U.S. Navy

MARINE SPECIES MONITORING PROGRAM

2025 ANNUAL REPORT

Pacific

Multi-range-complex marine species monitoring report for:

- *Hawaii-Southern California Training and Testing (HSTT)*
- *Mariana Islands Training and Testing (MITT)*
- *Northwest Training and Testing (NWTT)*
- *Gulf of Alaska Training (GOA)*

April 2026

Multi-range-complex marine species monitoring report for Hawaii-Southern California Training and Testing (HSTT), Mariana Islands Training and Testing (MITT), Northwest Training and Testing (NWTT), and Gulf of Alaska Training (GOA).

Submitted to National Marine Fisheries Service Office of Protected Resources
In accordance with 50 Code of Federal Regulations 216.245(e).

Science ⚓ Stewardship ⚓ Protection

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List of Contributors (Main Document):

Cathy E. Bacon (HDR, Inc.), Andrea Balla-Holden (U.S. Pacific Fleet), Maria A. Carnevale (U.S. Pacific Fleet), Jessica Chen (Naval Facilities Engineering Systems Command, Pacific), Chris Hunt (ManTech, Inc.), Chip Johnson (U.S. Pacific Fleet), James Powell (Naval Facilities Engineering Systems Command, Pacific), Corey Pressley Plakos (Naval Air Systems Command), and Bridget H. Watts (Naval Sea Systems Command).

List of Contributors (Technical Reports) (Alphabetized by Organization):

Robin W. Baird, Daniel M. Barrios, Colin J. Cornforth, James A. Fahlbusch, Annette E. Harnish, Liam D. Hutcheson, Michaela A. Kratofil, Sabre D. Mahaffy, and Mark A. Mohler (Cascadia Research Collective); Holger Klinck, Daniel P. Salisbury, and Irina Tolkova (Cornell University); Tina Yack (EcoSound Bioacoustics, Inc.); Shannon N. Coates, Erin A. Falcone, Erin L. Keene, Brenda K. Rone, and Gregory S. Schorr (Marine Ecology and Telemetry Research); Stephen W. Martin (National Marine Mammal Foundation); Gabriela C. Alongi, Regina A. Guazzo, Tyler A. Helble, E. Elizabeth Henderson, Cameron R. Martin, and Annalee O. Wagner (Naval Information Warfare Center Pacific); Asila Bergman and Dawn M. Grebner (Naval Undersea Warfare Center Division Keyport); Alexandra Carroll, Nancy A. DiMarzio, Karen Dolan, Susan Jarvis, Lauren Moniz, Ron P. Morrissey, and Stephanie Watwood (Naval Undersea Warfare Center Division Newport); Robyn P. Angliss, Catherine L. Berchok, and Jessica L. Crance (National Oceanic and Atmospheric Administration-Alaska Fisheries Science Center); Candice K. Emmons, M. Bradley Hanson, Marla M. Holt, and David D. Huff (National Oceanic and Atmospheric Administration-Northwest Fisheries Science Center); Jonathan B. Armstrong, Hannah S. Barrett, P. Santiago Dominguez-Sánchez, Alyssa Lopez, Hannah L. Sawyer, Kathleen M. Stafford, and Joshua D. Stewart (Oregon State University); Doug Jackson (QEDA Consulting); Simone Baumann-Pickering, Kaitlin E. Frasier, John A. Hildebrand, and Natalie Posdaljian (Scripps Institution of Oceanography); Michael B. Courtney, Hannah J. Myers, and Andrew C. Seitz (University of Alaska, Fairbanks); Lars Bejder, Cody W. Clifton, William Gough, Nicholas J. Hofmann, Susan E. Jones, Nelmarie Landrau-Giovannetti, Aude Pacini, Jana E. Phipps, Ilse Silva-Krott, Sydney M. Traina, and Kristi L. West (University of Hawai'i at Manoa); Danielle Harris (University of St Andrews); Eric K. Braen, Amy S. Kennedy, Brynn M. Kimber, Jessica M. Knoth, Dan Woodrich, Dana Wright, and Alexandre N. Zerbini (University of Washington and National Oceanic and Atmospheric Administration-Alaska Fisheries Science Center); and Laura B. Heironimus, Shaffryn M. Schade, and Matthew T. Sturza (Washington Department of Fish and Wildlife).

