Investigating barnacle occurrence and effects on Diamondback Terrapins (*Malaclemys terrapin*) at The Wetlands Institute

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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 examining barnacles on terrapins despite their potential negative effect. This study therefore investigates the occurrence of barnacles over time and the potential impact they may have on terrapins. I analyzed terrapin photos from 2020, 2023, and 2024, recorded barnacle count and infestation classes (absent, low, moderate, heavy, extremely heavy). I found there to be a significant increase in barnacle occurrence ($X^2_2 = 55.8$, $P < 0.01$) as well as barnacle infestation ($X^2_2 = 51.7$, $P < 0.01$) in 2024. Additionally, in 2024, I found there to be greater odds of barnacles being located on an infested terrapin's carapace ($F_{1,125.5} = 114.8$, $P < 0.01$) and posterior region ($F_{1,123.4} = 15.9$, $P < 0.01$) compared to the plastron and anterior region, respectively. Results indicate that the occurrence of barnacles as well as level of infestation has increased over time, and that barnacles tended to be located posteriorly, where they may impact mating and nesting. This suggests that barnacles may be a growing threat to terrapins in our study area. 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.

Effects of elevation and vegetation on Diamondback Terrapin (*Malaclemys terrapin*) nest site selection and density

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The Diamondback Terrapin (*Malaclemys terrapin*) is considered a keystone species in salt marsh ecosystems, yet we are still improving our understanding of nest site selection at local scales. This study aims to identify factors influencing nest site selection at The Wetlands Institute. Previous research suggests elevation may play a critical role in nesting behavior, while impacts of vegetation coverage are less clear. By mapping protected nest locations and conducting vegetation surveys, I sought to identify environmental parameters that guide terrapin nesting choices. I gathered GPS and elevation data for identified nests and utilized ArcGIS Pro for spatial analysis. In addition, I examined the relationship between nest density and substrate, as well as percent vegetation coverage. Further, I investigated effects of substrate and vegetation cover on nest predation. Within the study site, terrapins demonstrated selection for specific elevations ($X^2_3 = 93.1$, $P < 0.01$), preferentially nesting at elevations of 4-5 ft ($P < 0.01$) and elevations greater than 6 ft ($P < 0.01$). In addition, terrapins tended to nest where there was approximately 0-19% total percent vegetation coverage (n = 41 of 85 nests), and terrapins most frequently chose to nest in sand substrate (n = 37 of 85 nests). Patterns in nest site selection related to substrate and vegetation characteristics may influence predation rates, hatchling sex ratio, and overall nest success. Moreover, selection for nest elevations within a certain range may have implications for flooding, particularly as historic nest sites are impacted by sea level rise. These results will help inform future restoration projects to maintain suitable environmental parameters for terrapin nesting.

Investigating avian use and nest site selection throughout natural and enhanced marsh areas

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Beneficial placement of dredged sediment can be a valuable practice to augment habitat critical to marsh-nesting birds at risk from sea level rise. As beneficial re-use of dredged sediment becomes a more established technique, it is essential to assess the effects of placement on biological communities. This study aims to establish a baseline for avian use and nest site selection in a potential placement site. I conducted intensive nest searching and monitoring at the proposed placement site, adjacent marsh, and a nearby site that has previously received sediment placement. Moreover, I monitored avian behavior and habitat use in a subset of the targeted placement area. In 2024, nest success for Clapper Rail (*Rallus crepitans*) and Willet (*Tringa semipalmata*) did not differ by species or site ($X^2_2 = 1.9$, $P = 0.38$), and more visible nests were more likely to fail ($X^2 = 5.5$, $P = 0.02$). Nest depredation and abandonment was inversely related to proximity to creek edge ($X^2 = 3.9$, $P = 0.05$). For Clapper Rails, nest height was significantly related to ground elevation, with lower ground elevations resulting in taller nests ($F_{1,39} = 104.3$, $P < 0.01$), showing adaptability in nesting strategy depending on site characteristics. Foraging was more common than other behaviors, accounting for 67.5% of observations. This study contributes to our understanding of current site use and avian response following sediment placement. This information will help to inform decisions in creating and maintaining more resilient avian habitats in the face of sea level rise.

Investigating prevalence of the parasitic trematode *Pleurogonius malaclemys* in the guts of road-killed Diamondback Terrapins (*Malaclemys terrapin*)

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Diamondback Terrapins (*Malaclemys terrapin*) are a species of turtle native to coastal brackish-water marshes. They are primarily carnivores and consume a multitude of different prey, which can contain parasites that use terrapins as a host. *Pleurogonius malaclemys* is a trematode parasite that dwells in the guts of terrapins. These parasites require multiple hosts to survive, including terrapins and Mud Snails (*Ilyanassa obsoleta*), which are a prey species commonly consumed by terrapins. Little is known about the effects of *Pleurogonius malaclemys* on terrapins. In this study, I investigated the prevalence of this parasite in the guts of road-killed terrapins in different locations throughout the marshes of southern New Jersey. I also examined relationships between plastron length and clutch size of road-killed terrapins and parasite load to gain insight into potential impacts to terrapin health. Results showed there was not a significant relationship between infection status, site, and plastron length ($X^2_3 = 2.6$, $P = 0.46$), nor between infection status, site, and clutch size ($X^2_3 = 1.0$, $P = 0.81$). However, there was a relationship between parasite prevalence and year, with significantly more parasites found in 2015 than 2024 ($X^2 = 4.9$, $P = 0.03$). This study helps to establish a baseline for parasite prevalence in known terrapin nesting populations, providing context for possible health implications caused by the parasite. Future studies may benefit from monitoring fitness in live specimens to better understand how the parasite may affect terrapin health.

Bay for breeding: The other side of life and foraging for American Oystercatchers (*Haematopus palliatus*)

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American Oystercatchers are a valuable indicator species of suitable nesting habitat and conditions to raise young. The species is well studied on Atlantic Coast beaches, but not on the Delaware Bay. Many oystercatchers spend the breeding season on Delaware Bay beaches foraging and raising young. In collaboration with Conserve Wildlife Foundation of NJ and U.S. Fish and Wildlife Service, I developed a web-based interactive map to inform general audiences about oystercatchers and ongoing conservation efforts for the Delaware Bay population. In addition, I conducted a pilot study to examine location, duration, prey items, and microhabitat selection by oystercatchers on the Delaware Bay. I did not detect significant relationships between presence of foraging oystercatchers and environmental conditions including tide ($X^2_2 = 0.45$, $P = 0.80$) and temperature ($X^2 = 1.4$, $P = 0.24$). Results from foraging observations ($n = 13$) show that oysters were the most common prey item. Foraging microhabitat and water level were related ($F_{1,11} = 5.0$, $P = 0.05$), indicating that higher tide levels were associated with foraging on sand. By identifying patterns including preferred foraging sites, my research on habitat use informs future work and management actions within the broader Delaware Bay Oystercatcher Project. The ArcGIS StoryMap that I have developed supports the project, raising awareness about the species and conservation efforts. More broadly, this project contributes to shorebird conservation as global populations face dramatic losses.