

## Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Pacific Marine Assessment Partnership for Protected Species (PacMAPPS) II: Hawaiian Archipelago (PC-23-02a)
Administered by	Pacific OCS Regional Office
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Procurement Type(s)	Interagency Agreement
Conducting Organization(s)	National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Pacific Islands Fisheries Science Center
Total BOEM Cost	\$2,050,000
Performance Period	FY 2023–2026
Final Report Due	Hawaiian Archipelago Report: June 30, 2025 Winter Hawaiian Archipelago Report: September 30, 2026
Date Revised	November 2, 2023
Problem	Up-to-date density estimates for protected species are needed to ensure that environmental assessments are accurate. Prior to PacMAPPS I, these data were several years old.
Intervention	Collaborate with ongoing NMFS efforts to continue to conduct multiple biological surveys to estimate population densities of endangered or threatened marine species and continue to fill spatial and temporal gaps in current survey efforts.
Comparison	Comparisons between the older existing data sets and this new species density and distribution data will inform trends or changes in environmental variables and/or species densities and distributions.
Outcome	Up-to-date assessments, including spatial and temporal distribution, of protected species in areas of the Pacific that are of special interest to BOEM.
Context	Hawaiian Archipelago

BOEM Information Need(s): BOEM Pacific Region continues to assess environmental effects of existing oil and gas development activities and proposed renewable energy facilities using the best available information. For marine mammals, we often rely on stock assessment reports prepared annually by NMFS. Although these reports are prepared annually, the underlying data supporting these reports may be several years old and NMFS' Science Center cruise schedules in the Pacific (Southwest, Northwest, and Pacific Islands Fisheries Science Centers) are not necessarily coordinated across species distributions. Likewise, there is limited information on offshore distribution and use of the Outer Continental Shelf (OCS) by other protected species including seabirds and sea turtles. This study supports a Pacific-wide strategic plan for coordinated protected species assessment surveys and derived site-specific analyses relevant to BOEM's areas of interest.

Background: In 2011, BOEM and NMFS signed a memorandum of understanding whereby both agencies agreed to cooperate and coordinate environmental studies and analyses. Collection and analysis of protected species (marine mammals, seabirds, and sea turtles) data are fundamental needs for both agencies. In 2013, the Marine Mammal Commission recommended that BOEM Pacific Region partner with other state and federal resource agencies, academic institutions, and private researchers to support broad-scale, multi-year, seasonal wildlife surveys. BOEM met with NMFS, U.S. Navy (Navy), and U.S. Fish and Wildlife Service (FWS) representatives from West Coast and Pacific Islands Science Centers and regional offices on March 18, 2016. The objective was to develop a multi-year strategic plan for protected species assessment surveys across the Pacific that would address each agency's information needs. BOEM, Navy, FWS, and NMFS all agreed that the U.S. West Coast (California Current ecosystem) and Hawaiian Archipelago were high-priority areas for protected species survey effort. A white paper arising from the 2016 workshop (<https://www.fisheries.noaa.gov/west-coast/science-data/pacmapps-pacific-marine-assessment-program-protected-species>) described the resulting partnership between our agencies (BOEM, Navy, NMFS) and included a plan (schedule and funding needs) to conduct protected species surveys throughout the North Pacific between 2017 and 2022 and to conduct analyses of these data. That first round of PacMAPPS generated valuable data products (see BOEM 2021; Moore 2021a, 2021b; Oleson 2021a, 2021b). The goal now is to maintain the successful partnership established between our agencies and regions under PacMAPPS, so that we can continue to support ongoing information needs pertaining to accelerating wind energy development planning across the Pacific. To this end, it is time to initiate a new round of protected species surveys and analysis. BOEM's contribution to this effort will help update knowledge about protected species distributions and densities, help fill spatial and temporal gaps from prior survey efforts, and provide important baseline information for eventually evaluating the potential impacts of offshore wind energy development to protected species taxa in the study area.

Objective(s): The purpose of this study is to provide up-to-date assessments, including spatial and temporal distribution, of protected species in areas of the Pacific that are of special interest to BOEM. Specific objectives include:

1. Provide updated estimates of population size and maps of animal density, particularly for marine mammal species.
2. Identify oceanographic conditions that influence protected species distribution.
3. Describe how protected species distribution in the Pacific may shift with changing environmental conditions.
4. Identify geographic features that are associated or interact with key life history elements (e.g., feeding, migration, breeding, and birthing).
5. Evaluate the relative importance of protected species habitat on a scale useful for the evaluation of offshore energy projects in the Pacific.
6. Archive survey data in a system that will allow current data to be compared with past and future efforts.

Collection of data across the range of species' distribution provides context for environmental review of offshore projects. A clear understanding of what drives species' use of marine habitats allows us to describe the relative intensity of interactions between protected species and offshore human activities. Both context and intensity are critical components of National Environmental Policy Act reviews.

