

## Environmental Studies Program: Ongoing Study

Title	Atlas of Main Hawaiian Island Seabird Colonies (PC-17-03)
Administered by	Pacific OCS Region
BOEM Contact(s)	David Pereksta ( <a href="mailto:david.pereksta@boem.gov">david.pereksta@boem.gov</a> )
Procurement Type(s)	Intra-agency Agreement
Conducting Organizations(s)	U.S. Geological Survey
Total BOEM Cost	\$899,996
Performance Period	FY 2017–2022
Final Report Due	August 17, 2022
Date Revised	March 24, 2022
PICOC Summary	
<i><u>Problem</u></i>	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 Main Hawaiian Islands.
<i><u>Intervention</u></i>	Revise the Atlas of Hawaiian Seabird Colonies to allow BOEM and others to (1) evaluate threats to colonies and adjacent high-use offshore waters, (2) measure population trends, and (3) best inform place-based conservation and restoration actions.
<i><u>Comparison</u></i>	Update the known status of seabird colonies on the Main Hawaiian Islands; assess the effectiveness of survey protocols and other data collection approaches; determine how information on Hawaiian seabird colonies can be shared with other scientists, agencies, and stakeholders; determine how colony data can quantify and map foraging seabird distribution at sea.
<i><u>Outcome</u></i>	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.
<i><u>Context</u></i>	Hawaii

**BOEM Information Need(s):** 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.

**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).

**Specific Research Question(s):**

1. What is the status of seabird colonies on the Main Hawaiian Islands?
2. How effective are survey protocols and other data collection approaches?
3. How is the distribution of feeding seabirds at sea related to colony locations?

**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
- Completed MOU with University of Hawaii to support partnerships with Maui Nui Seabird Recovery Project (MNSRP) and Kauai Endangered Seabird Recovery Project (KESRP)
- Took steps to support a CESU cooperative agreement with University of Hawaii Pacific Cooperative Science Unit

- Hired a USGS Biological Technician (Maui) to assist with data compilation and colony surveys focused on the islands of Maui Nui
- Obtained NPS Scientific Research Permit to conduct survey work off northcoast Molokai (Kalaupapa National Historical Park)
- Worked with MNSRP to heli-deploy 11 acoustic recorders on Molokai offshore islets and in remote, higher elevation montane forest habitats
- Coordinated with Molokai Land Trust to complete site visit at Mokuo Preserve
- Conducted stakeholder outreach with Molokai community
- Obtained permission and access to historic bird observation database for Molokai
- Planned and conducted first northshore Molokai seabird survey
- Initiated planning discussions with HI DLNR DOFAW to compile and survey state managed seabird colonies on Kauai
- Initiated planning discussions with DOD to compile existing aerial survey data (Kaula Island) and colony counts for Wedge-tailed Shearwater (WTSW) at PMRF
- Initiated planning discussions and Research Permit Application with Kilauea Point National Wildlife Refuge to complete census for WTSW, Red-tailed Tropicbird, and Red-footed Booby
- Initiated planning discussions with KESRP to support completion of Mokuiaea seabird census, evaluate acoustic data, and summary and acoustic survey results and Na Pali coast acoustic survey results

Progress since spring 2020 has been delayed by the COVID-19 pandemic due to the inability to travel to Hawaii and unavailability of personnel. Field work will need to be rescheduled. Data analysis and development of deliverables will be delayed and the period of performance has been extended. The final report is due in August 2022.

**Publications Completed:** <https://pubs.usgs.gov/ds/1130/ds1130.pdf>

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

#### References:

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- 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 SI. Unpublished data 1983-1989. U.S. Fish and Wildlife Service.
- Grecian WJ, Witt MJ, Attrill MJ, Bearhop S, Godley BJ, Grémillet D, Hamer KC, Votier SC. 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 RL, Pyle P. 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>