Environmental Studies Program: Ongoing Study

Title	Year-round and Diel Patterns in Habitat-use of Seabirds off Oregon (PC-14-03)
Administered by	Pacific OCS Region
BOEM Contact(s)	David Pereksta (david.pereksta@boem.gov)
Procurement Type(s)	Cooperative Agreement (OSU); Intra-agency Agreement (USGS)
Conducting Organization(s)	Oregon State University (OSU); U.S. Geological Survey (USGS)
Total BOEM Cost	$750,000
Performance Period	FY 2014–2019
Final Report Due	April 30, 2022
Date Revised	March 24, 2022
PICOC Summary	
Problem	Increasing interest in ocean-based renewable energy and certain activities associated with development of these energy resources pose risks for seabirds. Seabird interactions with wind-turbine structures, lighted facilities, elevated power lines on land, and lighted ships at sea have been documented in many regions, and we lack comprehensive knowledge of seabird distribution and behavior off Oregon to inform siting decisions and minimize risk to seabirds at sea.
Intervention	Use recent technological advances in wildlife telemetry to fill data gaps through individual tracking studies of seabirds complemented with direct observations. Both locally breeding and wintering species will be targeted for data collection.
Comparison	The data collected will be integrated with physical variables to improve predictive habitat-use models.
Outcome	Maps of species utilization distributions within state and federal waters off Oregon (and throughout the CCS and U.S. exclusive economic zone) and numerical models that relate environmental variables, including wind speed and direction, to seabird flight speed, direction, and altitude above the sea surface. These will be used by BOEM and others to assess seabird risk and vulnerability from offshore wind energy projects.
Context	Washington-Oregon

BOEM Information Need(s): The State of Oregon and BOEM have been engaged in marine spatial planning for siting of offshore energy projects within the territorial sea and OCS regions. While the initial focus has been on wave energy converters, offshore wind energy development is also being actively pursued off Oregon. Through recent retrospective studies, meetings, and gap analyses, several critical data needs for seabirds were highlighted. These data needs include quantitative information on year-round, diurnal/nocturnal, and weather-related patterns in movements, behaviors, residence time, and migration corridors for seabirds. The best way to fill these data gaps is through individual tracking studies complemented with direct observations. Over the past decade Oregon State University, USGS, and collaborators have used sophisticated telemetry techniques for behavioral tracking studies for several migratory seabird species that visit the California Current System (CCS). With recent technological advances, we can now expand these studies to include locally breeding and wintering species that dominate marine bird communities off Oregon and the Northern CCS. By integrating these data with physical variables we can improve predictive habitat-use models currently needed to inform site-specific and broad-scale marine spatial planning of the OCS. Results from tracking studies combined with previous transect surveys data will provide capability for comprehensive, spatially explicit vulnerability models for seabirds potentially impacted by wave- and wind-energy conversion device siting. Lastly, this study complements ongoing BOEM-supported habitat mapping and ranging behavior study in Hawaiian waters and adds significant new data to include in the *California Current System Seabird Telemetry Atlas*, currently in progress.

Background: Oregon hosts approximately 1.2 million breeding seabirds and even more summer and winter migrants with at-sea residence times of days to months. Common Murres are the most abundant breeding bird (50% of breeding population), followed by storm-petrels (37%), cormorants (5%), and gulls (2%). Common Murres, along with loons, grebes, and seaducks, are the most abundant overwintering species. At times of the year, shearwaters and albatrosses also are abundant. Several species, including the Short-tailed Albatross and Marbled Murrelet, are federally protected under the U.S. Endangered Species Act. Limited tracking data currently exist for larger bodied, non-resident species (albatrosses, Sooty and Pink-footed Shearwaters), and very little, if any, for numerically dominant breeding, overwintering, and migratory species. Oregon seabirds can be used to identify ocean regions of important community-level food-web interactions and trophic transfer of energy. Furthermore, some have adapted ranging behaviors, morphologies, and flight characteristics that capitalize on energy associated with predominant wind patterns and wave energy. Oregon seabirds face increasing threats at sea, including interactions with fisheries, pollution, and climate change. Increasing interest in ocean-based alternative energy and certain activities associated with development of these energy resources pose additional risks for seabirds. Seabird interactions with wind-turbine structures, lighted facilities, elevated power lines on land, and lighted ships at sea have been documented in many regions, and we lack comprehensive knowledge of seabird distribution and behavior to inform siting decisions and minimize risk to seabirds at sea.

