Field	Study Information
Title	Comprehensive Vulnerability of Marine Birds to Inform Offshore Wind Energy Development Throughout Waters Surrounding Pacific Offshore Continental Shelf of Hawai'i (PC-25-05)
Administered by	Pacific OCS Region
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Procurement Type(s)	Interagency Agreement
Performance Period	FY 2025–2027
Final Report Due	TBD
Date Revised	August 16, 2024
Problem	Approximately 25 species of marine birds breed in the Main Hawaiian Islands (MHI). Offshore wind energy infrastructure (OWEI) may affect Hawaiian marine birds by increasing risk of mortality from collision and by increasing energetic costs associated with disturbance and displacement of individuals from suitable habitats.
Intervention	Data quantifying distribution and abundance of marine birds combined with information about life histories and behaviors of species at sea can benefit evaluations of offshore wind energy development location and scope of potential impacts to species.
Comparison	BOEM and the US Geological Survey (USGS) have conducted extensive at-sea tracking of breeding Hawaiian marine bird species to collect baseline data on movements, habitat associations, and behavior. Furthermore, an updated registry of marine bird nesting locations and population estimates throughout the eight leeward islands will soon to be available.
Outcome	To inform marine spatial planning for OWEI, ranked species vulnerability assessments and fine-scale, spatially continuous maps of seabird density will be developed for the waters surrounding the MHI using the data identified above.
Context	POCS off the MHI

BOEM Information Need(s): OWEI may affect Hawaiian marine birds by increasing risk of mortality from collision and by increasing energetic costs associated with the disturbance and displacement of individuals from suitable habitats (i.e., foraging areas and movement corridors). Although data on the distribution and abundance of seabirds can advise the selection of locations for renewable energy projects, the seasonal abundance, life histories, and behaviors of birds at sea should also be taken into account because these factors also affect vulnerability (collision, displacement, and population) and vulnerability is expected to vary among diverse species assemblages.

Background: U.S. Pacific Outer Continental Shelf (POCS) waters surrounding Hawai'i support approximately 25 species that breed in the MHI, including the endangered Hawaiian petrel and band-rumped storm-petrel and threatened Newell's shearwater; additional migratory non-breeding marine

birds occupy these waters seasonally. All species are protected under the Migratory Bird Treaty Act and all breeding seabirds in Hawai‘i are protected by the State. Furthermore, Hawaiian seabirds are culturally important and regarded as ‘aumākua (spiritual guardians).

BOEM and USGS have conducted extensive at-sea tracking of breeding Hawaiian seabird species to collect baseline data on movements, habitat associations, and behavior (Adams et al. 2020, Donahue et al. 2012, Gilmour et al. 2022). Furthermore, an updated registry of seabird nesting locations and population estimates throughout the eight leeward islands will soon to be available (Adams and Kelsey et al. In prep). To inform marine spatial planning for OWEI, these data are necessary inputs for developing ranked species vulnerability assessments that do not yet exist for Hawai‘i and fine-scale, spatially continuous maps of seabird density (e.g., Ronconi et al. 2022) around the MHI.

Objective(s):

1. Develop collision and displacement vulnerability indices for all seabirds expected to regularly occur throughout the Hawai‘i POCS waters by ranking the same suite of key vulnerability metrics developed by Adams et al. (2017) and revised by Kelsey et al. (*In prep*) for waters off Oregon, Washington, and California.
2. Generate fine-scale, predictive spatial maps of Hawaiian seabird densities by combining Hawaiian seabird tracking data (Adams et al. 2020) and the new updated MHI colony registry.
3. Integrate seabird-OWEI vulnerability for the main Hawaiian Islands with predicted seabird densities to generate continuous coverage, mapped representations of cumulative marine bird vulnerabilities for the waters off Hawai‘i.

Methods: Consistent with the west coast POCS, USGS will combine existing new data with quantitative assessment and modeling to create comprehensive, fine-scale maps of density and cumulative vulnerability to OWEI for seabirds in the POCS waters surrounding Hawai‘i. This will provide cumulative density and vulnerability scores for continuous, fine-scale (~2-km resolution) maps of the Hawai‘i POCS and could inform offshore renewable energy development by highlighting important at-sea areas for vulnerable seabirds.

Task 1. The USGS will develop collision and displacement vulnerability indices for all seabirds expected to regularly occur throughout the Hawai'i POCS waters by ranking the same suite of key vulnerability metrics developed by Adams et al. (2017) and revised by Kelsey et al. (In prep) for waters off Oregon, Washington, and California. This includes a comprehensive review of existing information to generate OWEI vulnerabilities for Hawaiian breeding seabirds and subtropical migratory marine birds. The Species USGS will evaluate in the index will include all seabirds expected to regularly occur throughout the Pacific OCS waters surrounding Hawai'i. These will include approximately 21–23 breeding species of seabirds nesting in the main Hawaiian Islands and a number of additional migratory non-breeding marine birds that occupy these waters seasonally. In addition, the Hawaiian marine bird vulnerability may include other species of concern that may be traveling or migrating over water such as certain shorebirds (Pacific golden-plover, bristle-thighed curlew, etc.). The factors incorporated into the vulnerability index include flight maneuverability, flight altitude, percentage of time flying, nocturnal flight activity, and avoidance of OWEI. Each species-specific factor will be scored using a scale from low potential vulnerability to high potential vulnerability following Adams et al. (2017).

The ranking of each factor for all species will be independently evaluated by a selected group of experts. The experts will be chosen by USGS, in collaboration with BOEM, based on their experience with the

species in the targeted regions or other areas where the species occur. Because applications for offshore wind or hydro power construction may be decided in many locations before comprehensive, medium- to large-scale, ecological studies on the status of marine wildlife are completed, predicted effects must largely be based on current knowledge. This should include conclusions from studies of wind power facilities on land and offshore (the latter in Europe) and from knowledge of the spatiotemporal patterns of abundance and movements of birds at sea that might be at risk.

Task 2. To build off Winship et al. (2016) and generate predictive spatial maps of MHI seabird densities, additional approaches are necessary. USGS will create fine-scale, predictive spatial maps of Hawaiian seabird densities by combining Hawaiian seabird tracking data (Adams et al. 2020) and the new updated MHI colony registry. Specifically, integrating extensive telemetry data (Adams et al. 2020) and species nesting locations and abundances will provide colony-based species distribution maps for important MHI breeding species.

Task 3. USGS will integrate seabird-OWEI vulnerability for MHI with predicted seabird densities to generate continuous coverage, mapped representations of cumulative marine bird vulnerabilities for the waters off Hawai'i. This synthesis will allow better assessments of areas proposed for offshore renewable energy development. The methods are consistent with what we have proposed for Washington, Oregon, and California POCS.

Specific Research Question(s):

1. What are the collision and displacement vulnerability indices for seabirds expected to regularly occur off the MHI?
2. What is the predicted spatial distribution of seabirds off the MHI?
3. What are the continuous mapped representations of cumulative marine bird vulnerabilities for the waters off the MHI?

Current Status: N/A

Publications Completed: N/A

Affiliated WWW Sites: N/A

References:

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