Comparing Macroinvertebrate Communities between Disturbed and Undisturbed Locations in Southern New Jersey Saltmarshes

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Macroinvertebrates play a vital role in ecosystem structure and food web dynamics within saltmarsh habitats and have the potential to impact species on both higher and lower trophic levels. An understanding of species density in relation to disturbance is essential for monitoring overall system health and may inform future saltmarsh management and restoration decisions. This study compared above-ground macroinvertebrates between disturbed (bare ground, dredge placement areas) and undisturbed (natural, vegetated marsh) areas with known and unknown causes of disturbance at three saltmarshes surrounding Stone Harbor: Ring Island, The Wetlands Institute, and Gull Island. I randomly selected six points within each site (three disturbed, three undisturbed) and estimated the density of above-ground macroinvertebrates within a $1m^2$ quadrat for each point on three occasions in June-July 2021. Species richness was most strongly affected by disturbance (χ^2_4=19.2, $p<0.01$) when examined in a model that included distance to water (m) and site (both $p>0.05$) and was significantly higher in undisturbed areas compared to disturbed areas ($p<0.01$). Richness was correlated with an increase in vegetative cover (χ^2_1=5.0, $p<0.02$). Exact counts of individuals, taken within a $0.25m^2$ quadrat, were higher at disturbed locations (χ^2_4=56.2, $p<0.01$) and differed between sites ($p=0.01$) when compared with distance to water ($p>0.05$). Results from this project indicate that dredged material placement, undetermined disturbances, and vegetative cover can significantly affect saltmarsh macroinvertebrate communities. This information can help quantify macroinvertebrate responses to dredged material placement or other disturbance causing loss of vegetation within these saltmarshes, and better inform restoration practices.

Investigating Diamondback Terrapin (Malaclemys terrapin) Salt Panne Use at The Wetlands Institute

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Coastal wetlands provide important habitat for the diamondback terrapin (Malaclemys terrapin). The saltmarshes in Stone Harbor, New Jersey contain numerous salt pannes, depressions in the marsh that collect tidal water. A previous study by The Wetlands Institute (TWI) found gravid female terrapins spent significant time in pannes, suggesting pannes may be staging areas for nesting females as they travel to upland nesting areas. To investigate salt panne use and nesting behavior, I conducted headcount surveys of terrapins in pannes and captured terrapins present using a dip net. I measured, sexed, and marked terrapins for later identification, and measured panne characteristics (water depth, mud and water temperature). I surveyed two salt pannes at three sites: along the TWI trail and Stone Harbor Boulevard (adjacent to nesting habitat), and marsh west of the TWI trail (farther from nesting habitat). I surveyed each panne twice a week from June through July. All captured terrapins were adult females, and the majority (80%) were gravid. Site ($p<0.001$), water depth ($p<0.05$), and date ($p<0.05$) were significant indicators of terrapin presence (χ^2=38.0, $p<0.001$). Odds of terrapin presence increased with water depth and dropped off in late July, corresponding with the end of nesting season. Terrapins were only caught in pannes adjacent to nesting habitat and many exhibited nest site fidelity before or after salt panne activity. Future surveys may determine if terrapins are returning to the same pannes in addition to nest sites. Pannes along roadways may indicate potential road crossing hot spots, helping guide conservation efforts.

Using Headcount Surveys to Understand Northern Diamondback Terrapin (Malaclemys terrapin terrapin) Distribution in the Delaware Bay

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While terrapins are commonly seen along the Delaware Bay in New Jersey, characteristics of these populations are not well understood. Terrapin populations face several risks, however accidental drowning as bycatch in crab traps is the main threat to terrapins in the region, including relatively unknown populations in the Delaware Bay. To increase our understanding of this population, headcount surveys of terrapins were conducted from points along the high tide line at three survey locations along the Delaware Bayshore. Survey points (4-5 per survey location) were selected approximately 350 m apart, resulting in 14 points. Each point was visited three times, for 42 unique point-visit surveys. At each survey location, terrapins within 100 m of the point were counted during five, two minute surveys separated with one minute breaks. The AIC model selection approach was used to determine the best fit model among 14 candidates that tested factors influencing abundance and detection probability. In the best fit model, detection probability improved with calmer water conditions ($p<0.01$), and the likelihood of observing terrapins increased over time in areas closer to creeks and decreased in areas farther from creeks ($p<0.01$). Abundance varied significantly with survey location, ($p<0.01$) and was highest at Moores Beach compared to other locations. The results of this study have improved our knowledge of factors influencing terrapin distribution in the bay. Continued headcount surveys can inform ongoing threat assessments and changes in crabbing regulations to reduce bycatch impacts on poorly known terrapin populations.