Executive Summary

The United States (U.S.) Navy (Navy) conducts training and testing activities in the Pacific region. These activities are described in the Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for each study area: the Hawaii-Southern California Training and Testing (HSTT) (Department of the Navy [DON] 2018a), the Mariana Islands Training and Testing (MITT) (DON 2020a), the Northwest Training and Testing (NWTT) (DON 2020b), and the Gulf of Alaska (GOA) Training (DON 2022a). The Navy training and testing ranges covered by these EISs/OEISs include the Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL), which are part of the HSTT Study Area; the Mariana Islands Range Complex, which is part of the MITT Study Area; and the Northwest Training Range Complex, the Keyport Range Complex, and the Southeast Alaska Acoustic Measurement Facility (SEAFAC), which are part of the NWTT Study Area.

To authorize these actions, the National Marine Fisheries Service issued Final Rules and Letters of Authorization under the Marine Mammal Protection Act to the Commander, U.S. Pacific Fleet, and the Commander, Naval Sea Systems Command, and Biological Opinions under the Endangered Species Act for each training and testing area.

This monitoring report was prepared in accordance with the annual monitoring reporting requirements for the 2025 calendar year (CY) and presents results and progress made during the period of 1 January 2025 to 31 December 2025. This is the Navy's 17th annual monitoring report since the program began in 2008. The marine species monitoring (MSM) described was conducted in accordance with objectives listed on the Navy's MSM Program website:

http://www.navymarinespeciesmonitoring.us/regions/pacific/current-projects/

In this report, monitoring goals for HSTT, MITT, NWTT, and GOA study areas are framed in terms of progress made on question-based scientific objectives and programmatic Intermediate Scientific Objectives (as discussed in **Section 1**). The following list provides brief summaries of key results during 2025, with additional details in **Section 2**. **Section 3** lists the 2026 Monitoring Goals and projects.

Highlights of scientific progress over the course of this reporting period include the following:

- Several projects in the HSTT, MITT, and GOA study areas resulted in peer-reviewed publications or presentations in 2025, including Goose-beaked Whale (*Ziphius cavirostris*) and Fin Whale (*Balaenoptera physalus*) Population Dynamics and Impact Assessment at Southern California Anti-Submarine Warfare Range (SOAR); Southern California Beaked Whale Occurrence; Pacific Missile Range Facility (PMRF) Marine Mammal Acoustic Monitoring; Visual Survey and Tagging of Hawaiian Odontocetes; Estimation of Received Levels of Mid-Frequency Active Sonar (MFAS) and Behavioral Response of Marine Mammals at PMRF; Pacific Islands Comprehensive Stranding Investigations; and Telemetry and Genetic Identity of Chinook Salmon in Alaska (see **Appendix A**).

- With regard to the conceptual framework categories of *occurrence, exposure, response,* and *consequence* (DON 2010), several projects in CY25 demonstrated progress beyond the category for *occurrence* and estimated the *exposure* of animals to MFAS and explosives, assessed

animals' *responses* to underwater noise generated by Navy training and testing activities, and continued to make strides toward assessing any population *consequences* resulting from these activities by investigating population trends.

Navy study area and range-specific progress highlights include the following:

HSTT-HRC

- Acoustic data collection and analysis continued at PMRF. Updates and improvements were made to the localization, tracking, and autogrouping algorithms. Beaked whale detections increased with the deployment of a new recording system, and causes were investigated. Acoustic behavioral responses to Submarine Command Course (SCC) and Sinking Exercises were analyzed.

- The Marine Mammal Monitoring on Navy Ranges (M3R) Program continued to add to their acoustic data collection and held discussions with resource managers about planned future analyses.

- Ten satellite tags were deployed on four odontocete species: short-finned pilot whale (*Globicephala macrorhynchus*), rough-toothed dolphin (*Steno bredanensis*), false killer whale (*Pseudorca crassidens*), and dense-beaked whale (*Mesoplodon densirostris*). All tags successfully transmitted data and at least partially overlapped temporally with Phase A or Phase B of the SCC. Tag data were analyzed for exposure and response to Navy training activity at PMRF. All but one were exposed to hull-mounted sonar, helicopter-dipping sonar, or active sonobuoys, with exposures up to a maximum median received sound level of 159 decibels referenced to 1 microPascal.

- The University of Hawaii (UH) Health and Stranding Lab continued to conduct comprehensive stranding response, necropsy, and cause-of-death investigations, covering 19 stranding events that occurred in CY25 in the Pacific Islands Region. The lab conducted trials of two new techniques to increase capacity to examine human impacts on stranded cetaceans.

