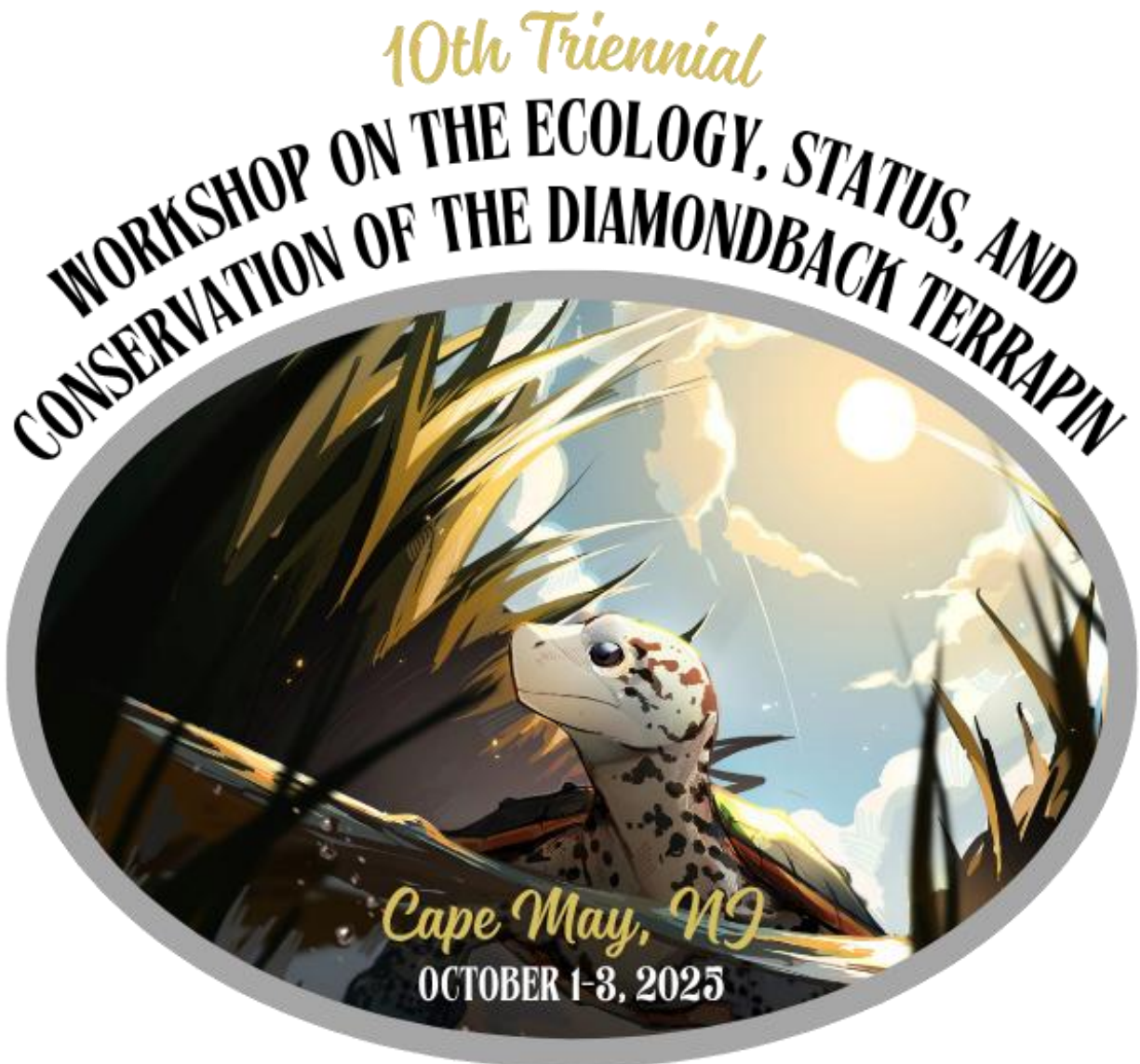


The Diamondback Terrapin Working Group's



On behalf of the organizing committee, we welcome you to the Diamondback Terrapin Working Group's 10th Triennial Workshop on the Ecology, Status and Conservation of the Diamondback Terrapin in Cape May, New Jersey. The 2nd Workshop was held at the Wetlands Institute in Stone Harbor almost 25 years to the day. Our first knowledge of diamondback terrapin nesting ecology was documented in central New Jersey in the mid-1970's (Burger and Montevecchi, 1975). The effect of crab pots on terrapins was documented in Cape May, NJ (Wood, 1997). The 10th Triennial promises to feature current research, regional conservation actions and best practices in terrapin research and conservation.

We welcome representation from throughout the range of diamondback terrapins from Massachusetts to Texas, where the threats to diamondback terrapins and their habitat have been a consistent theme since the first inaugural meeting in 1994. However, our knowledge of diamondback terrapin populations, ecology and human impacts continues to grow. The future of terrapins depends on this knowledge as advances in tracking technology, placing an emphasis on bycatch reduction, mitigating nesting habitat loss, enforcing illegal possession (poaching), and reducing road encounters offer hope for the future of diamondback terrapins. Also, a greater emphasis on diamondback terrapin education, highlighting their importance in our ecosystem, will be a key to the conservation of this unique species.

The 10th Triennial Workshop will be a venue to share more knowledge about the diamondback terrapin and we are happy to bring you together for this program.

Very truly yours,

John Wnek,
Junior Co-Chair, DTWG, and
10th Triennial Host

Local Host Team

Lisa Ferguson
Brian Williamson
Ben Wurst
Brian Zarate
Michele Budd
Courtney Parks
Randy Chambers
Patricia Wnek

Diamondback Terrapin Working Group (DTWG) Officers:

Senior Co-Chair: John Maerz (University of Georgia), Outgoing; John Wnek (Marine Academy of Technology & Environmental Science, Project Terrapin, NJ), Incoming
Junior Co-Chair: Lisa Ferguson (The Wetlands Institute, NJ), Incoming
Secretary: Sarah Finn (North Carolina Wildlife Resources Commission)
Treasurer: Randolph Chambers (William and Mary, VA)

DTWG Board Members:

Northeast Representative: Russell Burke (Hofstra University, NY)
Mid-Atlantic Representative: Lisa Ferguson (The Wetlands Institute, NJ), Outgoing;
Brian Williamson (The Wetlands Institute, NJ), Incoming
Southeast Representative: Jordan Gray (Turtle Survival Alliance)
Florida Representative: Chris Lechowicz (Sanibel-Captiva Conservation Foundation)
Gulf Representatives: Aaron Baxter (Coastal Bend Bays & Estuaries Program, TX)
At Large Member: Jason Alstad (Skidaway Georgia Audubon)
At Large Member: Barbara Brennessel (Wheaton College, MA)
At Large Member: George Heinrich (Heinrich Ecological Services, FL)
At Large Member: Patricia Levasseur (Smithsonian Environmental Research Center)
At Large Member: David Zailo (County of Volusia, FL)

DTWG Regional Board Representative Alternates:

Mid-Atlantic: Brian Williamson (The Wetlands Institute, NJ), Outgoing
Southeast: Kathryn Craven (Georgia Southern University)
Florida: Joe Butler (University of North Florida)
Gulf: Daniel Catizone (USGS Wetland and Aquatic Research Center, FL)

Past Co-Chairs

John Maerz (University of Georgia - Incoming)
Amanda Williard (UNC - Wilmington)
Christina Mohrman (Gulf of Mexico Alliance)
Russell Burke (Hofstra University)
Willem Roosenburg (Ohio University)
Joe Butler (University of North Florida)

DWTG Board Positions Needed for the 2025 – 2028 cycle:

- Northeast Regional Alternate Representative
- Mid-Atlantic Regional Alternate Representative
- Web content developers

The historic Cape May Point Arts and Science Center is host site to our 10th Triennial Workshop



The Cape May Point Arts and Science Center (The Center) stands nestled among the dune grasses at New Jersey's southernmost point, where the Atlantic Ocean meets the Delaware Bay, creating one of the country's most vital and biodiverse ecosystems.

In the middle of the Atlantic flyway, Cape May Point is a renowned ecological intersection of marine, insect, and avian species. Within a few square miles, you can experience the beauty and wonder of the world's biggest butterfly migration, the largest concentration of one of the world's oldest creatures, horseshoe crabs, and critical habitat of migratory birds, including raptors like hawks, owls, and eagles. Devoted to environmental protection, restoration, and conservation throughout the region, The Center advances its mission by providing unique opportunities and funding for advocacy, education, and research.

The Center has found its home in the 38,000 square-foot Victorian structure that debuted as the Shoreham Hotel in 1889. In 1909, It became Saint Mary by-the-Sea, the summer retreat house for the Sisters of Saint Joseph of Philadelphia. Lovingly maintained by the Sisters for more than 100 years, The Center would not be possible without their preservation of the building and dedicated stewardship of nature. With widespread community support, and under the leadership of top researchers and scientists, The Center builds on Cape May Point's century-and-a-half-long legacy of providing a restorative backdrop for recreational, spiritual, and educational retreats. We thank Bob Mullock, president, David Cassidy, director of facilities, Natalie Moyer, administrative coordinator, and Katie and Mark Bliss, groundskeepers, for helping to make our workshop possible.

We greatly appreciate our sponsors for helping to make this workshop possible...



Jenkinson's Aquarium is located on the boardwalk in Point Pleasant Beach, NJ. Since June of 1991, the aquarium has been dedicated to educating the public on all aspects of marine life and conservation. The Aquarium has been instrumental in local

conservation efforts including support of bycatch reduction device usage and education. Jenkinson's Aquarium has been part of diamondback terrapin head starting throughout the past 12 years. The Aquarium has also provided generous support for diamondback terrapin research, conservation and education in New Jersey. They continue to educate about the conservation of terrapins and set up a conservation display that focuses on diamondback terrapins from hatchlings to mature, adult females.

We appreciate their generous cash support of the 10th Triennial Workshop as a Platinum Terrapin level supporter.



The New Jersey Academy of Science (NJAS) proudly celebrates over seven decades of dedicated service to advancing scientific research and education throughout the state. Established in 1954, NJAS was founded by a coalition of academicians and corporate professionals who recognized the need to cultivate and support scientific endeavors in New Jersey. NJAS became an affiliate of the American Association for the Advancement of Science (AAAS) and a member of the National Association of Academies of Science (NAAS), further cementing its

position as a leading scientific organization in the region.

