ACCESS NUMBER: 00101

STUDY TITLE: Acoustic Monitoring of Temporal and Spatial Abundance of Birds Near Outer Continental Structures

REPORT TITLE: Acoustic Monitoring of Temporal and Spatial Abundance of Birds Near Outer Continental Shelf Structures: Synthesis Report

CONTRACT NUMBER: M10PC00101

SPONSORING OCS REGION: Atlantic

APPLICABLE PLANNING AREA(S): Atlantic Coast

FISCAL YEAR(S) OF PROJECT FUNDING: 2011, 2012, 2013

COMPLETION DATE OF REPORT: January 2014

COSTS: FY 2011, $1,679,703.16; FY 2012, $1,062,728.47; FY 2013, $695,977.15; Cumulative Award Amount: $ 3,438,408.78

PROJECT MANAGER: Christian Newman

AFFILIATION: Normandeau Associates, Inc.

ADDRESS: 102 NE 10th Avenue, Gainesville, FL 32601. Corporate Office: 25 Nashua Road, Bedford, NH 03110-5527

PRINCIPAL INVESTIGATOR(S)*: Chuck Grandgent, Robin Smith, Julia Robinson Willmott, Greg Forcey, Chris Ribe, Caleb Gordon, Ron Rohrbaugh, Andrew Farnsworth.

KEY WORDS: acoustic, birds, collision, displacement, ranking, indices, sensitivity, thermographic, offshore wind, remote, sensing, Atlantic Outer Continental Shelf

BACKGROUND: Offshore alternative energy developments have the potential to provide a significant source of energy to the coastal areas of the mid-Atlantic and northeastern United States. The proliferation of artificial structures associated with energy development, both on land and offshore on the continental shelf, potentially pose a real, but poorly understood, risk to migratory birds. BOEM has been seeking additional data to describe bird and bat use of the Atlantic Outer Continental Shelf (AOCS). Because significant portions of bird and bat migration occur at night, directly monitoring the timing and magnitude of migration is very difficult, confounding the ability to assess the risk that accompanies hazards such as structures. Though recent advances in technologies such as radar and thermal imaging allow quantification of some aspects of bird and bat migration, only the recording and subsequent analysis of distinctive vocalizations made by birds and bats while in active migratory flight can provide species-specific information at a specific place and time. Therefore, a multi-modal sensor system that includes a sophisticated acoustic recording and analysis component is necessary to more accurately assess the risk to migratory birds from offshore and other energy development. Normandeau was contracted by BOEM to design and test such a system, combining thermal imagery and acoustic and ultrasound sensors to survey bird and bat species potentially affected by offshore developments.

OBJECTIVES: (1) develop a system that combined thermal imagery and acoustic and ultrasound sensors to survey bird and bat species potentially affected by offshore developments, (2) field test the system, (3) deploy the system on a structure in the AOCS to gather acoustic and thermographic data, and (4) report seasonal, annual, and weather-related variation in bird species' presence near OCS structures.

DESCRIPTION: The Acoustic Thermographic Offshore Monitoring (ATOM) system is designed to gather data through all weather conditions during both day and night. The system was tested at onshore locations before being deployed at the remote Frying Pan Shoals Light Tower (FPSLT), 29 mi offshore, where it gathered data between December 2011 and February 2013. This report describes the development of the system, field trials and results, and presents seasonal, annual, and weather-related variation in bird and bat occurrence data that were gathered by ATOM during the FPSLT deployment.

SIGNIFICANT CONCLUSIONS: Bats, though known from other studies to occur at offshore locations (e.g., Pelletier and Peterson 2013; Pelletier et al. 2013; Mackiewicz and Backus 1956; Carter 1950), were not found at FPSLT from within the ultrasonic or thermographic data.

The data show a clear pattern of migrant bird occurrence in the offshore environment, with April and October showing peak density, using combined acoustic and thermographic data.

ATOM recorded high counts of several song bird species, such as Cape May Warbler, Northern Parula, Palm Warbler, Yellow-rumped Warbler, and Swainson's Thrush. These species represent a mix of different migrant strategies, highlighting the importance of this type of monitoring offshore. Calls from all 5 of these species peaked in October with a much smaller number being recorded during other months, if at all.

Peak in fall density of migrating birds occurred during periods of north to northwest winds (i.e., with a tail wind). Flight bearing in passerines showed seasonal differences but similar trends were not evident with non-passerines. Passerines showed strong tendencies to fly to the south and southeast during the fall and to the northwest during the spring. Mean flight direction during April was 286º (NW) and in October was 151º (SSE).

Most birds appear to fly higher in the evenings with an estimated 1.8 times increase in flight height between 8 pm and 12 am than at all other times. Flight altitude seems unaffected by wind speed. Species-specific data collected show Yellow-rumped Warbler with flight altitudes of 103.9 m and 46.3 m (n=2), and Laridae with flight altitudes ranging from 49.1 m to 193.9 m, mean 87.43 m (n=35).