- The UH project to advance tagging capabilities in Hawaii resulted in support for 10 biologging field efforts with 95 biologging devices deployed on four species; support advancing the studies of 12 students; and four published peer-reviewed journal articles (three in 2025), one manuscript in review, and eight manuscripts in preparation over the course of the project (2022–2025).

HSTT-SOCAL

- Continued collecting and analyzing passive acoustic monitoring (PAM) data using High-frequency Acoustic Recording Packages deployed at five sites off California from November 2024 to December 2025. This includes a new site off Central California.

- Continued to study the distribution and demographics of beaked whales and fin whales within SOCAL, conducting 18 days of small vessel surveys in SOAR, resulting in 12 sightings of goose-beaked whales with 41 individuals identified and 40 sightings of 69 fin whales. One Sound Motion Recording and Telemetry tag was deployed on a goose-beaked whale, and three satellite tags were deployed on fin whales.

- Conducted four California Cooperative Oceanic Fisheries Investigations cruises between January and November 2025.

- Two manuscripts from a past blue (*Balaenoptera musculus*) and fin whale tagging study were published.

MITT

- PAM recordings off the island of Guam successfully detected, classified, and located beaked whales; results showed goose-beaked whales were the most commonly detected species and occurred almost exclusively at night, while sonar events were rare and detected only during the day. Detection probabilities were derived for goose-beaked whales and Cross Seamount beaked whales. Goose-beaked whale densities were estimated in the same range as other recent reports.

- One manuscript from a past survey was published.

NWTT

- An array of acoustic moorings and PAMs designed to detect both acoustically tagged fishes and vocalizing marine mammals was maintained on the outer coast of Washington State through 2024, and data were analyzed in 2025 for spatiotemporal patterns in detections. The highest detection rates of Chinook salmon (*Oncorhynchus tshawytscha*) generally occurred during spring and summer, while Southern Resident killer whale (*Orcinus orca ater*) detections peaked from July to November.

- In order to characterize the distribution of two distinct populations of green sturgeon (*Acipenser medirostris*) in and near the NWTT Study Area, 174 sturgeon were acoustically tagged between 2020 and 2023 and acoustically tracked moving along the Washington, Oregon, and California coasts as they migrate to spawning habitats within the Sacramento River, with some individuals detected off the coast of British Columbia. Within the offshore portion of the NWTT Study Area, there were no significant differences in residence time between distinct population segments in 2019–2024; however, inconsistent and limited array coverage within the NWTT Study Area limits further analysis within this area.

- Very high-frequency acoustic recorders were deployed at four survey sites within the Dabob Bay Range Complex in 2025 to describe seasonal occurrence and distribution of harbor porpoise

(*Phocoena phocoena*) in Hood Canal, as well as to examine relationships between harbor porpoise click activity and other variables. Analysis has begun and will continue in CY26.

- An acoustic receiver array with 42 elements was deployed 3 nautical miles (nm) offshore of Washington State's Olympic Peninsula, and 30 bull trout (*Salvelinus confluentus*) were tagged with acoustic transmitting tags. One tag was detected by the array 3 nm offshore; however, it exhibited movement patterns inconsistent with typical bull trout behavior and was likely reflecting tag transport by a marine mammal predator. Ten bull trout were detected traveling between rivers but were not detected on the offshore array. This study found that bull trout utilize nearshore coastal habitats as a migratory corridor between coastal river and stream systems but likely stay very close to shore, which corresponds with critical habitat designations for this region.

- Visual surveys were conducted in Behm Canal and Southern Clarence Strait, Alaska, including the SEAFAC Range, in 2024. Estimated group size, abundance, and seasonal densities were derived using line-transect methods for each region of interest for species with a reasonable sample size (approximately 20 or more sightings) across three surveys in 2019, 2023, and 2024. This resulted in estimates for humpback *(Megaptera novaeangliae*), fin, and killer whales (*Orcinus orca*), and harbor and Dall's (*Phocoenoides dalli*) porpoises. PAM via sonobuoys was also conducted on the 2023 and 2024 surveys; analysis completed in 2025 shows killer, humpback, and fin whales were detected primarily in Clarence Strait during the fall 2024 survey.

- A passive acoustic recording package was deployed eight times over the course of a year (February 2023–February 2024) at the SEAFAC site. Analysis completed in 2025 found killer whales, humpback whales, porpoises, and vessel noise were detected in the recordings.