Since its inception, the Academy has evolved into a critical nexus connecting corporations, academia, and state government, working collectively to advance scientific research, education, and policy. Thousands of dedicated members have invested countless hours in mentoring, supporting, and awarding talented students, ensuring the development of the next generation of scientists and science educators. Through scholarships, research competitions, and professional networking opportunities, NJAS continues to inspire young minds and strengthen the scientific community. They are proud supporters of this year's 10th Triennial Workshop.

We appreciate their generous cash support of the 10th Triennial Workshop.

MacFarland Wilson Family Foundation provided a generous donation to cover the cost for the rental of the Cape May Point Arts and Science Center for our 10th Triennial Workshop. We are incredibly grateful for their support and appreciate their commitment to our efforts in sharing diamondback terrapin research, conservation and education over the course of our three days in Cape May, NJ.



Project Terrapin is an initiative that supports diamondback terrapin research, conservation and education throughout Barnegat Bay and New Jersey. Students from the Marine Academy of Technology and Environmental Science (MATES) volunteer over 1000 hours to its initiatives each year. The program is a volunteer initiative at the grass roots level of research and conservation. We reach 1000's of students and the general public throughout the year.

Project Terrapin has been instrumental in local conservation initiatives including fundraising for bycatch reduction devices (BRDs). Over 34,000 BRDs have been distributed through Project Terrapin. There are also several schools that are conducting conservation projects including diamondback terrapin hatchling head starting under Project Terrapin.

We appreciate their generous donation of the workshop beach bags with the 10th Triennial Workshop logo, monetary donation for supplies, and auction items.



The Wetlands Institute is a non-profit 501(c)(3) organization promoting appreciation, understanding, and stewardship of coastal and wetland ecosystems through programs in research, conservation, and education. They work to restore, preserve and protect wetlands and coastal ecosystems for a healthy environment for people and wildlife. Research and conservation efforts are focused on the issues that are affecting wetlands and the critical species that live in them. Studying and conserving diamondback terrapins, horseshoe crabs, shorebirds, and the plants that grow and stabilize the marsh dominate our efforts. They are testing methods to raise the marsh to offset decades of sea level rise to make sure we have healthy marshes to protect the island from storm surges and flooding. They are restoring habitats and conserving terrapins, horseshoe crabs and birds to maintain the balance disrupted by people and climate change. The Wetlands Institute engage thousands of children each year in discovering the wonders of our environment to keep them interested in science and make them more environmentally literate. It is a world-class research, conservation and education facility and it's right here in our backyard.

We appreciate their donation of a workshop field activity and silent auction items.



Gusto Brewing Company, North Cape May, NJ is New Jersey's southernmost brewery and taprooms. They have been serving the community for the past seven years. With custom brewing as their specialty, Gusto developed a special beer for our 10th Triennial Workshop.

We appreciate their donation of the Wednesday evening social space, and the brewing of the custom brewed hazy “diamondback terrapin workshop” IPA. They produced a can version of our special IPA that was graciously donated.



Conserve Wildlife Foundation staff work tirelessly to protect rare and imperiled species through grassroots conservation efforts, innovative enhancement projects and citizen engagement and outreach. It is our duty to conserve wildlife to support healthy ecosystems, human health and for future generations to admire. Over the past 25 years, Conserve Wildlife Foundation of New Jersey has made significant strides in wildlife conservation through habitat restoration, species protection efforts, and public awareness campaigns, helping to safeguard endangered and threatened species across the state. Diamondback terrapin conservation is one such initiative by establishing a large nest site in a high-density terrapin nesting habitat in partnership with other stakeholders.

We appreciate their coordination of the silent auction and donation of multiple works of art for the 10th Triennial Workshop.



OCVTS offers career development for high school and post-secondary students. Its career academies are four-year public high schools administered by the Ocean County Vocational Technical School District. At the Marine Academy of Technology and Environmental Science (MATES), STEM-oriented students are chosen through a competitive selection process. OCVTS-MATES hosts the Project Terrapin initiative where over one-half of the MATES student body is involved.

We appreciate their donation of local transportation, use of supplies, kitchen items, and all printing for the 10th Triennial Workshop.



Stockton University is located in Southern New Jersey and has been a leader in diamondback terrapin research and conservation throughout the decades. They coordinate a hatchling head start program for rescued terrapin hatchlings and eggs extracted from adult female terrapins that experience road mortality at their Vivarium. Stockton is also a leader in recovering derelict crab pots from local waters, as well as providing local crabbers with technology to reduce the loss of their gear. They provide specialized crab pot recovery techniques for multiple projects throughout New Jersey and Delaware.

We appreciate their field trip opportunity on the first day of the 10th Triennial Workshop as well as providing us with the keynote speaker.



Since 1946, Herr's has been making exceptionally delicious snacks. You can always trust that you're getting an exceptional snack that's made for you to enjoy. Herr Foods Incorporated sets aside a portion of our annual budget for charitable giving. Our Herr's Has Heart program offers individual-sized snack bags for the 10th Triennial.

We appreciate their donation of snacks for the 10th Triennial Workshop.

Overview of the 10th Triennial

Wednesday October 1, 2025

1:00 – 3:00 PM Optional Early Field Activity at Stockton University (Live Animal Lab) – Pre-registration requirement

4:00 PM *Business Meeting at Cape May at [Gusto Brewing Company](#) (3860 Bayshore Rd. Cape May, New Jersey 08204, (609) 849 -8260 (gustobrewco@gmail.com)*

5:30 – 8:00 PM Social Gathering and Registration at [Gusto Brewing Company](#) ([Directions](#))

Thursday October 2, 2025

8:00 AM Registration Opens, Breakfast at the [Cape May Point Art and Science Center](#) Ballroom (Continental Breakfast)

8:20 AM – *Optional tour of the Cape May Point Arts and Science Center*

8:50 AM Welcome to the 10th Triennial Workshop by the NJ Planning Team

9:00 AM- Overview since the last Triennial and beyond by Dr. John Maerz, Senior Co-Chair, DTWG

9:20 AM Keynote Speaker: Dr. Mark Sullivan, Stockton University, NJ.

9:55 AM Break

10:05 – 11:10 AM **Presentation Session 1** (CMPASC Exhibit Hall)

11:25 – 12:30 PM **Presentation Session 2** (CMPASC Exhibit Hall)

12:30 – 1:30 PM Lunch

1:00 – 1:30 PM Optional Monarch Butterfly migration activity – [Project Monarch](#)

1:35 - 2:40 PM **Presentation Session 3** (CMPASC Exhibit Hall)

2:40 PM Break

2:55 – 4:00 **Presentation Session 4** (CMPASC Exhibit Hall)

4:00 Break and Poster Set-up in the Ballroom

4:15 PM **DTWG Awards (Ballroom)**

4:45 PM 10th Triennial Group Photo – Outside Courtyard!

4:50 Poster Session (Banquet Room) and Silent Auction (Exhibit Hall)

6:30 Social Gathering and Buffet Dinner in the CMPASC Ballroom

7:30 PM (Flexible) – *Silent Auction Closed - (Items can be paid using cash, check, PayPal, Venmo and ApplePay)*

Enjoy the Beautiful Fall Season in Lower Cape May

Friday October 3, 2025

**7:15 – 8:30 AM (Optional Birding Program
w/ Jason Kelsey, BEAK (Meet in the Lobby of
the CMPASC)**

8:30 AM Breakfast in the CMPASC Banquet
Room

9:00 – 10:05 AM Kick off Day 3 with
Presentation Session 5 (CMPASC Exhibit
Hall) & Outstanding Student Presentation and
Student Poster Award Announcement

10:05 Conclusion of the Presentation Sessions &
Break

10:20 – 12:00 PM Breakout Sessions (proposed
below, locations to be assigned):

- Bycatch Reduction
- Nest Conservation Efforts
- Head Start
- Populations Assessment Best Practices
- Publicity/Education

12:00 PM Lunch and Departure (Lunch: Grab
and Go)

12:30 PM Departure for optional field activity to
visit the Wetlands Institute in Stone Harbor, NJ



John C. Maerz, Senior Co-Chair, Diamondback Terrapin Working Group

Dennis and Sara Carey Distinguished Professor of Forestry and Natural Resources

*& Josiah Meigs Distinguished Teaching Professor
Warnell School of Forestry and Natural Resources
University of Georgia*

John has provided leadership in the Co-Chair position over the past six years and has been instrumental in establishing our website, an on-line presence, and developed a comprehensive diamondback terrapin library, which is an invaluable resource for all of us.

Keynote Speaker: Dr. Mark Sullivan, Stockton University, NJ, USA



"Abandoned, Lost, Derelict Fishing Gear (ALDFG) Removal and Prevention: Lessons Learned in Shallow New Jersey Coastal Bays"

Stockton University scientists have engaged New Jersey commercial crabbers to help break the cycle of crab trap loss in a network of coastal bays covering ~36 km of coastline. To date, >3500 items of abandoned, lost, discarded fishing gear (ALDFG) have been removed off-season, supplemented by hundreds of in-season recoveries using recreational-grade sonars to prevent future accumulation. Results and lessons learned from this work will be discussed as well as ongoing/future research directions involving marine debris.

Biography:

Dr. Mark Sullivan received his M.S. degree in Marine Environmental Science from SUNY Stony Brook and a Ph.D. in Marine Biology and Fisheries from the University of Miami Rosenstiel School of Marine and Atmospheric Science. He is currently a Professor of Marine Science at Stockton University. His research focuses on the role of larger-scale phenomena (fishing activity, regional oceanography, climate change) as sources of variability for marine and estuarine species, primarily fishes.

