

## **Environmental Studies Program: Ongoing Study**

**Study Area(s):** Hawaii

**Administered By:** Pacific OCS Region

**Title:** Atlas of Main Hawaiian Island Seabird Colonies  
(NSL #PC-17-03)

**BOEM Information Need(s) to be Addressed:** The Hawaii Clean Energy Initiative and renewable energy goals are the most aggressive in the nation, with the Governor setting the goal at 100% clean energy by 2045. In addition to land-based alternative energy, the DOI and the State of Hawaii have received proposals to develop commercial-scale offshore renewable energy capacity within state and federal waters surrounding the Main Hawaiian Islands (MHI). Several Hawaiian seabird species, including Endangered Hawaiian Petrels, are killed by terrestrially sited wind turbines; future turbine infrastructure at sea and marine cable-laying operations pose strike, grounding, and mortality risks to free-ranging seabirds that colonize Hawaii. This risk will vary according to species, time of year, and environmental conditions. Currently, BOEM, federal, state, and local resource managers lack comprehensive, quantitative data to map seabird colony locations, extents, and breeding population sizes throughout the MHI. This basic population information—compiled in previous MMS-supported seabird colony catalogues for California, Oregon, Washington, and Alaska—now is urgently needed in Hawaii to (1) evaluate threats to colonies and adjacent high-use offshore waters, (2) provide a reference to measure population trends, and (3) best inform place-based conservation and restoration actions.

**Total BOEM Cost:** \$899,996

**Period of Performance:** FY 2017–2021

**Conducting Organization(s):** U.S. Geological Survey

**Principal Investigator(s):** [Dr. Josh Adams](#)

**BOEM Contact(s):** [David Pereksta](#)

### **Description:**

**Background:** The MHI (8 main islands, excluding the leeward archipelago) and numerous associated offshore islets provide substantial breeding habitat for approximately 20 seabird species; the Newell's Shearwater, Hawaiian Petrel, and Band-rumped Storm Petrel are considered threatened or endangered by state or federal agencies. Presently, very little is known about seabird breeding population sizes and trends throughout the MHI. More than 30-years ago, the U.S. FWS initiated a synthesis of existing information about the status of seabird populations in Hawaii; a review of reports and literature identified 21 species and 247 colony sites (Fefer n.d.). This effort occurred before GIS mapping and no new colony surveys were conducted in association with the synthesis. To support extensive colony-based tracking of Hawaiian seabirds (BOEM 2015) and a comprehensive vulnerability assessment for seabirds at sea throughout the MHI (Adams et al. 2017), USGS has compiled a digitized geodatabase

version of the preliminary Fefer et al. synthesis and has worked with more recent collaborator data (Hawaii State Department of Land and Natural Resources) to update site-specific species count data. A revised, comprehensive Atlas of Hawaiian Seabird Colonies is needed by BOEM to support environmental risk assessments, environmental impact statements, and pre- and post-lease decisions related to potential renewable energy leasing on the Pacific OCS surrounding Hawaii. This effort will provide mapped breeding distributions and contemporary reference information to increase knowledge, build resource management capacity, and assist targeted conservation actions on land. Furthermore, this atlas will allow USGS to generate quantitative model-based predictions of at-sea distribution based on colony size and location, central-place foraging theory, and new empirical data from at-sea ranging studies throughout Hawaii (BOEM 2015).

#### Objectives:

1. Update the known status of seabird colonies on the Main Hawaiian Islands.
2. Assess the effectiveness of survey protocols and other data collection approaches.
3. Determine how information on Hawaiian seabird colonies can be shared with other scientists, agencies, and stakeholders.
4. Determine how colony data can quantify and map foraging seabird distribution at sea.

Methods: This three-phase effort is facilitated by previous seabird colony atlases. In phase one, USGS will continue networking among main-island-based resource stakeholders (federal and state land managers, NGO partners, and private land owners) to involve existing regional expertise in a collaborative effort to concatenate the most recent colony count data into a common database and identify regional data gaps. This is imperative for a regionally comprehensive atlas because of the physical and political separation of the MHI, their resources, and stakeholders. In phase two, quantitative surveys guided by results from regional data gap analysis will be implemented to measure breeding seabird abundance, distribution, and habitat characteristics. Effective survey protocols and standardized approaches (e.g., ground-based sampling for burrowing seabirds, aerial photogrammetry for surface-nesting species, acoustic and remote methods for cryptic and nocturnal species) will be developed to quantify abundance and associated habitat metrics. New aerial photogrammetry methods will be used to document and map remote and inaccessible islet sites to a fine-scale (~5 cm resolution). The resulting SQL database of seabird colonies will host count data, habitat metrics, and associated metadata (e.g., sources, methods, history, introduced species, threats, etc.). A comprehensive and accessible GIS Atlas (geodatabase) of seabird colonies throughout the MHI and associated islets will be created and hosted online via the BOEM Marine Cadastre and USGS. New methods to generate at-sea distributions among breeding seabirds can be used to inform similar efforts to map colony-based distributions in the Pacific. In phase three, USGS will use a modeling-based approach to combine recent BOEM-supported seabird at-sea utilization data with new colony data from this atlas to generate spatially explicit, central-place-foraging-based species probability distributions (Grecian et al. 2012).

