Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Exploring the Connectivity Among Offshore Wind Turbines (AT-22-07)
Administered by	Office of Renewable Energy Programs
BOEM Contact(s)	Brandon Jensen (brandon.jensen@boem.gov)
Procurement Type(s)	Cooperative Agreement
Conducting Organization(s)	University of Massachusetts Dartmouth School for Marine Science and Technology
Total BOEM Cost	$794,416
Performance Period	FY 2022–2024
Final Report Due	May 31, 2025
Date Revised	July 12, 2024
Problem	Offshore wind turbines provide new habitat through artificial reef effects that attract fish. The overall impacts to ecosystems may be localized but could be additive if species interact with multiple structures.
Intervention	Trace the interactions of fish species between structures. Do they have high fidelity or move among structures?
Comparison	The interactions between turbine structures may be compared to interactions with natural structure such as rock outcrops.
Outcome	Does turbine spacing increase or decrease these interactions?
Context	Northeast Atlantic Coast, where the majority of offshore turbines are proposed.

BOEM Information Need(s): BOEM reviews and conducts an environmental analysis on each construction and operation plan submitted by developers. The review evaluates the environmental impacts from the proposed project and offers mitigation measures to reduce or eliminate those impacts. Impacts of the structures on ecosystems is an important environmental consideration, and a possible mitigation is to examine the proximity of turbines to each other.

Background: Offshore wind turbines introduce hard substrate into an environment that is usually composed of soft sediment. The structure also provides vertical habitat through the entire water column. As has been observed for all man-made structures introduced in the marine environment, marine growth is rapid, and a complex habitat is formed. Specifically for wind facilities, researchers in Belgium have observed a rapid succession of marine life over a ten-year period (Kerckhof et al. 2019). Besides the reef effect from encrusting organisms, fish species are often attracted to the structures.

One concern raised is whether the proximity of structures is additive and, as such, results in a restructuring of the ecosystem at larger scales than just the immediate vicinity of the turbine. In other words, is there connectivity between the turbines for mobile species such as fish. Although the Gulf of Mexico has thousands of oil and gas structures, and in some locations, there are clusters of structures, changes to the environment have focused on alterations at individual structures. In the Pacific, oil and

gas structures are studied in relation to nearby natural reefs for comparisons. Because offshore wind turbines are not installed as solitary structures as oil and gas wells or reefing of individual vessels are, but as groups of structures that may number 100 or more within a close proximity, a reasonable question to ask is whether these structures have an additive effect.

Objective(s): The objective of this study is to determine if there is an additive effect on fish from multiple structures in an offshore wind facility.

Methods: The evaluation of connectivity should be conducted on species that may move between turbines and nearby natural reefs. For this study, telemetry and tagging of a fish species of concern, for example black sea bass, would be used to examine whether the bass show high fidelity to a single turbine or move between turbines. This study could be conducted at Block Island Wind Farm.

Specific Research Question(s): Is there connectivity for some species between turbines and does this result in a larger impact to ecosystems than if impacts are localized to each turbine?

Current Status: Project is underway and progressing on schedule.

Publications Completed: N/A

Affiliated WWW Sites: N/A

References:

Kerckhof F, Rumes B, Degraer S. 2019. About “mytilisation” and “slimeification”: A decade of succession of the fouling assemblages on wind turbines off the Belgian coast. Pp. 73–84 in Environmental Impacts of Offshore Wind Farms in the Belgian Part of the North Sea: Marking a Decade of Monitoring, Research and Innovation. S. Degraer, R. Brabant, B. Rumes, and L. Vigin, eds., Royal Belgian Institute of Natural Sciences, OD Natural Environment, Marine Ecology and Management, Brussels.