Detailed Program

Wednesday October 1, 2025

1:00 – 3:00 PM Optional Field Activity at Stockton University (Live Animal Lab) – Pre-registration required. Meet at Stockton University's Vivarium, Unified Science Building First Floor, 101 Vera King Farris Drive, Galloway, NJ 08205 (John Rokita and Melissa Laurino)

4:00 PM Business Meeting at Cape May at [Gusto Brewing Company](#) (3860 Bayshore Rd. Cape May, New Jersey 08204, (609) 849 -8260) gustobrewco@gmail.com

5:30 – 8:00 PM Social Gathering and Registration at [Gusto Brewing Company](#) ([Directions](#))

Thursday October 2, 2025

All Activities are at the Cape May Point Arts and Science Center, 101 Lehigh Avenue, Cape May Point, NJ 08212

8:00 AM Registration Opens, Breakfast at the [Cape May Point Art and Science Center](#), Ball Room (Continental Breakfast)

8:20 AM Optional tour of the Cape May Point Arts and Science Center

8:50 AM Welcome to the 10th Triennial Workshop by the NJ Planning Team (John Wnek, Junior Co-Chair, DTWG)

9:00 AM- Overview since the last Triennial and beyond by John Maerz, Senior Co-Chair, DTWG

9:20 AM Keynote Speaker: Dr. Mark Sullivan, Stockton University, NJ.
"Abandoned, Lost, Derelict Fishing Gear (ALDFG) Removal and Prevention: Lessons Learned in Shallow New Jersey Coastal Bays"

9:55 AM Break

10:00 AM – 4:00 PM Presentations (up to 13 minutes with 2 minutes for questions in the Exhibit Hall).

Presentation Session 1: Status and Management 10:05 – 11:05 AM Exhibit Hall

Session Chair: Willem Roosenburg

- 10:05 Quantifying Movements and Home Ranges of an Estuarine Turtle: The Effects of Urbanization and Boundaries**
Karissa Hough
- 10:20 Sex-Dependent Seasonal Shifts in Diet of Diamondback Terrapins (*Malaclemys terrapin littoralis*) in a Gulf Coast Marsh: Elucidation by Fecal DNA Metabarcoding**
Mark Merchant and Sarah Baker
- 10:35 Preliminary Results of a Field Study on the Distribution and Status of the Diamondback Terrapin (*Malaclemys terrapin*) in Tampa Bay, Florida**
George L. Heinrich, Joseph A. Butler, and J. Sean Doody
- 10:50 Terrapin Monitoring to Guide Good Management**
John C. Maerz and Danielle R. Bradke
- 11:05 – 11:20 AM Break**

Presentation Session 2: Population & Behavior I 11:25 AM – 12:30 PM Exhibit Hall

Session Chair: John C. Maerz

^LDenotes Lightning Talk (~5 minutes)

- 11:25 Habitat Use and Environmental Tolerances of Diamondback Terrapins in the Southwestern Gulf of Mexico**
Garrett Guzowski, Daniel Coffey, Shawn F. McCracken, and Loretta L. Battaglia
- 11:40 Population Structure and Size Estimates for Alabama Diamond-backed Terrapins (*Malaclemys terrapin pileata*)**
Matthew E. Wolak, Thane Wibbels, Tonia S. Schwartz, and Iwo P. Gross
- 11:55 A First Look at Movements of Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) in the Delaware Bay Using Satellite Telemetry**
Brian Williamson and Lisa Ferguson
- 12:10 ^{L+}First Report: Assessing Microsatellite Diversity Within Bermuda's Diamondback Terrapin (*Malaclemys terrapin*) Population**
Terri J. Seron, Madeline L. Musante, Lydia C. Logan, Benjamin K. Atkinson, and Mark E. Outerbridge
- 12:20 ^LAggregate Brumation Site for Wellfleet Harbor Diamondback Terrapins**
Barbara Brennessel and Bob Precott

12:30 – 1:00 PM Catered Lunch at the CMPASC, Banquet Room)

1:00 – 1:30 PM Optional Monarch Butterfly migration activity – [Project Monarch](#)

Presentation Session 3: Population Assessment I 1:35 – 2:40 PM Exhibit Hall

Session Chair: Lisa Ferguson

**Denotes student presenter*  *Student award participant*

1:35 Understanding the Movement Patterns of Diamondback Terrapin as a Function of Sex and Size Stage

Kelsey Krumm, Willem M. Roosenburg, Matt Kendall, and Bethany Williams

1:50 Understanding the Movement Patterns of Wild vs Head-start terrapin as a Function of Age and Experience

**Kelsey Krumm, Willem M. Roosenburg, Matt Kendall, and Bethany Williams*

2:05 Population Genetics of Diamond-backed Terrapins in Southeastern North Carolina

**Brett Wilson, Stephanie Kamel, and Amanda Southwood Williard*

2:20 Evaluating Diamond-backed Terrapin (*Malaclemys terrapin*) Nesting and Reproductive Vulnerabilities at Sandy Hook National Recreation Area, Fire Island National Seashore, and Sagamore Hill National Historic Site

**Kathryn A Marshall, Karissa I. Hough, Rebecca J. Berzins, and Sean C. Sterrett*

2:35 – 2:50 PM Break

Presentation Session 4: Population & Behavior II 2:55 – 4:00 PM Exhibit Hall

Session Chair: Brian Zarate

**Denotes student poster*  *Student award participant*

2:55 Nest Site Choice as a Potential Behavioral Adaptation to a Warming Climate in the Diamondback Terrapin (*Malaclemys terrapin*)

**Andrew Robey, J. Sean Doody, and George L. Heinrich*

3:10 Evidence of Diamondback Terrapin Ecology within the Population Genetic Structure of a Unique Parasitic Trematode

**Garrett J. Maggio, April M.H. Blakeslee, Krista A. McCoy, James E. Byers, Jason D. Williams, Iris Segura-Garcia, Sarah R. Goodnight, Michael W. McCoy*

3:25 🌱 Scale-optimized Habitat Analysis Using UAV Photogrammetry: Diamond-backed Terrapin Nest Site Selection in Mississippi

**Iwo P. Gross and Matthew E. Wolak*

3:40 Investigating Diamond-backed Terrapin (*Malaclemys terrapin*) Behavior

**Griffin Kennedy and Willem M. Roosenburg*

4:00 PM Break and Final Poster Setup (Ballroom)

4:15 PM Diamondback Terrapin Awards (Ballroom)

-Sornborger Citizen Science Conservation Award – George Heinrich



-Terrapin Conservation Award – Sarah Finn



-Community Conservation Award – The Wetlands Institute



~4:45 PM 10th Triennial Group Photo (Outside Garden Area)

4:50 PM Poster Session (Ballroom), Networking, and Silent Auction (Exhibit Hall)

Poster Session starting at 4:50 PM (Ballroom)

*Denotes student poster  Student award participant

A Test of BRDs and Escape Hatches in Commercial-Style Crab Traps

Randy Chambers, Mary Laun, Francesca Twombly, Jack Zamary and Cheryl Leu

 Evaluating Regional Patterns of Diamondback Terrapin (*Malaclemys terrapin*) Occupancy in South Carolina

*Graham Nystrom and Kristen Cecala

 Analysis of Environmental Conditions Between Diamondback Terrapin Hatchery Designs

*Chloe C. Wnek, Michele Budd, and John Wnek

 Bycatch Reduction Device and Crabbing Equipment Distribution Analysis of Bait and Tackle Shops Along Barnegat Bay, New Jersey, USA

*Isabella S. Morgan, Jason Kelsey, and John Wnek

 Magnetic Orientation in Northern Diamondback Terrapin Hatchlings

*Rhea J. Dudhwala, Jason Kelsey, and John Wnek

 Pattern and Contrast Analysis of Diamondback Terrapin Hatchlings in the Ultraviolet Spectrum

*Isabel Kopsaftis, Jason Kelsey, and John Wnek

Influence of Elevation, Substrate, and Vegetation on Nest Site Selection in the Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*)

Brian Williamson and Lisa Ferguson

Occurrence of Northern Diamondback Terrapins, *Malaclemys terrapin terrapin*, and Anthropogenic Threats in a Residential Neighborhood in Ocean City, New Jersey

*Lily VanWingerden and Rhonda VanWingerden

Investigating the Role of Ultraviolet-B in the Growth of Northern Diamondback Terrapin Hatchlings

*Avery Larew, Arya Sood, and John Wnek

Short Term Hydration for Newly Emerged Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) Hatchlings

Michele Budd and John Wnek

Pine Protection as a Predator Deterrent for Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) Nests

Michele Budd and John Wnek



Investigating Bay Island Nesting Viability for Northern Diamondback Terrapins Using Machine Learning

*Kendal Gray, Alex Mariievskyi, and John Wnek



How Coastal Microhabitat Change Affects Nesting Abundance and Predator Dynamics in Diamondback Terrapins (*Malaclemys terrapin*)

*Andrew P. Pagan and Willem M. Roosenburg

Detection Probability of Diamondback Terrapins with Fyke Nets in New York City Estuary

Neha Savant, Michael Rosenthal, Carla Garcia, and Georgina Cullman

6:30 PM Social Gathering and Buffet Dinner (Ballroom)

7:30 PM – Silent Auction Closes (*Payment can be made using cash, check, PayPal, Venmo or Apple Pay*)

Enjoy a beautiful fall evening in Lower Cape May!

Friday October 3, 2025

All morning activities are at the Cape May Point Arts and Science Center, 101 Lehigh Avenue, Cape May Point, NJ

7:15 – 8:30 AM Optional Birding Program w/Jason Kelsey, BEAK Program (Meet in the main lobby of the CMPASC). We will provide binoculars, a spotting scope and guides.