Methods: NOAA vessels will conduct long-range visual and acoustic line-transect surveys for protected species and collect oceanographic data in the Hawaiian Archipelago ecosystem in Calendar Year (CY) 2023 (circa Aug–Dec). A second survey effort will be conducted in the Hawaiian Archipelago again, but in winter (to describe animal ecology at that time of year) in CY 2025 (Jan–Mar). The resulting data will be used to support up-to-date stock assessments and derived protected species use and distribution products for areas of interest to BOEM around the Main Hawaiian Islands).

Specific Research Question(s):

1. Where do marine mammals live in the Hawaiian Archipelago?
2. Why do they live there?
3. What factors can we look at to predict future distribution?

Current Status: After ship delays, Leg 1 began on July 22, 2023 and turned out to be more of a shakedown cruise to train NOAA core crew on the science protocols and also to sort out equipment gremlins, like crane hydraulics etc., and ended on July 29, 2023.

Leg 2 of the HICEAS survey began on August 5, 2023, with their last survey day on September 1, 2023. Leg 2 surveyed over 4,800 km of trackline, 90 marine mammal sightings, 115 acoustic detections, and visually identified 15 species. Bryde's whales were the most frequently sighted species, followed by sperm whales and Cuvier's beaked whales. 5,400 photos collected during 43 sightings and 5 biopsy samples from one sighting of bottlenose dolphins. Bird observers tallied 37 species and 4124 individuals during the 29 days, including a lost Mourning Dove that landed on the ship on the last survey day. Ecosystem sampling was hampered by technical difficulties with the main CTD unit, but it was repaired and will be ready for Leg 3.

Leg 3 was briefly delayed, but officially began on September 7, 2023 and ended on October 4, 2023. Having had to face challenging COVID-related issues, the team still managed to survey ~4,000 km of trackline, making 52 sightings of 15 identified species, with sperm and Bryde's whale tying for most frequently sighted (at 6 sightings each), followed by Risso's and Fraser's dolphins (4 sightings each). Highlights include sightings of killer whales and Longman's beaked whales. 84 detections on the towed array, with over half of them of unidentified dolphins. Of those identified to species, sperm whales again came in first (18), followed by Blainville's beaked whales (8), and false killer whales (4). False killer whales are PIFSC highest priority species, only two of the acoustic detections were sighted, and there was unfortunately no opportunity to collect more specific information, such as photo-IDs or biopsy samples. Launched almost 20 sonobuoys, deployed 4 DASBRs, and retrieved 2 of them. Saw roughly 17,000 individuals of 34 different species of birds! 'Ua'u kani (Wedge-Tailed Shearwater) were the most numerous, with over 9,800 individuals (~5,500 were dark morph birds that we would love to know where they're coming from). Short-tailed Shearwaters on their migration south were next, with over 4,000 in the 300 m survey strip. Nunulu (Bonin Petrels) were next with over 830 seen, and 'Ewa'ewa (Sooty Terns) were close behind with almost 800. Then we had everybody's favorite with close to 400 Manu 'A (Boobies), including the super star Red-foots, Browns (with at least 28 of the brewsteri subspecies), Masked, and two Nazcas. Saw about 375 Noio kōhā (Brown Noddies), and Manu o Kū graced us with a wonderful flock as we approached our "Sea and Anchor Detail" outside Pearl Harbor, with close to 250 individuals in the survey strip. 'Ou (Bulwer's Petrels) were more common around Nihoa and Mokumanamana, and we saw close to 90 of them. They were standouts in that they would come incredibly close to the bow and didn't ever seem to avoid the ship! Our luck with 'Iwa (Great Frigatebirds) held throughout the Leg, with over 50 seen. We saw 39 Koa'e 'Ula (Red-tailed) and 11

Koa'e Kea (White-tailed) tropicbirds. Eight different species of Pterodroma petrels were seen. Chocolate Shearwaters, aka 'Ao'u, aka Christmas Shearwater, had a good showing with 36 individuals. There were a few South Polar Skuas and a couple of Long-tailed Jaegers.