GOA

- Pop-up Satellite Archival Tags were deployed on 16 Chinook salmon near Sand Point, Alaska, and on 24 near Craig, Alaska, to characterize their horizontal and vertical distribution, habitat use, natural mortality of tagged individuals, and occupancy in the Gulf of Alaska. Data from 2020 to 2025 were analyzed, providing reconstructed movement paths, habitat use, depth use, and thermal environments utilized by Chinook salmon. Mortality of tagged salmon was also reported, including predation by endothermic fishes, ectothermic fishes, and marine mammals, as well as unknown causes. Additional tagging efforts are planned for 2026 at Craig, Alaska.

- Three PAM moorings were recovered and redeployed. These recordings will allow investigation into the seasonal occurrence of several species, including North Pacific right whales (*Eubalaena japonica*), killer whales, and beaked whales. Previously archived data are in the process of being collated or analyzed for killer whale occurrence and ecotype and for future use in density modeling. A summer 2026 cruise plan is in development.

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MOVEMENT PATTERNS OF ANADROMOUS BULL TROUT ALONG THE COAST OF WASHINGTON'S OLYMPIC PENINSULA [BARRETT ET AL. 2026]

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Acronyms and Abbreviations

°C	degrees Celsius
AFSC	Alaska Fisheries Science Center
BRS	behavioral response studies
CalCOFI	California Cooperative Oceanic Fisheries Investigations
COD	cause-of-death
CRC	Cascadia Research Collective
CV	coefficient of variation
CY	calendar year
dB re 1µPa	decibel(s) referenced to 1 microPascal
DNA	deoxyribonucleic acid
DON	Department of the Navy
DPS	Distinct Population Segment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FDM	Farallon de Medinilla
FY	fiscal year
GOA	Gulf of Alaska
GVP	group vocal period
HARP	High-frequency Acoustic Recording Package
hr	hour(s)
HRC	Hawaii Range Complex
HSTT	Hawaii-Southern California Training and Testing
Hz	Hertz
ICMP	Integrated Comprehensive Monitoring Program
ISO	Intermediate Scientific Objective(s)
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
LIMPET	Low Impact Minimally Percutaneous Electronic Transmitter
LOA	Letters of Authorization
M3R	Marine Mammal Monitoring on Navy Ranges
MarEcoTel	Marine Ecology and Telemetry Research
MFAS	mid-frequency active sonar
min	minute(s)
MIRC	Mariana Islands Range Complex
MITT	Mariana Islands Training and Testing
MMPA	Marine Mammal Protection Act
MSM	marine species monitoring
Navy	United States Navy
nDPS	northern distinct population segment
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWTRC	Northwest Training Range Complex
NWTT	Northwest Training and Testing
OEIS	Overseas Environmental Impact Statement
PACMAPPS	Pacific Marine Assessment Program for Protected Species
PAM	passive acoustic monitoring
Photo-ID	photo-identification
PMRF	Pacific Missile Range Facility
PSAT	Pop-up Satellite Archival Tag
RIMPAC	Rim of the Pacific Exercise
RL	received level
SCC	Submarine Command Course
sDPS	southern distinct population segment
SEAFAC	Southeast Alaska Acoustic Measurement Facility
SINKEX	Sinking Exercises
SMRT	Sound Motion Recording and Telemetry
SOAR	Southern California Offshore Anti-Submarine Warfare Range
SOCAL	Southern California Range Complex
SRKW	Southern Resident Killer Whale
TMAA	Temporary Maritime Activities Area
U.S.	United States
UH	University of Hawaii
VHF	very high-frequency
WARP	Whale Acoustic Reconnaissance Project
WMA	Western Maneuver Area

1 Introduction

The United States (U.S.) Navy (Navy) conducts training and testing activities in the Pacific region. These activities are described in the Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for each study area: the Hawaii-Southern California Training and Testing (HSTT) (Department of the Navy [DON] 2018a), the Mariana Islands Training and Testing (MITT) (DON 2020a), the Northwest Training and Testing (NWTT) (DON 2020b), and the Gulf of Alaska (GOA) Training (DON 2022a).

The Navy training and testing ranges covered by these EISs/OEISs include the Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL), which are part of the HSTT Study Area; the Mariana Islands Range Complex (MIRC), which is part of the MITT Study Area; and the Northwest Training Range Complex (NWTRC), the Keyport Range Complex, and the Southeast Alaska Acoustic Measurement Facility (SEAFAC), which are part of the NWTT Study Area.

