STUDY TITLE: Atlantic Fish Telemetry: Movement and Habitat Selection by Migratory Fishes within the Maryland Wind Energy Area and Adjacent Reference Sites

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CUMULATIVE PROJECT COST: $437,022.67

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PROJECT MANAGER(S): Brian Hooker

AFFILIATION (OF PROJEC MANAGER): Office of Renewable Energy Programs, Bureau of Ocean Energy Management

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KEY WORDS: Atlantic sturgeon, before-after-gradient design, biotelemetry, dynamic habitat model, phenology, Mid-Atlantic Bight, migration corridor, offshore wind energy, striped bass

BRIEF ABSTRACT: Baseline information is needed on the extent of fish migration corridors within BOEM-leased Wind Energy Areas. This two-year biotelemetry study deployed a before-after-gradient approach to evaluate migration behavior and habitat selection of two model migratory fishes, Atlantic sturgeon *Acipenser oxyrhynchus* and striped bass *Morone saxatilis*, in the Maryland Wind Energy Area (MD WEA). The MD WEA is located in the migration corridors for both species during periods of spring, fall and winter. Detected individuals within the MD WEA originated broadly, from Maine to South Carolina. During summer, Atlantic sturgeon were rarely detected and striped bass were absent in the MD WEA, suggesting a potential window for wind turbine construction. Dynamic habitat models identified cross-shelf gradients in depth and temperature that were predictive of seasonal incidence and whether test species distributions were within MD WEA or in adjacent shelf regions.

BACKGROUND: Wind farms within inner shelf regions of the Mid-Atlantic Bight will greatly increase the amount of structured habitat for coastal fishes. Installed wind turbines present longterm structures, which similar to petro rigs in the Gulf of Mexico can alter movement behaviors by fishes and their accessibility to fisheries. The Mid-Atlantic Bight shelf ecosystem functions as a migration corridor for fishes, marine mammals and birds. Fields of wind turbines in this relatively “featureless” region could alter behaviors of migratory animals, causing them to use wind farms as stopover habitats during seasonal migrations.

OBJECTIVES: Gather baseline information on seasonal transit and habitat occurrence of striped bass and Atlantic sturgeon in relation to depth, temperature, and other oceanographic and benthic variables in and adjacent to the MD WEA.

METHODS: An array of 20 biotelemetry receivers was deployed 2016-2018 in a before-after-gradient design centered in the MD WEA and extending 48 km offshore (see Figure 1), detected and recorded seasonal incidence of acoustically-tagged Atlantic sturgeon and striped bass. Receivers were downloaded on a quarterly basis. Detections and observing system environmental data were compiled to analyze transience, seasonal incidence, habitat selection and to develop dynamic habitat models for both species. Leveraging detection data from a BOEM-supported project in the DE WEA, transit direction and rates were analyzed. Incidence data in habitat models was adjusted for seasonal changes in biotelemetry receiver detection efficiency, which was simultaneously measured within the MD WEA. Generalized Additive Mixed Model selection compared hundreds of models incorporating combinations of demographic and environmental variables, lag periods and interactions.

RESULTS: The biotelemetry array logged 745,385 detections of 1,286 acoustically-tagged fish, including 315 striped bass and 352 Atlantic sturgeon. Detections of Atlantic sturgeon occurred in autumn, early winter, spring, and early summer. Striped bass occurrence was more concentrated during winter months with a rapid pulse in spring. Both species were transient, with mean durations of 1.6 and 2.5 days respectively for Atlantic sturgeon and striped bass. Single-variable analyses and habitat models alike identified depth and temperature as key variables; Atlantic sturgeon tended to occur at shallower sites and warmer temperatures while striped bass incidence was more likely at great depths and cooler conditions.

CONCLUSIONS: The MD WEA occurs within a migration corridor. Summer-time wind turbine construction would minimize interactions with striped bass and Atlantic sturgeon. During other seasons, striped bass distributions occurred within the footprint of the MD WEA, whereas Atlantic sturgeon occurred inshore, in areas affected by inshore transmission lines. The cross-shelf biotelemetry sampling design is suitable for both baseline and impact phases of offshore wind energy development, supporting the before-after-gradient analysis approach.

STUDY PRODUCTS:

1. BOEM study report: Secor D, O’Brien M, Rothermel E, Wiernicki C, Bailey H. 2020. Movement and habitat selection by migratory fishes within the Maryland Wind Energy Area and adjacent reference sites. Sterling (VA): U.S. Department of the Interior, BOEM, Office of Renewable Energy Programs. OCS Study BOEM 2020-xxxx. 109 p.

2. Report data is available via the Dryad data repository along with relevant metadata guidance (https://doi.org/10.5061/dryad.6hdr7sqx3).

* The affiliation of the Principle Investigator(s) may be different than that listed for Project Manager(s).

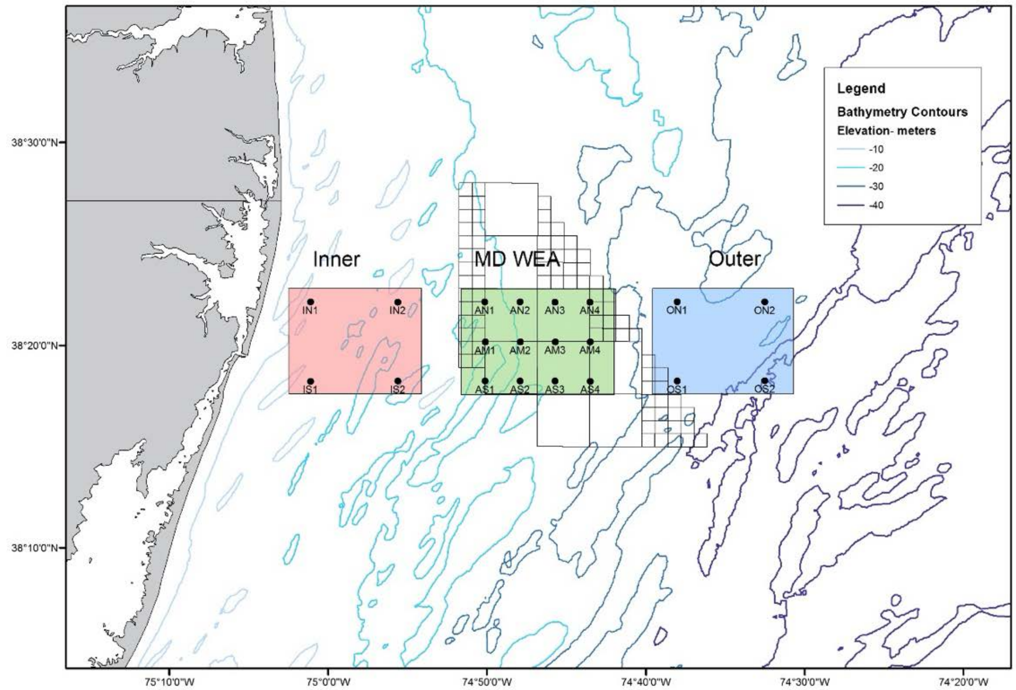

Figure 1. Acoustic receiver array design
Twenty receivers are divided into three strata; Inner (pink), MD WEA (green), and Outer (blue). Bathymetric depth contours are shown at 10-m intervals.