From both acoustic and thermographic data, there is more observed bird activity during wind speeds of less than 10 km/hr with no discernable alteration in altitude. Flight direction is affected by wind speed and direction with data showing birds inclining to fly into head wind. Flight speed data are consistent throughout the year as well as throughout the day with an average speed of 23 km/hr.

STUDY RESULTS: The data collected in this study are invaluable for attempting to clarify the movements of birds and bats, particularly offshore migrants, and assessing the potential risk that these species might face. The results presented in this report are evidence of progress in the use of acoustic and thermographic monitoring to understand the ecology of large-scale migrations and their implications for conservation. Particularly novel is the dataset itself, the first of its kind from the offshore environment in the western Atlantic Ocean.

A number of seabird species, including gulls, terns, and a frigatebird, were identified by ATOM. The dataset of land bird species identified by ATOM includes herons, bitterns, and many passerines, significantly contributing to filling gaps in knowledge about these migrants.

Although there were large data gaps in the ultrasonic data, no bats were seen in the thermographic data. Bats have been encountered offshore and away from any terrestrial habitat; however, it is unlikely that they occur at remote stations like FPSLT with any regularity.

Results show a clear pattern of migrant bird occurrence in the offshore environment with April and October showing peak density with combined acoustic and thermographic data. However, a paucity of data from March means that a potentially important month for bird activity was under-surveyed.

The system is designed to survey birds and bats within the rotor swept area of a turbine, and consequently most flight altitude data are within this detection area. Acoustic data also fill information gaps on small birds flying higher than 150 m that might otherwise be missed by thermographic methods due to the decay in detection over distance for small birds. Information from these two detection methods provides new data on peak migration times for both vocal and silent species.

Deployment at FPSLT, 29 mi offshore, provided a challenging work arena with costly and limited access to the system for installation, maintenance, repairs, and retrieval. These factors forced improvements and modifications to both hardware and software to create a more robust unit that was able to withstand harsh offshore conditions.

STUDY PRODUCT(S):

Report: Normandeau Associates, Inc. 2014 Acoustic Monitoring of Temporal and Spatial Abundance of Birds Near Outer Continental Shelf Structures: Synthesis Report. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. BOEM 2014-004. 172 pp.

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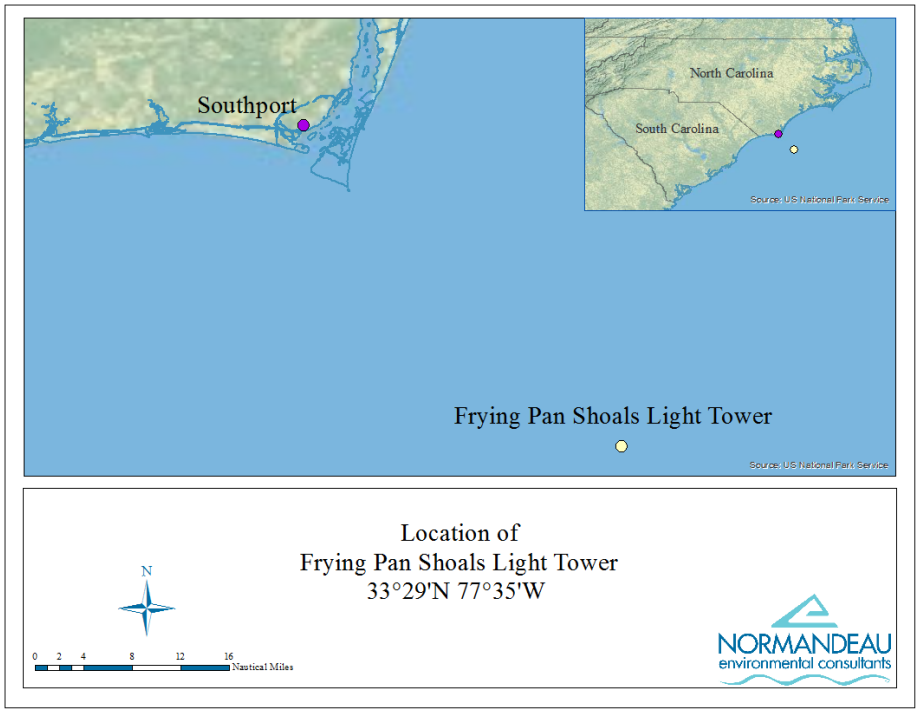
Pelletier, S. K., K. Omland, K. S. Watrous, and T. S. Peterson. 2013. Information Synthesis on the Potential for Bat Interactions with Offshore Wind Facilities: Final Report. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. OCS Study BOEM 2013-01163. 119 pp.

Pelletier, S. K., and T. S. Peterson. 2013. Wind power and bats offshore: What are the risks? A current understanding of offshore bat activity. Oral presentation at American Wind Energy Association Offshore WindPower 2013. Providence, Rhode Island. October 2013.



Location of Frying Pan Shoals Light Tower.

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* P.I.'s affiliation may be different than that listed for Project Manager(s).