Leg 4 began on October 13, 2023 and ended on November 2, 2023. The visual team had a productive Leg 4 with 65 sightings of 5 different species of dolphin (plus a couple unidentified groups), 3 species of blackfish (including false killer whales!), 2 species of baleen whales (plus some unidentified groups), 6 sperm whale groups, 2 dwarf sperm whale groups, 3 beaked whale groups, and. The acoustics team's efforts were also successful. They heard 95 groups altogether, including 31 sperm whale groups, 44 unidentified dolphin groups, 12 of the visually sighted dolphin groups, and a several beaked whales were also detected. We saw just over 2,000 individuals of 39 different species. That's 15,000 less birds than Leg 3 and shows the importance of being at sea over extensive space and time. 'Ua'u kani were once again the most numerous with about 900 individuals, though less than a tenth of what we saw on Leg 3. Some of the decline in numbers is accounted for because adults depart the colonies between September and November. But the greatest difference is between the influx of thousands of birds last leg that have moved on. We look forward to the analysis of the survey's oceanographic conditions to help explain these differences and the potential impact of the current El Niño Southern Oscillation (ENSO). Always a favorite with close to 375 individuals were 'Ā including about 230 Red-foots, 80 Masked, 60 Browns (with over 20 of the brewsteri subspecies), and one Nazca. Overall difference with all 'Ā species between the two legs was about a 15% drop. Nunulu (Bonin Petrels), the Hawaiian Islands local breeder, had a good showing with almost 175 individuals, though that was about 80% less than Leg 3, likely from post breeding dispersal to the western Pacific. There were just over 100 Short-tailed Shearwaters that trickled through on their migration south, a 98% drop from last leg, emphasizing that we were past the peak of their remarkable migration. Even in the distance far to the horizon there were very few going by, nothing like the earlier clouds of constant flocks. 'Ewa'ewa (Sooty Terns) were close behind with just over 90, almost 10% of what we saw on Leg 3. Over one million pairs of 'Ewa'ewa breed in the part of the Papahānaumokuākea Marine National Monument we surveyed this leg. Banding records suggest that populations breeding in Hawai'i disperse primarily toward the southwest Pacific in November to January when numbers are reduced or absent at colonies. We saw about 50 Noio kōhā (Brown Noddies), a 96% drop from last leg. When not breeding they disperse throughout the tropical and subtropical Pacific, usually seen near islands. Almost 30 Manu o Kū (White Terns) were seen and also represented about a 90% drop from Leg 3. In the Northwest Hawaiian Islands they are present at nesting colonies year-round but show a peak in colony attendance and breeding activity in February to August. We saw more than 15 'Iwa (Great Frigatebirds), a 68% drop from the previous leg. They also disperse through the tropical and subtropical Pacific after breeding. Twelve Koa'e 'Ula (Red-tailed Tropicbirds) were about a third of what we saw on Leg 3, they disperse into temperate waters during non-breeding and are virtually absent during November to January. Interestingly, we saw 11 Koa'e Kea (White-tailed Tropicbirds) the exact same number as last leg. They are year-round breeders and don't appear to disperse like so many other species do. Our proximity to Mokumanamana was rewarded with seeing 11 Hinaokū and Manuohina (Blue gray Noddy). Pyle and Pyle (2017) cite "preliminary information indicates peak colony attendance and breeding occurs in December to March, although it appears that breeding can occur at reduced rates year-round, in at least some years". We were in the right place at the right time and saw these birds on a single afternoon. 'Ou (Bulwer's Petrels) showed a 92% drop from Leg 3. We saw less than 10 individuals. The last fledglings leave in September to October, and they are absent or virtually so from Hawaiian waters in November to March. The three 'Ao'u (Christmas Shearwaters) we saw were a 92% drop from Leg 3. Chicks fledge in early fall, and most or all individuals depart Hawaiian waters by early November to winter south and east of Hawai'i. We saw three 'A'o (Newell's Shearwaters), all within about 50 nmi of Kaua'i, close to their nearest breeding colony. This was one less

than Leg 3. Seventeen `Akē`akē (Band-rumped Storm Petrels) and four Ka`upu (Black-footed Albatross) were seen, both the first since Leg 2. The Ka`upu were likely adults returning to breed. A Flesh-footed Shearwater was seen, we typically see a few in the fall. Again we had numerous “winged runners” the elegant Pterodroma petrels, with the same six (five Southern Hemisphere-breeding) species seen. Comparative numbers with Leg 3 in parentheses were Black-winged 67 (also 67), Kermadec 5 (also 5), Mottled 12 (6), `Ua`u (Hawaiian) 6 (2), White-necked 4 (2), and Cook’s 2 (27). Cook’s are the earliest breeders, beginning in October, and were almost absent this leg. The other four Southern Hemisphere breeders begin nesting in November and December. The local `Ua`u young fledge in October to November and this, combined with being closer to their colonies on Kaua`i likely account for the increase in their numbers. One South Polar Skua, two Parasitic Jaegers and the first Pomarine Jaegers (two individuals) for the 2023 survey. Long-tailed were not seen this leg. Almost a constant companion throughout the leg were Kōlea, we saw just over 50 of them. Most were when we were far west and to the south of the Northwest Hawaiian Islands, likely headed deep into the Central and South Pacific. Five species were new to HICEAS 2023. There were 20 `Akihike`ehi`ale (Tristram’s Storm Petrels), 17 Leach’s Storm Petrels, one Wilson’s Storm Petrel, one Tahiti Petrel and last but certainly not least was one Black Merlin, a small falcon of the Pacific Northwest suckleyi subspecies. The ecosystem sampling team performed 3 more tows last night and 3 tows the night before. Last night’s highlight includes a large phyllosome, the larval stage of a lobster. Somehow its thin, flat, transparent body survived the net mostly intact! 45 IK tows, 13 eDNA casts, 10 mālolō, 11 squid.

Leg 5 is scheduled to begin on November 7, 2023.

Publications Completed: None

Affiliated WWW Sites: <https://storymaps.arcgis.com/stories/b3bbf0e90d0141f7bf47edc5339ccb7a>

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