8:30 AM – Breakfast in the Ballroom

9:00 AM – Kickoff Day 3 (Outstanding Student Presentations and Poster Awards - Exhibit Hall)

Presentation Session 5: Population Assessment II 9:05 – 10:05 AM Exhibit Hall

Session Chair: Brian Zarate

^LDenotes Lightning Talk (~5 minutes)

- 9:05 Field Observations of Retained Yolk Sacs in Diamondback Terrapin (*Malaclemys terrapin*) Hatchlings: Management and Conservation Implications**
Tabitha Hootman, Allison Conboy, Wade Smith, Ali E. Flisek, Melissa I. Smith, DVM, John Enz, Shannon McNeil, and Eric C. Munscher
- 9:20 Habitat Use of Juvenile Northern Diamondback Terrapins (*Malaclemys terrapin*) in a Tidal Saltmarsh**
Lisa Ferguson and Brian Williamson
- 9:35 ^LDistribution and Movement Ecology of the Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*)**
**Tyler B. T. Bowling, Garrett Guzoski, Daniel L. Coffy, Loretta L. Battaglia, Shawn F. McCracken*
- 9:50 ^LInvestigating Barnacle Occurrence and Effects on Diamondback Terrapins at The Wetlands Institute**
**Darby Brant, Lisa Ferguson, Brian Williamson, and Amanda Lyons*

10:05 – 10:20 AM – Break

10:20 – 12:00 PM – Breakout Sessions on Proposed Topics to be assigned in CMPASC Main Lobby, Exhibit Hall, and Ballroom): Bycatch Reduction, Nest Conservation Efforts, Head Start, Populations Assessment (Best Practices), and Publicity/Education

12:00 PM – Lunch “Grab ‘n Go” (Ballroom and Close of Workshop)

12:30 PM – Departure for optional field activity at The Wetlands Institute, 1075 Stone Harbor Blvd, Stone Harbor, NJ 08247

Oral Presentation Abstracts

Distribution and Movement Ecology of the Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*)

Tyler B. T. Bowling (1), Garrett Guzoski (1), Daniel L. Coffy (1), Loretta L. Battaglia (1), Shawn F. McCracken (1)

(1) Texas A&M University-Corpus Christi, 6300 Ocean Dr., Unit 5800 Corpus Christi, TX 78412, USA

Our research aims to identify the distribution of the Texas Diamondback terrapin and potential nesting habitat locations in the bays and estuaries of the Texas Coastal Bend. Texas Diamondback terrapins are listed as *S2 Imperiled* by the Texas Parks and Wildlife Department and as a Species of Greatest Conservation Need, with declining population trends due to human development, habitat loss, bycatch, and climate change. Despite this conservation concern, the contemporary range of the subspecies in the middle Texas Gulf Coast system and the western extent of their range is unknown, along with current nesting habitat use and availability. The project has three primary objectives using eDNA and telemetry data: (1) determine the distribution of Texas Diamondback terrapin populations in the Coastal Bend bay complexes; (2) determine if seasonal patterns of terrapin distribution exist; and (3) identify suitable nesting habitat sites in proximity to identified populations. Water samples are collected seasonally at approximately 80 high-probability sites between San Antonio Bay and Baffin Bay, with sites classified from aerial and historical satellite imagery. Seasonal sampling will also target potential winter brumation sites. Head surveys are conducted concurrently to visually confirm eDNA detections and identify additional occupied areas. Trapping and GPS tagging are being conducted at three sites with confirmed populations. The project aims to fill critical knowledge gaps, informing vulnerability assessments, adaptive management, and conservation strategies to protect essential estuarine and nesting habitats for this unique brackish-water turtle.

KEYWORDS: Environmental DNA (eDNA), Texas, Species distribution, Telemetry

Investigating Barnacle Occurrence and Effects on Diamondback Terrapins at The Wetlands Institute

Darby Brant (1), Lisa Ferguson (1), Brian Williamson (1), and Amanda Lyons (1)

(1) The Wetlands Institute, 1075 Stone Harbor Blvd, Stone Harbor, NJ 08247, USA

Diamondback terrapins (*Malaclemys terrapin*) are considered a keystone species in the salt marsh and are a species of special concern in New Jersey. Barnacles are crustaceans that are motile as larvae and as adults attach to hard substrates such as terrapin shells. Heavy infestations of barnacles on terrapins can cause shell erosion and reduce mating and nesting success. There is a lack of current research on the impact and occurrence of barnacles on terrapins despite their potential negative effect. As a result, this study investigated the occurrence of barnacles over time and the potential impact they may have on terrapins. Terrapin photos were analyzed from 2020, 2023, and 2024, barnacle count and- infestation classes (absent, low, moderate, heavy, extremely heavy) were recorded- and we found there to be a significant increase of barnacle infestation in 2024 ($\chi^2 = 51.7$, $P < 0.001$). Furthermore, there was a significant increase in barnacle occurrence in 2024 ($\chi^2 = 55.8$, $P < 0.001$). In addition, we took measurements of barnacles in 2024 and found there to be greater odds of barnacles being located on an infested terrapin's carapace ($F_{1,125.5} = 114.8$, $P < 0.001$) and posterior region ($F_{1,123.4} = 15.9$, $P < 0.001$) compared to the plastron and anterior region, respectively. Our results indicate that the occurrence of barnacles as well as level of infestation has increased over time and that barnacles could become a greater threat to terrapins. Additionally, barnacles located posteriorly can impact the success of mating and nesting. More research needs to be conducted locally in order to determine what environmental factors may be increasing barnacle infestations, and how they may continue to affect terrapins.

Aggregate Brumation Site for Wellfleet Harbor Diamondback Terrapins

Barbara Brennessel (1), Professor Emerita; Bob Precott (2), Director Emeritus

(1) Wheaton College, 26 E. Main Street, Norton, MA 02766, USA

(2) Massachusetts Audubon, Wellfleet Bay Wildlife Sanctuary, 291 US-6, South Wellfleet, MA | 02663, USA

Although terrapins are dispersed throughout Wellfleet Harbor during summer periods, they aggregate during two periods of the year. From late April through May, they can be found in Chipman's Cove and a few other areas in the Harbor in mating aggregations. In June and July, females disperse and stage near nesting areas. After learning of a report from the Wellfleet Shellfish Department of sighting of a terrapin buried in the mud in Chipman's Cove in late February, 2021, we set out to confirm the sighting. As we searched for the terrapin during the first weeks in March, we encountered others in the same area. Over the course of a few days, we documented over 70 terrapins. A few of the terrapins were active and moving over this intertidal area at low tide. The average air temperature during this period was 4 degrees C; the temperature in the substrate ranged from 3.3-4.2 degrees C.

KEYWORDS: Brumation, Aggregation

Habitat Use of Juvenile Northern Diamondback Terrapins (*Malaclemys terrapin terrapin*) in a Tidal Saltmarsh

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There is much to learn about the movements and habitat use of diamondback terrapins in their juvenile years due to the challenges of finding and tracking them during this life stage. From 2018-2020, we used lightweight radio transmitters to track juvenile terrapins across a tidal saltmarsh in Cape May County, NJ assisted by a combination of a Yagi antenna and an automated telemetry system. Transmitters were attached to 86 terrapins, including both wild caught (N=11) and head-started (N=75) juveniles. In all, 72 individuals were relocated after release an average of 13.0 ± 13.9 times per terrapin. Once found, we collected data on terrapin location, cover type, and vegetation (percent cover and species). We also collected vegetation data at random locations throughout the study area. We generated home ranges based on relocations for each turtle for which sufficient data existed using k-LoCoH, and examined habitat use via use versus availability analysis. Future analyses will incorporate data collected using our automated telemetry system to further improve our understanding of movements and habitat selection of diamondback terrapins during the juvenile life stage.

KEYWORDS: Habitat use, Juvenile, Telemetry, Saltmarsh

Scale-optimized Habitat Analysis Using UAV Photogrammetry: Diamond-backed Terrapin Nest Site Selection in Mississippi

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Maternal nest site selection represents a critical maternal effect in oviparous species, directly influencing offspring development and survival during incubation. Diamond-backed terrapins (*Malaclemys terrapin*) exemplify turtle nesting complexity, as females select sites based on vegetation density, elevation, and other habitat cues. This complexity is compounded by natal philopatry, where selection may reflect culturally inherited site fidelity rather than condition-dependent habitat selection. Understanding how cultural and environmental factors influence maternal nesting decisions requires high-resolution habitat data across ecologically relevant scales, but traditional studies rely on arbitrarily defined spatial scales limited by logistic constraints. We conducted the first scale-optimized nesting habitat selection analysis of entirely drone-based mapping data at Grand Bay National Estuarine Research Reserve (Jackson Co., Mississippi). We hypothesized that maternal terrapins select nest locations with favorable microenvironmental conditions at multiple scales, with vegetation height selection occurring at fine scales (0-2 m) and elevation selection occurring at broader scales (50+ m). We used structure-from-motion photogrammetry to generate georeferenced 3D point clouds from 6,340 UAV images and classified vegetation and topographic surfaces using machine learning algorithms. We extracted environmental variables around known nest sites and random locations, and used distance-based Moran's Eigenvector Maps to characterize spatial structure. Contrary to predictions, distance to marsh edge was the strongest predictor of nest presence, with spatial components explaining only 2.76% of variation in nest site selection. This suggests terrapins at this locality assess nesting site quality based on raw microhabitat values rather than their spatial configuration. This study demonstrates how UAV technology can help overcome logistical limitations of fine-scale habitat selection analyses by enabling comprehensive scale-optimization across ecologically relevant spatial extents. Future research should incorporate additional fine-scale variables and genomic evidence of natal philopatry to further distinguish habitat quality from site fidelity effects.

KEYWORDS: Drone, Geographic Information System, Nest depth, *pileate*

Habitat Use and Environmental Tolerances of Diamondback Terrapins in the Southwestern Gulf of Mexico

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Movement ecology examines how organisms respond to environmental and anthropogenic pressures through movement and behavior. The diamondback terrapin (*Malaclemys terrapin*) is the only turtle inhabiting brackish waters in North America, ranging from Massachusetts to southern Texas. While most research has focused on northern subspecies, little is known about the Texas subspecies at the southwestern extent of its range. This study investigated the influence of salinity, water temperature, and potential sea level rise on terrapin occurrence and habitat use in the Nueces River and Nueces Bay, north of Corpus Christi, Texas—a known terrapin hotspot. Salinity in this system fluctuates widely, from fresh to hypersaline, depending on river inflows. To assess environmental conditions, salinity and temperature were monitored across a 20 km river segment at 4 km intervals using permanent data stations and HOBO loggers. Terrapins were trapped from September 2023 to August 2024 with modified crab traps, marked for identification, and tracked along the salinity gradient. A total of 105 captures were recorded, including five recaptures. Captures occurred across salinity values of 9.37–37.15 psu and water temperatures of 19.7–32.64 °C, with the majority occurring near ~17 psu and ~26 °C. These results suggest terrapins in this region exhibit tolerance to broad salinity and temperature ranges, but capture frequency indicates preference for intermediate values. Climate-driven sea level rise could expand total estuarine habitat yet simultaneously reduce availability of optimal habitat conditions. This study provides a systematic assessment of habitat use by the Texas subspecies of diamondback terrapin and highlights key environmental drivers at the southwestern edge of its distribution. Findings establish a foundation for future research and management of terrapins in the Nueces Estuary and other Gulf Coast systems.