"Waste Management Consultants": Quantifying the Impacts of Fish Crow Behavior in Southern New Jersey Salt Marshes

Samuel Hermanstorfer, University of Wisconsin- Madison

Since 1970, bird populations in North America have declined by three billion individuals. In a similar timeframe, Fish Crow (Corvus ossifragus) (Crows) populations increased in the Piedmont Region- including New Jersey- by 10.5% per year. The habitat surrounding The Wetlands Institute (TWI) in New Jersey has potential to sustain a relatively high number of Crows because of its proximity to resources, low levels of potential predators, and a moderate amount of urban disruption; ultimately causing imperiled species more stress. A suite of methods were used to explore baseline behaviors and conditional predictions of Crow activity, including ethogram analyses, passive observations, food cache monitoring, and supplemental camera trap utilization. Crows showed no detectable change in activity around tides, time, or date ($X^2=7.3$, $p=0.4$; $X^2=3.4$, $p=0.3$), suggesting Crows do not rely on changing tides or time to perform key survival functions. Crows nesting on TWI property travel to Ring Island or Avalon Marshes (>1 km) to forage, but also find food frequently nearby based on the dominance of Diamondback Terrapin (Malaclemys terrapin) eggs found at the cache. Throughout different sampling methods, Crows seemed to congregate in areas with higher perch availability. Results suggest removing perches may help reduce foraging opportunities at habitats for sensitive species like Ring Island ($t=-5.6$, $df=59$, $p<0.001$). Future efforts should continue to monitor Crow caches, activity levels on Ring Island, and test alternative methods to sign postings, which alert humans of beach-nesting bird presence, but the potential cost of Crow predation may outweigh the benefit to these species.

The Phenology of Diamondback Terrapin (Malaclemys terrapin) Creek Use During the Nesting Season
Brandon Ross, University of Connecticut

Diamondback terrapins are one of the few reptiles that reside in salt marshes and coastal habitats throughout their lives. Terrapins have been documented to have high site fidelity, but these findings are inconsistent throughout scientific literature. The phenology and behavior of the local nesting population is well studied, but less is known about terrapin use and transit through the surrounding marsh during the nesting season. I hypothesize that female terrapins utilize the marsh creeks as causeways to access nesting sites and wait in these creeks during times of sub-optimal nesting conditions. To examine how terrapins navigate the surrounding marsh, I surveyed a creek on The Wetlands Institute property throughout June and July using daily fyke net captures as a measure of abundance. The creek approaches known, high density nesting habitats, 90m away from the fyke. I captured 164 terrapins over 17 trap-days (median=5, Female:Male = 13.9:1, 83.3% gravid). Terrapin abundance in the fyke net was best explained by tidal range ($p<0.01$) and date ($p<0.01$) in a model that also included precipitation ($\chi^2=64.7$, df=5, $p<0.001$). Abundance decreased as the nesting season progressed and with increasing tidal range. Research on the local population has demonstrated that nesting activity peaks during the highest tides and total nesting activity tapers off in July. The decrease in captures as tidal range increased can be explained by the increase in terrapin nesting during high tides. These results suggest terrapin activity in this creek is tied to nearby nesting activity.

How Do Weather Conditions, Tides, and Nesting Season Progression Influence Flight Line Counts of Black-crowned Night Herons?
Autumn Turney, Lenoir-Rhyne University

Black-crowned Night Herons were listed as a threatened species in New Jersey in 1999 after facing decades of population decline. Gull and Sturgeon Islands, located near Stone Harbor, are key nesting areas for Black-crowned Night Herons and other wading bird species in New Jersey. These islands are estimated to provide habitat for approximately 36% of all Black-crowned Night Herons nesting in the state. Standard approaches to survey these nesting areas (i.e., aerial surveys, direct ground counts) may underestimate populations of Black-crowned Night Herons, or disrupt nesting and disturb the colony. Flight line surveys conducted during peak nesting activity may provide an alternative method to estimate breeding populations. I conducted flight line surveys of two nesting areas on Gull and Sturgeon Island to examine the relationship between tide level, nesting stage, site, and date with counts of Black-crowned Night Herons. More birds were detected at Gull Island compared to Sturgeon Island (P=0.01), with more detections occurring at high tide earlier in the nesting season (P=0.02). I also investigated directionality of detections and found the directionality of incoming detections differed with wind direction at Gull Island ($\chi^2_3=9.7$, p=0.02), but did not vary for outgoing detections. Wind direction also affected outgoing detections for Sturgeon ($\chi^2_4=15.1$, p=0.005). This study offers insights for optimal times and conditions to conduct flight line surveys to estimate breeding populations and minimize disturbance to sensitive species of colonial nesting wading birds. Future flight line surveys of these key nesting areas may also inform wading bird response to restoration efforts.