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FE = Fates & Effects

HE = Habitat & Ecology

IM = Information Management

IN = Interdisciplinary

MM = Marine Mammals & Protected Species

PO = Physical Oceanography

SE = Social & Economic Sciences



Discipline	Title	Rank
MM	<p>Data Synthesis and High-resolution Predictive Modeling of Marine Bird Spatial Distributions on the Pacific OCS</p>	3
<p>Needed now to fully understand distribution and abundance of avian species off the Pacific coast prior to renewable energy installation</p>		



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BOEM Information Need:

Improved species-specific distributions and density estimates of seabirds that can be extended to non-surveyed areas. High-resolution maps of predicted long-term average patterns of seabird occurrence and abundance will provide critical information for renewable energy siting.



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**Relationship to Previous
BOEM-Supported Research:**

- Builds on avian baseline studies funded through the Pacific OCS Region.
- Provide detailed information linking environmental and oceanographic conditions to seabirds and help define habitat characteristics and identify mechanisms that aggregate seabirds.



BOEM Objectives:

Increase BOEM's understanding of marine bird distribution on the Pacific OCS by:

- 1) Predictively modeling marine bird distribution on the Pacific OCS, taking into account all available data and relationships with environmental variables; and
- 2) Mapping the predictive distribution of marine birds to identify areas of persistent aggregation and persistent avoidance ("hotspots" and "coldspots").



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Other modeling efforts done (Nur et al., 2011); however:

- 1) Limited in spatial resolution (3-10 km) depending on the environmental predictors used, which is coarser than the BOEM lease block scale;
- 2) Only produced useable results for a small subset of species;
- 3) Did not provide a spatially explicit assessment of model uncertainty or model performance, limiting its applicability in risk assessment; and
- 4) Higher resolution datasets have become widely available, new descriptions of ocean habitat features have been found to vastly improve predictions of seabird abundance, and new seabird survey data have been collected.

Predictive models of seabird occurrence and abundance from NOAA's National Centers for Coastal Ocean Science have been developed at <1 km resolution, with associated maps of uncertainty, and are already useful in BOEM's environmental assessment processes.



Study Methods:

- 1) Identify, collect, and synthesize available quantitative seabird survey data for the Pacific OCS collected over the last 50 years and merge into a common database;
- 2) Identify species and groups of interest, combine species into functional groups, develop standardized effort metrics and relative indices of occurrence and abundance, and develop dataset and taxa-specific uncertainty estimates/weights;
- 3) Identify, collect, format, and process environmental and oceanographic predictors;
- 4) Choose modeling methods that account for multiple datasets with different levels of confidence and measurement error; account for different spatial and temporal support; and adapt methods that have been successfully applied in other regions;
- 5) Produce continuous, high-resolution predictive maps of presence probability and sightings per unit effort (SPUE) for bird species and groups of interest, including maps of annual climatologies and uncertainty;



Study Methods, con't:

- 6) Provide model predictions for presence probability and SPUE within BOEM lease blocks or similar planning areas; and
- 7) Combine predictive maps across species and groups to identify “hotspots” and “coldspots” of abundance and diversity and/or occurrence of multi-species assemblages.



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