KEYWORDS: Salinity gradients, Temperature tolerance, Movement, Sea level rise

Preliminary Results of a Field Study on the Distribution and Status of the Diamondback Terrapin (*Malaclemys terrapin*) in Tampa Bay, Florida

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The diamondback terrapin (*Malaclemys terrapin*) is an imperiled reptile which occurs in brackish water habitats of 16 states along the Atlantic and Gulf coasts of the United States. Florida's coastline represents ~20% of their entire range, and five of the seven currently recognized subspecies occur in the state, including three endemics. Florida terrapin populations and habitats are critical to the species' conservation, and major threats include habitat loss, mortality in crab pots, impacts of climate change, and predation. The Florida Fish and Wildlife Conservation Commission has the authority to issue rules that would mitigate some of these threats. Although the state wildlife agency has not listed the terrapin as a state threatened species, it does list them as a Species of Greatest Conservation Need in the State Wildlife Action Plan and has addressed some conservation and management needs. Understanding a species' geographic distribution is necessary to inform management plans and conservation efforts. Terrapin distribution surveys have been undertaken by researchers in many areas of Florida, but large gaps remain in need of study. In 2022, we initiated a four-year study on the distribution and status of terrapins in Tampa Bay, the state's largest open-water estuary, with the goals of determining distribution, identifying nesting areas, and addressing conservation needs. Fieldwork to date has produced minimal evidence of terrapin presence but has identified necessary conservation and management actions.

KEYWORDS: Climate change, Distribution, Nesting, Status, Threats

Field Observations of Retained Yolk Sacs in Diamondback Terrapin (*Malaclemys terrapin*) Hatchlings: Management and Conservation Implications

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Diamondback terrapins (*Malaclemys terrapin*) are a keystone species in estuarine ecosystems but face increasing threats from habitat loss and nest predation. During nest monitoring in northern Florida, we observed a rising incidence of hatchlings with retained yolk sacs, a condition that heightens vulnerability to predation, infection, and desiccation. Occurrence was widespread across nesting areas and appeared correlated with elevated incubation temperatures. Affected hatchlings were transferred to controlled environments for veterinary assessment and held until yolk absorption was complete, ensuring improved survival prior to release. These observations highlight the need for adaptive management to address developmental anomalies and support terrapin population viability.

KEYWORDS: Climate change, Elevated incubation temperatures, Population viability, Retained yolk sacs

Quantifying Movements and Home Ranges of an Estuarine Turtle: The Effects of Urbanization and Boundaries

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Diamondback terrapin movements and home ranges have been studied using VHF radio telemetry, acoustic telemetry, and mark and recapture methods. These studies indicated that terrapins travel maximum straight-line distances < 10 km and have mean minimum convex polygon (MCP) home ranges < 1 km². To better understand the spatial ecology of this imperiled species, and to test newly available tracking technology, I deployed 21 Argos based satellite tags on terrapins on Long Island, New York to explore different data processing techniques of terrapin movements, home ranges, and overwintering sites. I estimated summer home ranges using two methods: LC 3 locations and daily mean locations to calculate minimum convex polygons (95% MCP) and kernel density estimates (50% and 95% KDE). Mean summer home range sizes were 6.9 km² (95% MCP), 1.2 km² (50% KDE), and 7.2 km² (95% KDE) using LC 3. Mean summer home ranges using boundary filtered daily mean locations were 5.5 km² (95% MCP), 0.8 km² (50% KDE), and 5.2 km² (95% KDE). I also found evidence of terrapins traveling long distances between nesting and marsh habitats with round trip distances ranging from 12-16 km. My results indicate substantially larger home ranges and longer straight-line movements than VHF telemetry or sonic tag studies, and they show short-term journeys that would be easily missed by other approaches, highlighting the utility of satellite tags to improve our understanding of terrapin ecology and conservation.

KEYWORDS: Home range, Movement, Satellite tags

Investigating Diamond-backed Terrapin (*Malaclemys terrapin*) Behavior

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Studies investigating the level of social interaction in Chelonids remains limited. To date there exists no study that attempts to characterize the level of sociality in Diamond-backed Terrapins (*Malaclemys terrapin*). We aimed to address this gap through the observation of wild terrapins from Poplar Island. Videos of 39 wild juvenile terrapins were recorded in a captive pool environment. The first goal of the study was to create an ethogram of common terrapin behaviors. Through an *ad libitum* survey methodology we described 11 different behaviors. Second goal was to test if the varying frequency and duration of specific behaviors could be associated to differences in the group compositions of terrapins sampled. Using BORIS v7.9.13, we calculated the total number of occurrences and duration each behavior was performed over 14 different trials. Through our analyses we found that terrapins captured together perform three different social behaviors more frequently than terrapins sourced from different traps, suggesting juvenile female terrapins could be forming social aggregations in the wild. We also obtained evidence that terrapins are using chemical signals to communicate with each other in both a reproductive context and a non-reproductive context.

KEYWORDS: Behavior, Ethogram, Social Interaction, Chemical Signaling

Understanding the Movement Patterns of Diamondback Terrapin as a Function of Sex and Size Stage

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We used sonic telemetry to assess the movement and home range dynamics of Diamondback Terrapins at the Paul R. Sarbanes Ecosystem Restoration Project at Poplar Island. A 74 receiver sonic telemetry array was established on Poplar Island with the goal of being able to detect movement of terrapins both within and among the wetland cells. We tagged 56 terrapins, 14 adult females, 14 juvenile females, 14 adult males and 14 juvenile / sub-adult males. Five individuals in each class were tagged during the summer of 2023 and nine additional animals in each class in 2024. More than 1.9 million detections accumulated during the study. We visually compared movement patterns among sex and age classes using maps and abacus plots. We also visually evaluated hibernation sites and behaviors. Short term centers of activity (60 minute interval) were calculated to estimate kernel utilization distributions which then were used to estimate 95% and 50% home range sizes. We also calculated residency indices (RI) for all individuals as $\text{\#days detected} / \text{total \# days excluding the hibernation period}$. We compared home range estimates and RIs using a 2-Way ANOVA with sex and stage as class variables. We further analyzed by month using a 3-way ANOVA adding month as a third class. We located hibernation sites for all classes but, also, I identified 3 individuals that remained active throughout the winter but staying within a wetland cell. We found a strong and present sex by stage interaction in all our analyses suggesting an ontogenetic shift in movement behavior. Juvenile females show high site fidelity and limited movement which increases as they mature while males tend to be more vagile as juveniles and reduce their activity as they get older. We discovered a sex difference when month was added to the analysis, typically males move more than females. The RIs showed a similar sex by stage interaction in which females had a high RI as juveniles which decreased when they are mature and males exhibited the opposite pattern. We provide clear evidence of the strong site fidelity in terrapins and that conservation and management would be most effective at the local population level.

Understanding the Movement Patterns of Wild vs Head-start terrapin as a Function of Age and Experience

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We used sonic telemetry to assess the movement and home range dynamics of head-started and wild Diamondback Terrapins at the Paul R. Sarbanes Ecosystem Restoration Project at Poplar Island. A 74 receiver sonic telemetry array was established on Poplar Island with the goal of being able to detect movement of terrapins both within and among the wetland cells. We tagged 26 naïve head-starts, 13 experienced head-starts (8 adults and 5 juveniles at least one year since release), and 14 wild adult and 14 wild juvenile terrapins. All terrapins tagged were females. Naïve head-starts were further divided into two groups; one group was released in the headwaters of wetland cells while the other group released near the inlets where most head-starts are released. Detections of naïve head-starts was considerably lower than wild animals suggesting that they either fled the Poplar Island archipelago or had retreated into the salt marsh where they are likely not to be detected by the receivers. Many head-starts were not detected within 7 days of their release and one individual was detected by a receiver 28 km from the island within two weeks of its release. Naïve head-starts had significantly larger home ranges and lower residency indices than any of the other groups of telemetered individuals. Head-starts that were released in the inlets were detected for slightly shorter periods of time but three days after release, the proportion of inlet releases that were no longer detected by the end of the September was similar. Our results indicate that head-started terrapins have substantially different dispersal and movement behaviors than their wild counterparts. This is particularly true when comparing juvenile females with naïve head-starts. Furthermore, releasing in the inlets result in individual's loss of detection more quickly than those released in the headwaters, but over the course of the monitoring there was no difference in the retention of these two groups. We are awaiting the download of additional detection data from the winter of 2024-25 and into the following active season that will help understand the behavior of naïve head-starts after their release.

Terrapin Monitoring to Guide Good Management

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Wildlife management problems are generally complex. Effective management requires the use of structured, transparent processes with a clearly articulated problem, defined objectives, and a suite of alternatives (actions) that require decision. Research and monitoring is key to connect actions to objectives by evaluating and forecasting the consequences of actions and the uncertainties and risks associated with those actions. However, rarely are the research methods or monitor designs chosen to clearly connect actions to outcomes, thus not effectively contributing to making good management decisions. Terrapins are an excellent example of a species with complex problems and substantial challenges when trying to study or monitor. There are a range of methods used to address questions in terrapin ecology, but the extent to which those methods can guide management actions are rarely addressed explicitly. Here we evaluated a suite of common terrapin methods to determine their sensitivity to detect effects of management actions. We also discuss the value of using multiple methods and integrated models that leverage different data sets to reduce bias and uncertainty in terrapin studies. We also discuss the need to understand and work with agencies on their levels of risk tolerance in using information to guide decisions. We will end with a call for greater collaboration and integration of terrapin research agendas and stakeholders to make more progress on effective terrapin management.

