Evaluation of Rehabilitated Sea Turtle Space-Use to Inform Marine Energy Planning

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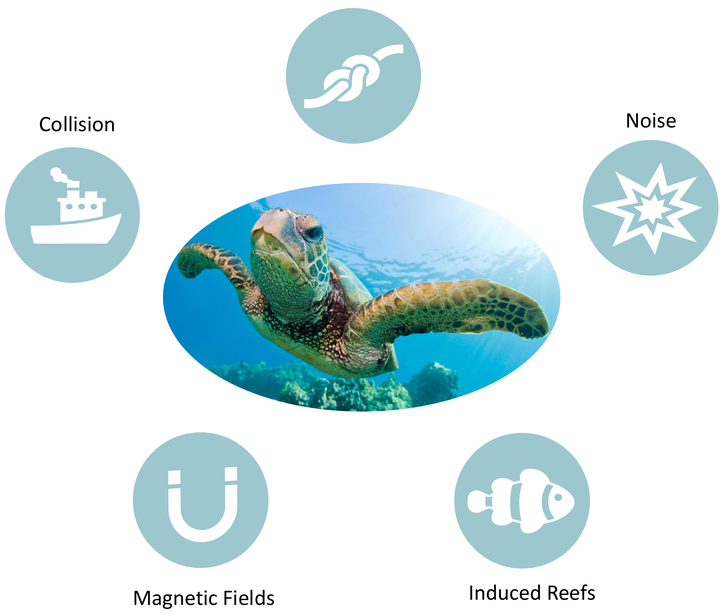
Marine Energy and Wildlife

Marine energy, the energy available in waves, tidal and ocean currents, and thermal differences in marine water, is a promising renewable energy that has the potential to meet up to **66% of the world's energy needs**[1]. A barrier to testing and implementation is the **potential of interactions with marine life**, including the protected loggerhead sea turtle. Although **negative interactions are rare, and some interactions are beneficial**[2], **proper spatial planning of offshore marine energy** to avoid areas of high use and ecological importance can mitigate these potential conflicts and **improve its perception among the public and regulatory stakeholders.**

Possible interactions with this species concerning stakeholders include:

- Collisions and entanglement with devices, cables, and boat traffic for maintenance.
- Exposure to electromagnetic fields from transmission cables.
- Noise from construction and operation.
- Induced reef effects providing foraging opportunity.



Large populations of loggerhead sea turtles depend on the **continental shelf of the east coast of the United States,** as it contains important breeding areas, foraging grounds, migration corridors, and access to nesting beaches[3]. The same region is well suited for the development of marine energy, providing shallow areas for construction and energy transmission to coastal communities[2].

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Sea Turtle Tagging

Tag telemetry data can provide tracking information for sea turtles over long periods of time, providing **insight on space-use and crucial habitat**[4].

Tagging in open water can be laborious and expensive, which can make tracking data both difficult to obtain and share. Furthermore, tagging of nesting turtles limits our knowledge to only one subset of turtles. Often, research on loggerhead turtle movements and space-use are restricted to these types of data collection due to the expectations that wild-captured individuals better represent trends of the population

Tagging of sea turtles held in rehabilitation centers is easily accessible and can offer additional data on a variety of turtle groups, especially smaller individuals. Approximately 1158 loggerhead sea turtles were released from US rehabilitation centers between 2007 and 2016, offering abundant opportunity for learning from existing and future data collections[5].

Research Question and Purpose

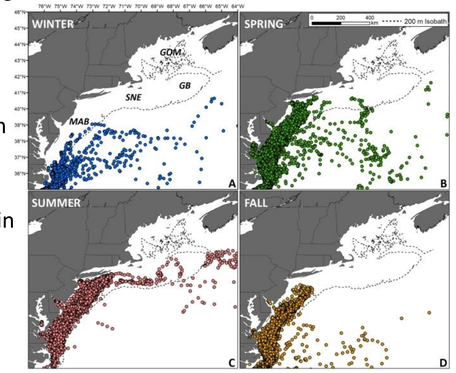
Can data from tagged loggerhead sea turtles who have temporarily resided in rehabilitation centers be included with wild-caught datasets to make assumptions on all loggerhead sea turtles? Ascertaining the similarities and differences in movements and space-use among the two groups could allow for **more robust datasets and higher-quality spatial planning for offshore industries, including marine energy.**

Data and Methodology

Location data from loggerhead sea turtles tagged in wild conditions and post-rehabilitation since 2012 will be analyzed. **Various metrics describing movement behavior and space use will be compared amongst groups to look for anomalies that may describe the overall data differently, including:**

- First and last day above 34 degrees latitude
- Maximum and minimum latitude
- Distance traveled per day
- Centroid of distribution
- Area of distribution

Rehabilitated sea turtles ranged in conditions from cold-stunned to physically injured. These turtles have spent from 155 to 277 days in rehab centers. If these turtles appear to resume "normal" behavior post-recovery, they may be able to offer additional data that can be analyzed with larger datasets for spatial planning.



Example tracks split by season[4]

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