**References:**

Adams, J., E.C. Kelsey, J.J. Felis, and D.M. Pereksta. 2017. Collision and Displacement Vulnerability among Marine Birds of the California Current System Associated with Offshore Wind Energy Infrastructure (ver. 1.1, July 2017). U.S. Geological Survey Open-File Report 2016-1154, 116 p. <https://doi.org/10.3133/ofr20161154>.

BOEM. 2015. Habitat Affinities and At-sea Ranging Behaviors among Main Hawaiian Island Seabirds (PC-13-03). Last revised July 13, 2018. Bureau of Ocean Energy Management: <http://www.boem.gov/pc-13-03/>.

Fefer, S. I. Unpublished data 1983-1989. U.S. Fish and Wildlife Service.

Grecian, W.J., M.J. Witt, M.J. Attrill, M.J., S. Bearhop, B.J. Godley, D. Grémillet, K.C. Hamer, and S.C. Votier. 2012. A novel projection technique to identify important at-sea areas for seabird conservation: An example using Northern Gannets breeding in the North East Atlantic. *Biological Conservation*, 156(2012), p.43-52.

Pyle, R.L., and P. Pyle. 2017. *The Birds of the Hawaiian Islands: Occurrence, History, Distribution, and Status*. B.P. Bishop Museum, Honolulu, HI, U.S.A. Version 2 (1 January 2017). <http://hbs.bishopmuseum.org/birds/rlp-monograph>

**Current Status:** The BOEM-USGS intra-agency agreement was awarded on August 18, 2017. After the agreement was fully executed, USGS initiated efforts to develop the USGS Atlas of Main Hawaiian Island Seabird Colonies. To support extensive colony-based tracking of breeding Hawaiian seabirds (BOEM 2015) and a comprehensive vulnerability assessment for seabirds at sea throughout the MHI waters (Adams et al. 2017), USGS has compiled a digitized geodatabase version of the preliminary unpublished Fefer et al. (1983) synthesis and has worked with more recent collaborator data (e.g. Hawaii State Department of Land and Natural Resources) to update site-specific species count data. This effort will provide mapped breeding distributions and contemporary reference information to increase knowledge, build resource management capacity, and assist targeted conservation actions on land. Furthermore, this atlas will allow USGS to generate quantitative model-based predictions of at-sea distribution based on colony size and location, central-place foraging theory, and new empirical data from at-sea ranging studies throughout Hawaii (BOEM 2015). Accomplishments to date include:

- Reviewed previous colony catalogs from California, Oregon, Washington, and Alaska and identified metrics we plan to include in the MHI Atlas
- Obtained habitat information (State digital elevation, soil types, vegetation cover, and land-use designations) for large islands of the MHI to evaluate seabird colony physical environment parameters
- Evaluated Pyle and Pyle (2017) which serves as a historic reference and includes comprehensive species accounts and references

- Consulted with colleagues experienced in constructing seabird and island-related spatial databases (USGS, UCSC) to learn more about appropriate platform and structure for the MHI Atlas
- Initiated networking among main-island-based resource stakeholders (federal and state land managers, NGO partners, and private land owners) to involve existing regional expertise in a collaborative effort to concatenate the most recent colony count data into a common database and identify regional data gaps

Planned activities for the near future include formalizing hiring, contracting, permitting, and partnerships with the first wave of MHI-based resource stakeholders; we will focus first on Kauai and Maui Nui (2018).

- Complete staff hires and required trainings
- Continue concatenating, formatting, and tabulating the most-recent seabird colony count data
- Tabulate information gaps to target required survey effort
- Establish aerial photo count methodology for ground and bush nesters
- Consult with GIS team and USGS WERC data managers to finalize database design
- Initiate colony surveillance

**Final Report Due:** August 18, 2021

**Publications Completed:** None

**Affiliated WWW Sites:** <https://marinecadastre.gov/epis/#/search/study/100223>

**Revised Date:** July 13, 2018