KEYWORDS: Decision-Making, Integrated Population Models, Monitoring, Risk Tolerance, Uncertainty, Wildlife Management

Evidence of Diamondback Terrapin Ecology within the Population Genetic Structure of a Unique Parasitic Trematode

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Parasites are increasingly being utilized as tools for investigating the ecology of their hosts. Digenean trematodes (“flukes”) are parasites with multi-host life cycles, typically relying on gastropod intermediate hosts before infecting vertebrate definitive hosts. These life cycles allow flukes to be relatively abundant within intermediate hosts, yet their reliance on vertebrates for dispersal results in congruent patterns of population genetic structure between flukes and vertebrate hosts. Flukes could therefore serve as proxies for apex predator hosts that may be difficult to sample. This was investigated using the fluke *Pleurogonius malaclemys* (the “terrapin fluke”) and its two hosts, *Ilyanassa obsoleta* (eastern mudsnails) and *Malaclemys terrapin* (diamondback terrapins) as a model system. We hypothesized that the population genetic structure of the terrapin fluke would reflect diamondback terrapin dispersal and population connectivity despite being relatively abundant in mudsnail populations. This could have great significance in the fight to protect terrapins and support their conservation by using a surrogate to delineate populations and subsequently manage them effectively. The fluke was collected within mudsnail hosts at sites from Massachusetts to Florida where host ranges overlap. Fluke mtDNA was sequenced at the COI marker, providing a 620bp fragment. Analysis revealed high levels of structure and diversity that correspond with terrapin ecology. This is a promising step towards using the fluke to support terrapin conservation and also represents a valuable contribution to our understanding of the life history of the fluke itself. Future work will explicitly examine the population genetics of all three species to establish an explicit proof-of-concept that terrapin population ecology can be studied via parasitic proxy.

KEYWORDS: Trematode, Fluke, Parasite, Population genetic structure, Terrapin, COI, Conservation

Evaluating Diamond-backed Terrapin (*Malaclemys terrapin*) Nesting and Reproductive Vulnerabilities at Sandy Hook National Recreation Area, Fire Island National Seashore, and Sagamore Hill National Historic Site

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The Diamond-backed Terrapin (*Malaclemys terrapin*; DT) is the only turtle species found in brackish waters in the United States, across its range from Cape Cod, Massachusetts to Corpus Christi, Texas. DT faces significant challenges due to human recreation, road mortality, and climate change, which disproportionately affect nesting females. During this study, we used beach nesting surveys and camera traps at three National Park Service sites to map the spatial distribution of nests and identify nesting vulnerabilities of DT. In 2023, we observed 13 live adult terrapins and 277 depredated nests at Sandy Hook National Recreation Area. In 2024, we observed 10 live adults and 205 depredated nests at Fire Island National Seashore and Sagamore Hill National Historic Site. While predators like red foxes and raccoons were identified, human activities, especially recreational use of nesting areas, emerged as a significant threat, especially at Sandy Hook. During the study, we observed 203 leashed and unleashed dogs, with some engaging in behaviors such as digging, barking, or splashing within designated search zones. These findings emphasize the need for enhanced, seasonal proactive conservation measures to mitigate the impacts of both natural and anthropogenic threats on DT, especially with the looming threats of climate change.

KEYWORDS: Diamond-backed terrapin, Nesting, Predation, Human impact, Climate change

Sex-Dependent Seasonal Shifts in Diet of Diamondback Terrapins (*Malaclemys terrapin littoralis*) in a Gulf Coast Marsh: Elucidation by Fecal DNA Metabarcoding

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Diamondback terrapins shown a high degree of sexual dimorphism in head size, with females possessing larger heads than males. Presumably, this allows females to exploit food resources too large or hard for males to consume. To determine differences in diet, we captured Diamondback terrapins in an upper Texas Gulf coastal marsh from February to August of 2023-2025. The animals were housed in small polypropylene tanks for 24 hrs. to collect fecal material. DNA was isolated from the samples for sequencing using specific primers to detect the presence of vertebrates, invertebrates, or algae. The resulting samples were subjected to Illumina sequencing and the resulting sequences were compared to bioinformatic databases to gain quantitative identification of dietary items. Results showed a clear shift in diets of large females (≥ 150 mm carapace length) from marine algae during the months of February and March to diets rich in periwinkle snails (*Littorea littoralis*) during late March- May. The small window during which snails were consumed correlated to the breeding season. The diets of large females then shifted primarily to crabs for the period of late June-August, with small amounts of fish. In contrast, the diets of small females (<150 mm carapace length) and all males shifted from marine algae in February and March to crabs in April-August. In addition, morphometric data and bite force analysis of terrapins of all sizes revealed that only adult females had large enough jaw gapes and strong enough bite pressures to crush periwinkle snail shells. These data support the idea that adult female DBTs have enlarged heads so that they can consume snails during the breeding and early nesting period to provide calcium for eggshell production.

KEYWORDS: Feeding ecology, Reproductive ecology, DNA metabarcoding

Nest Site Choice as a Potential Behavioral Adaptation to a Warming Climate in the Diamondback Terrapin (*Malaclemys terrapin*)

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Climate change is one of the leading causes of biodiversity loss today. Current and future increases in global temperatures could threaten turtle populations by increasing temperatures to lethal levels in the eggs developing in the nest. Assuming that behavioral changes such as nest site choice, nest depth, or timing of nesting seasons are heritable, these species may be able to adapt to warming climates. It is possible that by choosing to nest in locations that provide greater shade cover over the nests, female turtles are able to buffer the effects of warmer temperatures on the nests. One way to assess whether mothers can offset future climate warming through nest site choice is to determine if they have already done so across an environmental gradient. This leads to the prediction that mother turtles in hotter climates (lower latitudes) nest in more shaded areas than their counterparts in cooler climates (higher latitudes), a finding that would suggest that nest site choice is in the repertoire for mother turtles to respond to climate change. To determine this, hemispherical photography and Gaplight analyzer are used to quantify percent canopy cover and the level of incident radiation at nest sites across the range of the Diamondback Terrapin (*Malaclemys terrapin*). In addition, thermal data loggers are placed at a uniform depth adjacent to nests, as well as in locations with the greatest and least amount of canopy cover to show evidence of the consequences of nest site choice.

KEYWORDS: Nesting, Climate Change, Behavioral Adaptation

First Report: Assessing Microsatellite Diversity Within Bermuda's Diamondback Terrapin (*Malaclemys terrapin*) Population

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An enigmatic and isolated population of diamondback terrapins persists in the Mid-Atlantic on the Bermuda archipelago. Listed under Bermuda's Protected Species Act due to their diminutive numbers (approx. 100 adults and sub-adult individuals combined in total) and severely restricted viable habitat (just 16 hectares of mangrove pond wetlands), the long-term viability of this outlying population is unclear. Although fossil evidence suggests a long-term presence (up to 3000 years), the origin of the population—whether it arrived from a natural dispersal via ocean currents or through human introduction—remains mired in uncertainty. To assess the genetic diversity of Bermuda's imperiled terrapins and better understand the population's structure, we extracted DNA from 80 individual tail clippings and amplified 12 microsatellite loci. We then sequenced and analyzed amplicons using multiple sequence alignment tools. Additionally, we reviewed chromatograms to confirm or refute allelic variation and to detect any polymorphisms. Our initial results reveal genetic variations within microsatellite repeats at multiple loci. Comprehensive comparisons of these DNA sequences are ongoing.

KEYWORDS: Terrapin; Microsatellites; Bermuda

A First Look at Movements of Northern Diamondback Terrapin (*Malaclemys terrapin*) in the Delaware Bay Using Satellite Telemetry

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Southern New Jersey's Delaware Bayshore contains some of the most remote and extensive saltmarsh habitat within the state. Terrapin populations within this region are largely unstudied but face significant impacts from bycatch in enclosed crab traps, which in New Jersey are currently required only in waters of ≤ 150 ft wide at mean high tide. To understand movements and habitat use of individuals in this population and inform conservation and management, we equipped 10 female terrapins with Wildlife Computers SPOT 387A satellite transmitters in May and June 2025. Terrapins were captured at four sites along the Delaware Bay using a combination of hoop nets, cast nets, and opportunistic hand capture of nest seeking females. Transmitters were attached to the second and third vertebral using protocols established for marine turtles, collected data every 15 seconds and were programmed to reduce this rate to every 90 seconds when dry for more than 10 minutes. Each transmitter was programmed to collect percent dry timeline data, indicating the percentage of each hour the transmitter was dry, which we used to make inferences about behavior. Data collection and analysis are ongoing, but as of late August 2025, we have received an average of $2,542 \pm 697$ locations from each terrapin. We have documented multiple long-distance movements, confirmed nesting locations for several individuals, and documented use of open bay habitat more than 5 km from shore. Our continued analysis will aim to document brumation locations as the active season ends, estimate home range, and examine contributing temporal factors to habitat use such as season and tide. Our results will increase understanding of previously unstudied terrapin populations and help inform management decisions.

KEYWORDS: Satellite Telemetry; Habitat Use; Home Range

Population Genetics of Diamond-backed Terrapins in Southeastern North Carolina

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The estuarine diamond-backed terrapin (*Malaclemys terrapin*) is listed as a species of “Special Concern” by the North Carolina Wildlife Resources Commission (NCWRC) and faces several natural and anthropogenic threats in coastal habitats. The unintentional drowning of diamond-backed terrapins in crab pots targeting blue crab (*Callinectes sapidus*) is of particular concern as there is evidence that fishing pressure may lead to local extirpation and shifts in demography. Results from telemetry studies and mark-recapture data suggest that diamond-backed terrapins exhibit strong site fidelity and small home ranges. A combination of high site fidelity and, presumably low gene flow would indicate that diamond-backed terrapin populations are sensitive to small changes in mortality rates and vulnerable to local extirpation resulting from bycatch mortality. Information on diamond-backed terrapin population genetic structure and gene flow is needed to guide regulatory decisions to protect diamond-backed terrapins in coastal North Carolina. A high degree of site fidelity would be expected to be reflected genetically through strong local population structuring. We used microsatellites to assess population structure and genetic connectivity (i.e. gene flow) among diamond-backed terrapin populations at six sites in coastal North Carolina. We conducted several statistical analyses to identify genetic clusters, assess genetic diversity, and analyze kinship estimates. Preliminary results indicate weak population structuring between all sites. Our models identified two genetic clusters, suggesting weak genetic differentiation between northernmost and southernmost sites. Additional statistical analyses are ongoing. Our preliminary findings suggest that gene flow between populations may be higher than previously expected.

