Environmental Studies Program: Ongoing Studies

Study Area(s): North Atlantic

Administered By: Office of Renewable Energy Programs

Title: EMF (Electromagnetic Field) Impacts on Elasmobranch (sharks, rays and skates) and American Lobster Movement and Migration

BOEM Information Need(s) to be Addressed: While BOEM has funded reviews on the current understanding of potential effects of EMF on marine organisms; to date there has not been any field-based studies examining effects of EMF on elasmobranchs and lobster species in the Northeast. Of particular concern are the potential effects of HVDC cables, where there is little to no existing information. Commercial fishermen in the region have consistently voiced their concern regarding potential effects of EMF emitted from submarine cables on commercially targeted fish species. Further investigation into this topic would assist BOEM in future NEPA analyses of other proposed projects in the region, as well as show a commitment from BOEM to the concerns raised by fishermen.

Total Cost: $1,001,469 **Period of Performance:** FY 2015-2018

Conducting Organization: University of Rhode Island

Principal Investigator(s): John King, jwking@uri.edu

BOEM Contact: Mary Boatman

Description:

Background: The effects of EMF emitted from submarine cables on marine organisms is of high concern to commercial and recreational fishermen throughout New England. The BOEM funded study, *Effects Of EMF From Transmission Lines On Elasmobranchs And Other Marine Species* (BOEM report 2011-09), reviewed the topic area on subsea cable effects of EMF on marine species. While there are some studies, particularly from Europe, that indicate buried alternating current cables have little to no measurable effects on marine species, there is still concern for important US commercial species. Of interest in the Northeast, where wind development is underway, are the commercially important American Lobster (*Homarus americanus*) and elasmobranchs (skates, etc.). In addition, the effect of high voltage direct current (HVDC) cables that may be used in future commercial wind facilities has as yet not been directly measured.

Thus far, studies have been correlative hence they have not been able to conclusively demonstrate that the movement and response of marine animals is a result of the EMF emitted from the cable(s). While laboratory experiments may be used to mimic exposure, this does not reflect conditions in a natural environment. This effort will conduct field studies of the response of lobster and skates to an energized HVDC cable located in Long Island Sound.

Objectives: The focus of this research is on determining the actual emissions associated with the cables associated with HVDC cables and the response by sensitive receptor organisms including the American Lobster and elasmobranch species (skates, etc.).

Methods: This study will:

(1) produce a synthesis of existing information that updates BOEM report 2011-09;

(2) design and execute a field survey plan that will detect statistically significant, very small effects of EMF from HVDC cables on marine species of concern; and

(3) develop a model to predict EMF, compare the model predictions with field measurements and evaluate whether the model can be extrapolated to higher capacity cables that are likely to be installed in the future.

A necessary precursor to studies of the impacts of EMF on marine organisms is a detailed field characterization of the EMF generated by a strategically located HVDC transmission cable. The Cross Sound Cable is a 330 MW HVDC electrical transmission cable that connects the grids of New England and Long Island, NY. The cable is buried subsea and runs from New Haven, CT to Shoreham, NY. A detailed survey of this transmission cable using the URI Saab Falcon ROV and Meridian Ocean Services Innovatum 3 cable and pipeline tracker will be conducted. A bespoke, high sensitivity EMF sensor developed by PI Sigray will be towed by the ROV to measure the EMF generated by the transmission cable. At some points the sensor will be taken to control sites away from the cable to measure ambient (background) EMF in the study area. Furthermore, the sensor will be stopped at sample points over the area to collect data from a static position, thereby enabling EMF decay to be quantified. These measurements will be compared with modelling results. Additional field measurements of the nearby Neptune cable (660 MW HVDC cable) will be made.

Field experiments will be done over the cables using a mesh enclosure. Individuals will have telemetry tags attached and receivers will be placed within

the enclosure to detect the real-time movements in 3-D in relation to the energized section of sub-sea electricity cable. Locally acquired lobster and skates will be used. Cameras will also videotape the behavior in the enclosures. The experiments will be repeated in an area similar to the cable location as a control.

Additional experiments: After the successful completion of the experiments for lobster and skates, the work is being extended to include American eels. This species was observed previously to respond to fields from a cable, so it is the intent to further study this effect.

Current Status: Awarded September 24, 2014. A survey of the Cross Sound Cable was completed in August 2015. Experiments using telemetry on both lobsters and skates were conducted in 2016. A survey of the Neptune cable will be conducted in Summer 2017.

Final Report Due: January, 2018.

Publications: None.

Affiliated Web Sites: None.

Revised Date: June 30, 2017