportunity was to find a common understanding between factors that intrigue and excite the public and

develop these in a way to create a better portrayal of sustainability and the role that the individual public plays in supporting our overall efforts. The significant results of sustainable practices and efforts are just out of our reach. I've designed my project to leave a reminder of the countless possibilities that we, as a joined education, research and conservation community, have to generate sustainable ideas and implement practices that maximize our sustainable potential.

### **Diamondback Terrapin Escape Behavior in Commercial-style Blue Crab Traps with Functional Biodegradable Panels**

Jennifer Teson, *Millersville University of Pennsylvania*

Lost or abandoned crab traps, termed ghost traps, can significantly impact diamondback terrapin (*Malaclemys terrapin*) populations in areas heavily fished for blue crabs (*Callinectes sapidus*). Biodegradable panels typically constructed of wood, fiber, metal, or cellulose are intended to degrade within one year, allowing animals to escape from ghost traps. When functioning properly, panels can dramatically reduce bycatch impacts. Since 1998, New Jersey has required biodegradable panels on all commercial-style crab traps. However, most states lack standardized protocols for biodegradable panel composition and placement. New Jersey recommends the panel be placed in an upper corner of the top chamber. Terrapin entrapment times and subsequent mortality may be significantly decreased with proper panel design and placement. I simulated entrapment of juvenile and adult diamondback terrapins (using both wild and captive animals) by encouraging them to enter an experimental, standard blue crab trap set in a large water-filled barrel. Using a digital underwater video camera, I recorded their escape behavior and analyzed the footage to evaluate behavioral responses. I categorized escape behavior, counted specific actions, and timed durations of activities (such as swimming or walking). I focused especially on numbers of horizontal and vertical escape attempts. Their behavior in traps and the total time required for individual terrapins to escape varied considerably among terrapins. All but two terrapins were able to escape the trap within 12 minutes. After preliminary trials testing the efficacy of biodegradable panel placement, I concluded that New Jersey's current suggested placement of panels is adequate for



timely terrapin escape.

### **Child Exploration: A Simple Look at Complex Science**

Kimberly Bullock, *Ursinus College*

How do you get a 4-year-old to understand the term Echinoderm? This was one of the many challenges I faced during my intern project. Over three different weeks, I embarked on extensive adventures exploring creatures under the sea, journeyed back in time to find the actual size of the monster snake Titanoboa and created artful masterpieces all from objects collected while trekking through the salt marsh. It wasn't all fun and games though, lesson plans needed to be developed and research needed to be done on how exactly I was going to get these children to understand and appreciate the world around them. My goals were "simple", I wanted my students to be able to sit down at the dinner table and tell their family what they learned that day. I wanted them to walk away from Summer Nature Programs with enough information to impress mom and dad, but still curious and eager to learn more. As an Environmental Studies and Education major, I am always excited about translating complex environmental concepts to children. In order to accomplish my goals, I created lesson plans with hands-on activities and crafts that would leave a lasting impression. In addition to creating these interactive lessons, I compiled a master binder of best practices for future Summer Nature Program Instructors to utilize when educating this age group. As I hope to have a future in education, this project was not only beneficial for the institute, but it was also an excellent experience for me.

### **Body Size and Reproductive Potential of the Northern Diamondback Terrapin, *Malaclemys terrapin terrapin***

Jillena Yeager, *The Richard Stockton College of New Jersey*

Female diamondback terrapins produce immature eggs (follicles) which develop into successive clutches of eggs during the nesting season. Although an individual terrapin may lay three clutches during the nesting season, we cannot predict how many clutches a given terrapin will produce. I hypothesized that larger terrapins produce more clutches

than smaller terrapins, quantified by examining the numbers of shelled eggs and follicles of road kills. I extracted the reproductive systems from 38 road kill females with intact follicle assemblages. Follicles >1 g would be the most likely to form the next cohort of eggs. Individual terrapins with plastron lengths <15 cm contained a range of 1-12 such follicles, and larger terrapins contained a range of 1-22 such follicles. Dramatic variation in follicle counts for larger terrapins caused me to reject my original hypothesis. Regression analyses of the relationships between terrapin size and the numbers and masses of 1) follicles and 2) eggs+follicles suggested that terrapin reproductive potential might increase with size until leveling off at approximately a 15-16 cm plastron length. Smaller terrapins' reproductive output may be constrained by both physiological and environmental factors. In contrast, greater follicular variation among terrapins with plastrons  $\geq 15$  cm suggest that environmental factors may be important in determining if a terrapin lives up to its fitness potential. My results suggest that terrapin reproductive potential does not increase with size and age throughout the entire lifespan, and female terrapins may reach maximum reproductive potential at intermediate sizes.

### **Investigating the Demographic Impacts of Ghost Traps on Diamond-Backed Terrapins (*Malaclemys terrapin*)**

Benjamin Atkinson, *University of Florida*

Ghost traps include lost and abandoned blue crab (*Callinectes sapidus*) traps that passively capture terrapins. An estimated 25% of all crab traps become ghost traps, which can persist for years in coastal wetlands. Bycatch species die from anoxia, starvation, or predation within a trap. Any animal entering a ghost trap may become new bait until a trap is retrieved or disintegrates. My study estimates the number of ghost traps in the brackish sounds and intracoastal waterways along the Cape May Peninsula of New Jersey using side-scan sonar. I interpret salvaged skeletal elements from retrieved traps to estimate terrapin mortality rates. Minimum mortality and terrapin demographics can be inferred by applying paleontological techniques to disarticulated bones gleaned from ghost traps. Hyoplastra and hypoplastra are the bones most frequently retained in traps. Both have proven reliable for

allometry, enabling reconstruction of shell dimensions in life. Fontanels also facilitate determination of demographic class. I assess the percentage of terrapin mortalities potentially avoided via bycatch reduction devices and identify locations of highest concern. By measuring several hundred complete skeletons in museum and university collections, I created a dataset for comparison to bones collected in the field. Regression models based on complete skeletons allow me to use isolated terrapin bones retrieved from traps to predict which populations are most vulnerable. Insights gained from these previously unpaired techniques lead me to coin the term “conservation osteology.” These techniques, coupled with geo-referencing mortality hotspots, are powerful tools for understanding bycatch impacts.

**From all The Wetlands Institute staff and interns:**

***THANK YOU to the many collaborators, volunteers, and docents who have helped to make our programs a success!***



Elizabeth Rizzo, Jill Burgy, Kimberly Bullock, Zachary Schober



Sarah Zollner, Jennifer Teson, Alexandra Kontra, Jillena Yeager, Brianna Lowey, Ralph Boerner, Ben Atkinson