New York Marine Rescue Center Sea Turtle Telemetry Methodology
PI Maxine Montello

Research Plan

The New York Marine Rescue Center (NYMRC) is the primary sea turtle response and rehabilitation organization for New York State (NYS). Since inception, NYMRC has responded to 2,345 sea turtles with an average of 55 live turtles per year consisting of four species, 817 (34.8%) Kemp's ridley (*L.kempii),* 800 (34.1%) loggerhead (*C.caretta),* 322 (13.7%) green (*C.mydas)*, 800 (34.1%) and 399 (17%) leatherback (*D. coriacea)* sea turtles (Montello et al., 2022). Each year sea turtles strand for various reasons which include entanglement, vessel strikes, marine pollution, and cold stunning. Many of the stranding cases can be linked to human activities in this region which overlap with sea turtle habitat.

Due to the complex life cycle of sea turtles, limited information is known about habitat utilization specifically for juvenile and sub-adult sea turtles. With advances in technology, we can now gather more information quickly about these transient species through animal-borne tracking and instrumented tags. Information from tagged rehabilitated sea turtles released into the ocean offers valuable insights into the broader turtle population while removing the logistical challenges of at sea capture and stress on wild animals. Previous studies have found that rehabilitated turtles resume typical movement behavior of their wild counterpart (Coleman et al., 2017; Levy et al., 2017; Robinson et al., 2020) making them ideal subjects for research initiatives. Current in-house research involves the use of satellite telemetry to further understand post-release behavior of rehabilitated sea turtles.

To date, we have successfully placed satellite tags on 38 sea turtles over the course of 6 years (2018-2024). Preliminary results indicate that sea turtles post-release demonstrate similar movement behaviors as compared to wild counterparts. These patterns are characterized as coastal-southern, coastal-offshore, and offshore, and have all been documented in similar types of studies (Coleman et al., 2017; Levy et al., 2017; Robinson et al., 2020). Our data have offered valuable insights into habitat utilization and post-release movement patterns within the Peconic Estuary and nearby bays, including foraging and dive behaviors (Figure 3). In addition, these data were incorporated into NOAA Fisheries' efforts to designate marine critical habitat for green sea turtles. However, there is still limited information and insight into the natural behavior of free-ranging sea turtles (Hounslow et al., 2021; Heithaus et al., 2008) particularly in local waters (Montello et al., 2022).

This project aims to explore the critical relationship between green sea turtles (*Chelonia mydas)* and their foraging grounds, specifically in the Peconic Estuary and its surrounding sea grass beds. The data obtained from advanced satellite telemetry tags will provide valuable insights into

turtle movement patterns, environmental conditions such as surface water temperature, and habitat utilization. Through a combination of telemetry data and environmental analysis, we aim to uncover potential unknown foraging grounds for endangered green sea turtles that could help inform conservation efforts and habitat management strategies. Additionally, data from these tags can offer insights into the overlap with human populations and enhance our understanding of vessel interactions with sea turtles. Ultimately, all collected data will contribute to the development of more effective mitigation strategies for the endangered green sea turtle.

Direct funding will support the purchase of 15 Wildlife Computers satellite tags enabling monitoring of post-release movement behavior on green sea turtles. Satellite tags provide long-duration (year+) intermittent information on the geographic position, dive profile, and sea water temperature of the animal. This information can be used to identify critical habitats and large-scale processes affecting animal movements including migration timing.

Methodology

 NYMRC is permitted through the National Oceanic and Atmospheric Administration (NOAA) and United States Fish and Wildlife Services (USFWS) to rescue sea turtles throughout the state of New York. Reports of stranded sea turtles will come through the 24-hour hotline monitored by NYMRC staff. All turtles that strand alive during this study period (2024-2025) will be transported by trained Biologist to NYMRC for rehabilitation. Turtles will remain at NYMRC for both short-and long-term rehabilitation varying from 3 – 9 months. Animals selected for this project will have to meet several requirements set by NYMRC before being released. All animals will be cleared for release by veterinarian Dr. Robert Pisciotta and will be released within two weeks of approval. Release location will occur off the Atlantic Ocean coast of Long Island once water temperatures are optimal (~68 F°; June-October). Upon approval, selected turtles will be equipped with a satellite device, and data obtained from satellite tags will provide a more complete understanding of the sea turtle population. By enhancing our knowledge of their movements and habitat preferences, we can better protect these species and ensure their preservation.

Satellite tags will be selected based on the size of turtle (Wildlife Computers SPLASH vs. SPOT) and attached in-house at NYMRC within 24 hours of planned release. Before attachment all tags will be anti-fouled to ensure tag longevity. Attachment of satellite devices involves the established method of epoxy, fiberglass and marine putty to selected individual's carapace. Due to the range in size of sea turtle species, selection of tags will be based on standard curved length (SCL) and weight of individual ensuring a drag percentage of less than 10% (Jones et al., 2011). As the individual sea turtle grows, the tag attachment will naturally fall off with the shedding scutes. Satellite tags will be checked daily through Argos and Wildlife Protocol and live maps will be shared with the public via the NYMRC's website (www.nymarinerescue.org). Every 30 days, data will be downloaded from Argos platform and saved for each individual turtle. In

addition, once a tag has completed transmission all data will be downloaded via Wildlife Portal for further analysis. Previous deployments launched by PI ranged from 30- 800 days with an average of 229 days.