Population Structure and Size Estimates for Alabama Diamond-backed Terrapins (*Malaclemys terrapin pileata*)

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Designing an effective and realistic conservation plan requires accurate estimates of population size and a characterization of population structure. Here we report on recent results when attempting to achieve these two goals for diamond-backed terrapins (*Malaclemys terrapin pileata*) inhabiting habitats in the Mobile Bay (Alabama, USA) estuaries. We present both census data from capture-mark-recapture methods along with the use of genomic sequencing to identify distinct populations. Reduced costs associated with genome sequencing natural vertebrate populations make it possible to generate larger, more informative datasets to assess genetic diversity within and among populations. We demonstrate the feasibility and insight gained by using whole genome sequencing for estimating historical effective population size, evaluating population genetic structure, and comparing to previous single marker studies. We used whole mitochondrial genome sequences to compare haplotype diversity between the Alabama population and terrapin populations from the Atlantic and Gulf coasts and evaluated the utility of using whole mitochondrial genomes rather than a subset of loci to characterize unique haplotypic diversity. We found no genetic structure associated with nest-site philopatry within Alabama, but none of the haplotypes in this region were shared with other Gulf Coast sites. This genetic structure is consistent with strong female natal philopatry within Mobile Bay relative to the Gulf of Mexico and suggests that the Mobile Bay population is genetically unique relative to other terrapin populations and merits a unique conservation and management plan.

KEYWORDS: Conservation genetics, Reptile, Turtle, Mitogenome sequencing

Poster Presentation Abstracts

A Test of BRDs and Escape Hatches in Commercial-Style Crab Traps

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Virginia is the only mid-Atlantic state without a BRD regulation on commercial-style traps used in the blue crab fishery. Instead of blocking the funnel entrance with a BRD to exclude terrapins, we fashioned traps with an “escape hatch”—a gap in the top of the trap covered with parallel elastic lines. Lab trials had indicated terrapins could push their way out of traps through the elastic-covered opening, and that large crabs tended to remain in the trap. For seven weeks this summer, we compared crab catch and terrapin bycatch in control traps, traps with 2” oval BRDs in the funnels, and traps with escape hatches. Traps were baited and checked daily, with four traps of each type tested in each of two creek systems. From 208 trap days for each trap type, significantly more legal crabs were caught in control traps (CPUE 2.96 ± 0.17 s.e.) relative to traps with either BRDs (2.30 ± 0.16) or an escape hatch (1.99 ± 0.12). Among trap types, however, the average size of legal crabs captured was not significantly different (14.10 ± 0.02 cm, $N = 1,509$ crabs). Of 78 terrapins as bycatch, only 9 were in traps fitted with BRDs, with 33 terrapins in control traps and 36 in traps with the escape hatch. The escape hatch reduced crab catch, did not reduce terrapin bycatch, and thus was an ineffective alternative to BRDs. Although the size of crabs in traps with BRDs was not different from traps without BRDs, we measured a 22% reduction in legal crab catch. The decrease in crab catch, however, was offset by a 73% reduction in terrapin bycatch. Especially for recreational crabbers, we argue that the benefit of terrapins conserved by using BRDs is worth the cost of catching only four crabs instead of five.

KEYWORDS: Bycatch reduction, Escape hatch, Commercial-style traps

Evaluating Regional Patterns of Diamondback Terrapin (*Malaclemys terrapin*) Occupancy in South Carolina

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Alone and in interaction, climate change and anthropogenic development pose a significant threat to coastal habitats and the species they support. In the rapidly developing Kiawah Island, South Carolina region, diamondback terrapins have experienced a largely synchronized decline that was previously attributed to bycatch in blue crab fishing gear. Continued decline after addressing the issue highlights that multiple co-occurring changes threaten the future persistence of diamondback terrapins. This study aimed to assess a broader spatial distribution to determine if these declines are indicative of the landscape and to assess if there are patterns associated with their commonness. Using timed head-count surveys, we assessed occupancy at 34 sites, and its association with a range of variables representing coastal development and hydrological features. Diamondback terrapins were relatively uncommon with mean site occupancy probabilities of 0.34. Occupancy was unassociated with land-cover variables but positively associated with hydrologic distance to the ocean. More research is needed to understand the proximate causes of this relationship, but it is clear that diamondback terrapins are uncommon and most likely to occur in areas under high demand for human use in South Carolina.

KEYWORDS: Distribution, Habitat quality, Land-use change, Sea-level rise

Analysis of Environmental Conditions Between Diamondback Terrapin Hatchery Designs

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Diamondback terrapins (*Malaclemys terrapin*) nest in coastal areas along the East and Gulf coasts of the United States of America. To cope with poor nesting habitats, hatcheries are a different hatching solution constructed in areas that are difficult to put turtle gardens in, or that have a high predation rate that is hard to control. Hatcheries were originally built inground as a cage-like structure to prevent predation. A new variety of hatcheries has been recently constructed, raised three and a half feet (one meter) above ground. There have only been a few created for terrapin nesting. Comparisons were made between moisture and temperature at various depths (surface, 15 cm, and 30 cm), considering the composition of the sand. At the completion of the project, hatching success and incubation time was calculated. The results of this project indicated that there were no differences in both moisture and temperature at the same depths between both hatchery types. There was, however, a faster average incubation time of 74 days in the raised bed hatchery than in the inground hatchery, and there was a slightly higher hatching success rate at 87% in the inground hatchery. Overall, this study shows that the raised bed hatchery could be a viable conservation practice for terrapin nesting in areas vulnerable to flooding and high levels of predation.

KEYWORDS: Terrapin nesting, Raised bed hatchery, Inground hatchery

Bycatch Reduction Device and Crabbing Equipment Distribution Analysis of Bait and Tackle Shops Along Barnegat Bay, New Jersey, USA

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Bycatch Reduction Device (BRD) and crabbing equipment distribution along Barnegat Bay, New Jersey significantly impacts the Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) populations reliant on this fragile ecosystem. By conducting surveys with local bait and tackle shops in Ocean County, this study examines trends in crabbing equipment sales and how these statistics correlate with environmental factors, particularly focusing on the potential for BRDs to reduce the unintended capture of non-target species. Ten bait and tackle shops were contacted to complete a 14-question survey regarding crab trap and pot seller statistics formatted around the objective, and data was researched from 36 marinas/docks using Google Maps to get coordinate points of each location. Using this data, 11 maps were created through ArcGIS Pro Software highlighting different aspects, such as location, distribution, classification, and conservation. A majority of the maps used the New Jersey Municipality polygon shapefile symbology and/or the New Jersey Waterbodies shapefile. The pairwise buffer tool via the analysis toolbox feature was used to display location and proximity three-mile (5 km) radius surrounding all plotted bait and tackle shops. The usage of gradient symbology was also incorporated to represent unique values. A heat map was created showing the frequency of repairs of damaged crabbing equipment by each bait and tackle location based on a developed ranking scale. This study examined trends among location-based parameters, conservation efforts, trap/pot distribution, and equipment classification within Barnegat Bay bait and tackle shops. Ultimately, the findings highlight areas needing environmental protection and suggest opportunities to optimize resource allocation. Additionally, the proximity of bait and tackle shops to marinas positively impacts sales, fostering growth in both commercial and recreational crabbing across mainland and coastal regions.

KEY WORDS: Bycatch Reduction Device, Crabbing, Bait and Tackle, Terrapin Conservation

Magnetic Orientation in Northern Diamondback Terrapin Hatchlings

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Imprinting is a form of learning that occurs during a critical developmental stage of an animal's life. Geomagnetic imprinting enables animals to use the Earth's magnetic field for navigational purposes and return to their natal areas. Imprinting is observed in various turtle species, including the Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*), a coastal aquatic turtle species. Terrapin hatchlings are thought to use land-based geomagnetic imprinting cues while they remain in coastal areas. The following study tested hatchlings' geomagnetic response in three trials: on land without magnetic disruption (control), on land with magnetic disruption, and in water without magnetic disruption. Hatchlings were individually placed in an opaque round basin, and their directional movements were recorded. Magnetic stir plates were used to disrupt the geomagnetic field as a treatment for the magnetic land trial. Each hatchling was tested three times per trial, and the results were analyzed using Kruskal-Wallis tests ($\alpha = 0.05$). The hatchlings utilized were native to nesting sites in southern Long Beach Island, New Jersey, which are adjacent to marshes located to the north and west. As hypothesized, the hatchlings displayed predominant north-west movement during the non-magnetic land trials ($p = 0.032$), and no directional preference was observed when the magnetic field was disrupted ($p = 0.511$), indicating a geomagnetic response. These findings further our understanding of the effects of magnetic interference on terrapins and their predicted movement within their environment.

KEYWORDS: Terrapin hatchlings, Orientation, Directional preference

Pattern and Contrast Analysis of Diamondback Terrapin Hatchlings in the Ultraviolet Spectrum

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Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) is an aquatic turtle that ranges from Massachusetts to North Carolina, where they are considered a vulnerable species. The terrapin is tetrachromatic, meaning they have four cones in their eyes, which allows them to see shorter ultraviolet wavelengths (100-400 nm) than visible light (400-700 nm). Tetrachromacy is observed in many species of reptiles, birds, and fish. The hidden patterns could be for intra-species recognition and provide for predator avoidance especially by trichromatic species. Contrast and pattern analysis were done. Female terrapins tend to select mates with higher contrast between the carapace and plastron, which led to the hypothesis that there would be higher contrast values in UV light. Pictures were taken of the terrapins in visual light and in UV light using a specialized camera. Codes were assigned to the pictures. Contrast analysis was performed using the program ImageJ; values were then used to determine contrast in the plastron and between the plastron and carapace in both wavelengths. It was determined that the plastron pattern with the highest frequency was lines and dots in both UV and visible light. A plain black carapace was observed more in UV, compared to spirals being observed most in visible light. There was high intra-clutch variability. This may be due to random phenotypic gene expression, or multiple paternity. Contrast was found to be higher in visible light than UV light. This may be attributed to terrapins being able to see in both wavelengths, as well as trichromatic predator avoidance.