Objectives: Emphasis will be to fill knowledge gaps identified in recent BOEM reports with three objectives:

1. Conduct multi-species and multi-scale quantification of at-sea habitat utilization and ranging behaviors for breeding and non-breeding seabirds off the Oregon coast,
2. Compare and integrate results with existing transect survey data, and
3. Compile and provide an analysis of remotely sensed and model-derived habitat data (e.g., chlorophyll concentrations, sea surface temperature, sea surface height, sea level pressure, and wind speed/direction) to examine habitat relationships that can be used to predict species' distributions and improve spatial vulnerability (i.e., risk) maps.

Methods:

1. Newly available micro-electronic tracking devices will be used to quantify at-sea movements and range behavior of breeding seabirds on the Oregon coast. Specifically, fine-scale, short-term (GPS) and coarse-scale, long-term (Argos, GLS) tracking devices will be deployed on breeding birds at or near important breeding colonies. Non-breeding/migratory species that use the CCS will be captured and outfitted at-sea or on breeding colonies prior to migration.

2. Spatially explicit habitat modeling to combine seabird utilization with oceanographic habitat will be used to generate mapped species probability distributions and community-level hotspot areas.
3. To evaluate three-dimensional risk, numerical models that relate flight behavior with fine-scale (2–6 km) winds and waves (c.f., *Hawaiian seabird ranging study*) will be generated and supplemented using direct observations during peak migrations through the CCS. All new regional telemetry data will be integrated with existing telemetry-based information on at-sea utilization and behavior of non-breeding, migratory species (e.g., Short-tailed and Black-footed Albatrosses, Sooty and Pink-footed Shearwaters).

Results will include (1) raster-based maps of species utilization distributions within state and federal waters off Oregon (and throughout the CCS and U.S. exclusive economic zone) and (2) numerical models that relate environmental variables, including wind speed and direction, to seabird flight speed, direction, and altitude above the sea surface. Results will be provided in scientific presentations, peer-reviewed scientific papers, and in a readily accessible, comprehensive marine GIS package currently under development by USGS and collaborating scientists.

Specific Research Question(s):

1. What are the at-sea habitat utilization and ranging behaviors of breeding and non-breeding seabirds off the Oregon coast?
2. How are oceanographic habitats influencing species probability distributions and community-level hotspot areas?
3. What is the three-dimensional collision risk to seabirds from offshore wind energy development?

Current Status: OSU has finished the field work and data collection for the study. This included tracking Common Murres and Western Gulls with biologgers off of the Oregon coast, deploying satellite transmitters on Pink-footed Shearwaters and Common Murres to acquire their movement data, developing and testing a GSM/altimeter tag for Western Gulls, deploying GPS dataloggers and accelerometer altimeters on Black-footed and Laysan Albatrosses, and deploying PTTs on Pacific Loons. Tracking of Western Gulls and Common Murres continued through the fall of 2017, and tracks of Pacific Loons during their spring and fall migrations through Oregon waters continued to be recorded from tags that were deployed in 2015. Now that all the tracking data for the project has been collected, OSU will collate and standardize the datasets. This task as largely been accomplished for a number of species and they are working on obtaining additional datasets from collaborators. Progress since spring 2020 was delayed by the COVID-19 pandemic due to unavailability of personnel. Data analysis and development of deliverables were delayed. The final report is currently being reviewed and should be finalized in April 2022.

Publications Completed: None

Affiliated WWW Sites: https://marinecadastre.gov/espis/#/search/study/26992

References: None