Data Analysis

Historical stranding data for green sea turtles will be mapped within the Peconic Estuary to highlight and analyze key stranding trends. Additionally, the causes of stranding for all sea turtles tagged in this study will be carefully documented and analyzed. Telemetry data will be gathered via satellite tags deployed on the sea turtles. These tags will transmit real-time movement data, providing detailed information about turtle locations, and surface water temperatures. The telemetry data will be processed and analyzed using the Wildlife Computers portal (www.wildlifecomputers.com) and the ARGOS system (www.argos-system.org), which are both industry-leading platforms for tracking wildlife movement and behavior. Live maps and real-time tracking data will be accessible to the public through the New York Marine Rescue Center (NYMRC) website (www.nymarinerescue.org), allowing stakeholders, researchers, and the public to follow turtle movements and environmental conditions.

To better understand the interaction between green sea turtles and their habitat, tracking data will be integrated with additional environmental data, including known locations of sea grass beds. Sea grass is a crucial component of the marine ecosystem, providing essential foraging grounds for green sea turtles and other marine life. These beds not only serve as feeding areas but also play a vital role in water quality and coastal protection. Telemetry data will also be analyzed to explore the overlap between sea turtle movements and human water use, particularly focusing on boat launches, marinas, and other boat-related access points.

To analyze these interactions, telemetry data will be imported into R Studio, where spatial analysis and statistical modeling will be conducted. The goal is to identify patterns of habitat use, especially whether sea turtles frequently forage within sea grass beds in the Peconic Estuary. By mapping the locations of both turtles and sea grass beds, spatial overlays will be created to visualize shared areas of use, helping to pinpoint potential foraging hotspots. This analysis will also shed light on how vessel interactions with sea turtles are occurring, providing critical insights that could help inform strategies to mitigate risks and protect these endangered creatures.

Expected outcomes:

- Winter 2024
    - Rescue and admit sea turtle patients from the 2024/2025 cold stun season
    - Purchase of satellite tags through Wildlife Computers
- Summer 2025
    - Program and anti-foul all 15 tags before deployment
    - Deployment of 15 satellite tags placed on juvenile green sea turtles during

- - Tags are predicted to remain live for 30 – 200+ days
  - o Update live tracking map as animals are released and provide link to PEP and website
  - o Host one PEP public sea turtle release at Tiana Beach, Hampton Bays
    - - Date TBD
- Fall/Winter 2025
  - o Analysis of obtained data set to further provide insight into:
    - - Download data from all tags as the become inactive
    - - Historical stranding and live tracking maps will be provided
    - - Sea turtle movement within the Peconic Estuary
    - - Sea turtle utilization and potential habitat identification
      - - Overlay of utilization with known sea grass maps
- Spring/Summer 2026
  - o Completion of final report post project regarding summary of findings
    - - Protection and management recommendations will be provided based on findings
    - - Findings will be presented at the International Sea Turtle Symposium in Hawaii 2026
    - - The manuscript will be drafted highlighting the importance of New York waters for critical green sea turtle species

Works Cited

Coleman, A.T., Pitchford, J.L., Bailey, H. Solangi, M. (2017) Seasonal movements of immature Kemp's ridley sea turtles (*Lepidochelys kempii)* in the northern Gulf of Mexico. Aquatic Conservation Marine and Freshwater Ecosystems. 27:1.

Heithaus, M.R., Wirsing, A.J., Thomson, J.A., Burkholder, D.A. (2008). A review of lethal and non-lethal effects of predators on adult marine turtles. Journal of Experimental Marine Biology and Ecology. 356:43-51.

Hounslow, J.L., Jewell., O.J.D., Fossette, S., Whiting, S., Tucker, A.D., Richardson, A.R., Edwards, D., Gleiss, A. (2021). Animal-borne video from a sea turtle reveals novel anti-predator behaviors. Ecology, 102.

Jones, T. T., B. I. Bostrom, M. Carey, B. Imlach, J. Mikkelsen, P. Ostafichuk, S. Eckert, P. Opay, Y. Swimmer, J.A. Seminoff, D.R. Jones. (2011). Determining transmitter drag and best-practice attachment procedures for sea turtle biotelemetry. NOAA Technical Memorandum NMFS-SWFSC-480

Levy, Y., Keren, T., Leader, N., Weil, G., Tchernov, D., Rilov, G. (2017) Spatiotemporal hotspots of habitat use by loggerhead (Caretta caretta) and green (Chelonia mydas) sea turtles in the Levant basin as tools for conservation. Marine Ecology Progress Series. 575

Montello, M.A., Goulder, K., Pisciotta., R., McFarlane., W. (2022). Historical trends in New York cold-stunned sea turtle stranding-to-release: 1998-2019. Chelonian Conservation and Biology: 21. 74-87.

Robinson, N.J., Deguzman, K., Bonacci-Sullivan, L., DiGiovanni, R.A., Pinou, T. (2020) Rehabilitated sea turtles tend to resume typical migratory behaviors: satellite tracking juvenile loggerhead, green, and Kemp's ridley turtles in the northeastern USA. Endangered Species Research. Vol. 43: 133-143