KEYWORDS: Contrast, Ultraviolet light, Predator avoidance

Influence of Elevation, Substrate, and Vegetation on Nest Site Selection in the Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*)

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The loss of both marsh and nesting habitat to sea level rise is a main threat facing diamondback terrapin populations throughout their range. In the northeastern United States, this threat is compounded by the impacts of coastal development, which further limits access to nesting habitats. Natural or artificial nesting habitats on protected lands can be an effective conservation tool, but they too face pressures from sea level rise. In Cape May County, NJ, restoration of a well-studied and locally important nesting area is planned which would help increase resilience of the site to sea level rise. An understanding of preferences for terrapin nesting will help ensure that restoration preserves or enhances quality of nest habitat at the site. To evaluate terrapin preference with regards to elevation, vegetation cover, and substrate, nest location data were collected in 2024 and 2025 for all nests located (n=222) using a high accuracy GPS unit. Elevation of nest locations and random locations was determined using LIDAR data. Substrate type and vegetation cover were assessed visually for each nest and for randomly selected locations within upland habitat at the site. Using these data, we will conduct a use vs availability analysis to better understand terrapin nesting preferences at the site, which will help inform restoration at this site and beyond. Our results will provide important information that can be used to ensure terrapins are properly considered in shoreline restoration projects and can be used to help ensure populations of this unique reptile persist in the face of sea level rise.

KEYWORDS: Restoration, Nest Site Selection, Sea Level Rise.

Occurrence of Northern Diamondback Terrapins, *Malaclemys terrapin terrapin*, and Anthropogenic Threats in a Residential Neighborhood in Ocean City, New Jersey

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With the disappearance of salt marsh habitat, northern diamondback terrapins (*Malaclemys terrapin terrapin*) are losing their natural nesting grounds. This loss forces more females to nest in marginalized habitats, such as residential neighborhoods, where they and their offspring are exposed to anthropogenic threats, including barriers, road mortality, and subsidized predators. The residential neighborhood along West 52nd Street in Ocean City, New Jersey is one of the few non-bulkheaded areas along the marsh in Ocean City. It is adjacent to the Crook Horn Creek walking path, which is documented diamondback terrapin nesting habitat. Since 2019, volunteers have found thousands of terrapin hatchlings on the streets or trapped in storm drains in this neighborhood. Terrapin activity and anthropogenic threats were documented opportunistically across 39 days between April 10, 2024 - June 15, 2024 and 61 days between March 26, 2025 - June 29, 2025. For each terrapin sighting, location and condition were recorded. In addition, weekly systematic surveys for hatchlings were conducted along a set route between April 1, 2025 - May 27, 2025. Nesting activity in the neighborhood and along the walking path was recorded for five days between June 2, 2024 - June 14, 2024 and twelve days between May 31, 2025 - July 13, 2025. The combined effort of opportunistic and systematic collection resulted in data on 520 hatchlings, 140 adults, and 429 instances of nesting activity evidence. Of the hatchlings, 25% (n=132) were in storm drains, and 38% (n=138) of those on the street (n=366) were dead. These data show that terrapins actively use this neighborhood for nesting, but that anthropogenic threats prevent hatchlings from reaching natural salt marsh habitat. Protecting surrounding non-residential habitat, including the walking path, is critical to reducing adults from nesting in the neighborhood and subsequent mortality of the next generation of terrapins.

KEYWORDS: Anthropogenic threats, Habitat loss, Nesting habitat, Storm drains

Investigating the Role of Ultraviolet-B in the Growth of Northern Diamondback Terrapin Hatchlings

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Malaclemys terrapin terrapin are vital to salt marsh ecosystems, but populations are declining. Understanding their growth is crucial for improving conservation. Speculation emerges that ultraviolet-B (UV-B) increases vitamin D3, which helps with calcium absorption, strengthening their shells and increasing their overall growth. By comparing the growth of terrapin hatchlings raised under UV-B light versus incandescent light, we investigated which condition would indicate greater growth benefits. We raised 24 total hatchlings, divided into two groups of 12. We exposed one group to UV-B light and the other to incandescent light, both on a 12-hour on/off cycle. Parameters that were monitored weekly over six months were carapace length, carapace width, plastron length, height, mass, temperature, salinity, UV-B levels, and light intensity. A statistical analysis in the form of t-tests and normality equations regarding the carapace and mass data revealed no significant difference in initial values. Contrary to the hypothesis, terrapins raised under incandescent light showed a statistically significant greater increase in mass over the 24-week study period compared to those raised under UV-B light. The study suggests that incandescent light produces greater terrapin growth than UV-B light, which could benefit conservation and salt marsh health. The inquiry additionally highlights potential limitations related to the age of the hatchlings and the role of temperature in calcium metabolism.

KEYWORDS: Hatchlings, UV-B, Lighting, Head start

Short Term Hydration for Newly Emerged Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) Hatchlings

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The Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) is an estuarine turtle species in decline that utilizes several osmotic regulators for adjusting to fluctuating salinity gradients in their habitats. Conservation efforts are now focusing on increasing their population by creating natural nesting and alternative hatchery sites so that greater hatchling emergence can be achieved. This study was conducted to determine the most favorable short-term hydration conditions for transitioning hatchlings from nest emergence to the marsh habitat. We exposed newly emerged hatchlings to short term varying salinity hydration series containing fresh water, 15 ppt or 30 ppt solutions. We found that hatchlings gained weight whenever they were hydrated in fresh water, and lost weight when they were exposed to salt solution environments, or not hydrated. Following salt exposure, heavier and larger hatchlings were found to lose more weight and rehydrate less, especially after intervals of increasing salinity. Similar hydration weight differences occurred for wild and hatchery incubated hatchlings, regardless if they were from the same clutch. Accordingly, we have found that fresh water is the best short-term hydration before a hatchling is placed within its marsh habitat.

KEYWORDS: Hydration, Salinity, Hatchlings, Conservation

Pine Protection as a Predator Deterrent for Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) Nests

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The Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) experiences high predation of its nests by numerous predators, which is contributing to a decline in their population. Pine products have been shown to act as a repellent for several species by producing an aversion response. As a conservation initiative, we tested the effectiveness of pine to act as a predator deterrent on terrapin nests. We protected caged and uncaged nests with combinations of pine branches, pine cones, pine debris, and stones/pavers. We found that no predation occurred at any nests that we protected with pine. None of our decoy nests were predated regardless of the protection used. High predation occurred, however, at nests without pine. Although we did not find any evidence of pine consumption, we observed that nest predation attempts stopped, especially by raccoon and mink, when pine protection was detected. The presence of pine did not adversely affect nest productivity, incubation duration, egg development, hatchling morphology or the pH at nest cavity depths. Higher hatchling emergence occurred at nests with pine protection compared to our control nests and there was a low percentage (13%) of hatchlings with anomalies.

KEYWORDS: Predation, Terrapins, Nesting, Conservation

Investigating Bay Island Nesting Viability for Northern Diamondback Terrapins Using Machine Learning

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Malaclemys terrapin terrapin are increasingly threatened by habitat loss, shoreline erosion, flooding, and human disturbance across New Jersey's coastal bay islands. While established nesting sites such as Mordecai and Sedge Islands have been documented, conservationists currently lack a scalable method to assess the long-term viability of understudied or at-risk islands. This project addresses that gap by developing a predictive machine-learning (ML) model to evaluate and rank islands for terrapin nesting suitability. Spatial and ecological datasets—including elevation, marsh type, substrate, flood and erosion risk, and proximity to human activity—are integrated into a hierarchical clustering framework to group islands with ecological similarity to known nesting habitats. Each island is assigned a composite suitability score, refined by weighted penalties for environmental stressors, enabling prioritization of sites most vulnerable to ecological pressures. Outputs include geospatial visualizations that overlay suitability clusters, scores, and risk layers, generating directly actionable insights for conservationists, field biologists, and land managers. Model validation incorporates historical nesting records, expert review, and field reconnaissance. Beyond ranking existing habitats, the framework anticipates potential nesting shifts under climate change, providing a scalable and transparent decision-support tool for conservation planning and resource allocation in vulnerable coastal systems.

KEYWORDS: Terrapins, Machine Learning (ML), Nesting Habitat, Conservation

How Coastal Microhabitat Change Affects Nesting Abundance and Predator Dynamics in Diamondback Terrapins (*Malaclemys terrapin*)

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Female diamondback terrapins (*Malaclemys terrapin*) exhibit strong preferences for specific coastal microhabitats when selecting nest sites. Factors such as temperature, vegetation cover, proximity to shorelines, and predator presence have been shown to influence nesting behavior. Natural coastal micro-habitats change vastly over short periods of geological time due to erosion and accretion caused by wave action, and its effect on the growth of vegetation. As a result, high quality nesting micro-habitats may change locations over time but persist in their availability. However, on hardened or protected beaches the effect of wave action is reduced or eliminated allowing vegetation to become dense and eliminating open areas. Here we investigate how changes in the geomorphology of coastlines over time affect terrapin populations with three primary goals. First, we will test which microhabitats are correlated with high nest abundance. Second, we will compare three different turtle nesting locations, two natural and one stabilized to illustrate how nesting differs between sites and changes over time. Lastly, we will investigate how predation on turtle nests at a stabilized site has changed over time. Our expectation is that we will find significant changes in nesting micro-habitats over time on stabilized sites whereas natural sites will maintain preferred nesting microhabitats. We expect shoreline hardening will decrease preferred nest site availability and therefore reduce nesting activity in those areas over time. A better understanding of how turtle nesting habitats change over time will allow for more informed and effective conservation efforts for terrapins and turtles in general.

KEYWORDS: Nest micro-habitat, Coastal geomorphology, Predator-prey dynamics, Nest site selection

Detection Probability of Diamondback Terrapins with Fyke Nets in New York City Estuary

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Diamondback terrapins (*Malaclyems terrapin*), a Species of Greatest Conservation Need in New York State, are estuarine turtles that inhabit coastal marshes, including those in densely populated and transformed areas such as New York City (NYC). Between 2019 and 2022, the Natural Resources Group within NYC Parks & Recreation conducted a grant-funded study to understand how habitat connectivity of terrapins is affected by roads that bisect salt marshes in Queens and Staten Island. Due to the shallow and narrow characteristics of these salt marsh creeks, NYC Parks staff utilized fyke nets to capture terrapins on either side of the roads, once a month for four months annually. Staff captured and PIT tagged a total of 101 unique individuals between the two sites with 10 recaptures. Prior research on terrapin populations in NYC has relied on beach encounter surveys during the nesting season, which biases monitoring towards females in the population. Here we report on the differences in detection probability of terrapins by sex and seasonality when utilizing fyke nets. Detection probabilities are a helpful metric for land managers to determine efficient use of the fyke net method during a summer season and to prepare for further demographic modeling of NYC terrapin populations.

KEYWORDS: Salt marsh, Detection probability, Monitoring, Urban, Fyke net

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