To authorize these actions, the National Marine Fisheries Service (NMFS), under the Marine Mammal Protection Act (MMPA), issued (1) Final Rules for HSTT (NMFS 2025a), MITT (NMFS 2020g), NWTT (NMFS 2020d), and GOA (NMFS 2023a); (2) Letters of Authorization (LOA) under the MMPA to Commander, U.S. Pacific Fleet and Commander, Naval Sea Systems Command for HSTT (NMFS 2025b, 2025c), MITT (NMFS 2020f), NWTT (NMFS 2020b, 2020c), and GOA (NMFS 2023b); (3) and Biological Opinions under the Endangered Species Act (ESA) for HSTT (NMFS 2020h, 2024), MITT (NMFS 2020e), NWTT (NMFS 2020a), and the GOA (NMFS 2022).

The regulations issued with the Final Rules for HSTT, MITT, NWTT, and GOA require the Navy to submit an annual monitoring report, as specified at 50 Code of Federal Regulations § 218.75(d) (HSTT), § 218.95(d) (MITT), § 218.145(d) (NWTT), and § 218.155(f) (GOA). Monitoring results from all Pacific Navy study areas (i.e., HRC, SOCAL, MIRC, NWTRC, SEAFAC, and GOA) are treated in this report in an integrated fashion to allow comparison across ranges and a cumulative view of progress made on monitoring goals across ranges. This report is the tenth such "Multi-Range"-Complex Annual Monitoring Report (see DON 2016, 2017, 2018b, 2019, 2020c, 2021, 2022b, 2023, 2024, 2025). Results from this report are intended to iteratively inform future cycles of the Integrated Comprehensive Monitoring Program (ICMP), Adaptive Management Review, and Strategic Planning Processes as well as provide a comprehensive view of marine species monitoring (MSM) within the Pacific Ocean during the 2025 reporting period. Additional information about the ICMP and Strategic Planning Process is available on the Navy's MSM Program website at:

https://www.navymarinespeciesmonitoring.us/reading-room/program-workshop/

Prior-year reports and associated publications are available on the Navy's MSM Program website at:

https://www.navymarinespeciesmonitoring.us/reporting/pacific/

This monitoring report was prepared in accordance with the annual monitoring reporting requirements and presents results and progress made during the period from 1 January 2025 to 31 December 2025, with some variation in the reporting period of individual technical reports.

Marine species monitoring was conducted in accordance with project objectives listed on the Navy's MSM Program website at:

http://www.navymarinespeciesmonitoring.us/regions/pacific/current-projects/

Section 2 of this report summarizes monitoring goals and accomplishments reported in 2025. Detailed technical reports for the individual MSM projects are provided as supporting documents to this report (Baird et al. 2025; Barrett et al. 2026; Bejder et al. 2025; Berchok et al. 2026; Bergman and Grebner 2026; Courtney and Seitz 2026; Dolan et al. 2026; Henderson et al. 2026; Klinck et al. 2026; Martin et al. 2026; Posdaljian et al. 2026; Schorr et al. 2026; Stewart et al. 2026; Sturza et al. 2026; West et al. 2026; and Zerbini et al. 2026). See page vii for a list of reports.

Section 3 of this report summarizes monitoring projects for the next year—2026.

Appendix A provides a list of 2025 publications and conference presentations from Navy-funded monitoring by author's last name.

2 Marine Species Monitoring in the Pacific Ocean – 2025 Goals and Implementation

The Navy training and testing ranges within the Pacific Ocean are located within the HSTT Study Area, MITT Study Area, NWTT Study Area, and GOA Study Area. The study areas vary in terms of monitoring goals implemented for protected marine species, including marine mammals, sea turtles, and ESA-listed fishes, in support of each study area's MMPA and ESA requirements (NMFS 2020a, 2020b, 2020c, 2020d, 2020e, 2020f, 2020g, 2020h, 2022, 2023a, 2023b, 2024, 2025a, 2025b, 2025c).

Figure 1 provides an overview of all Navy MSM projects and goals across all the Pacific training and testing areas. **Figure 1** shows the distribution of monitoring goals and questions with respect to monitoring projects and Conceptual Framework Categories (i.e., *occurrence, exposure, response,* and *consequences*) (DON 2010) as well as illustrates which Intermediate Scientific Objectives (ISOs) are addressed by each monitoring project.

Current monitoring goals are framed in terms of progress made on scientific monitoring questions and are shown paired with accomplishments in **Table 1**. Project accomplishments are shown for the current year (2025). Readers may refer to previous Navy MSM Program Annual Reports (DON 2016, 2017, 2018b, 2019, 2020c, 2021, 2022b, 2023, 2024, 2025) for project accomplishments from previous years.

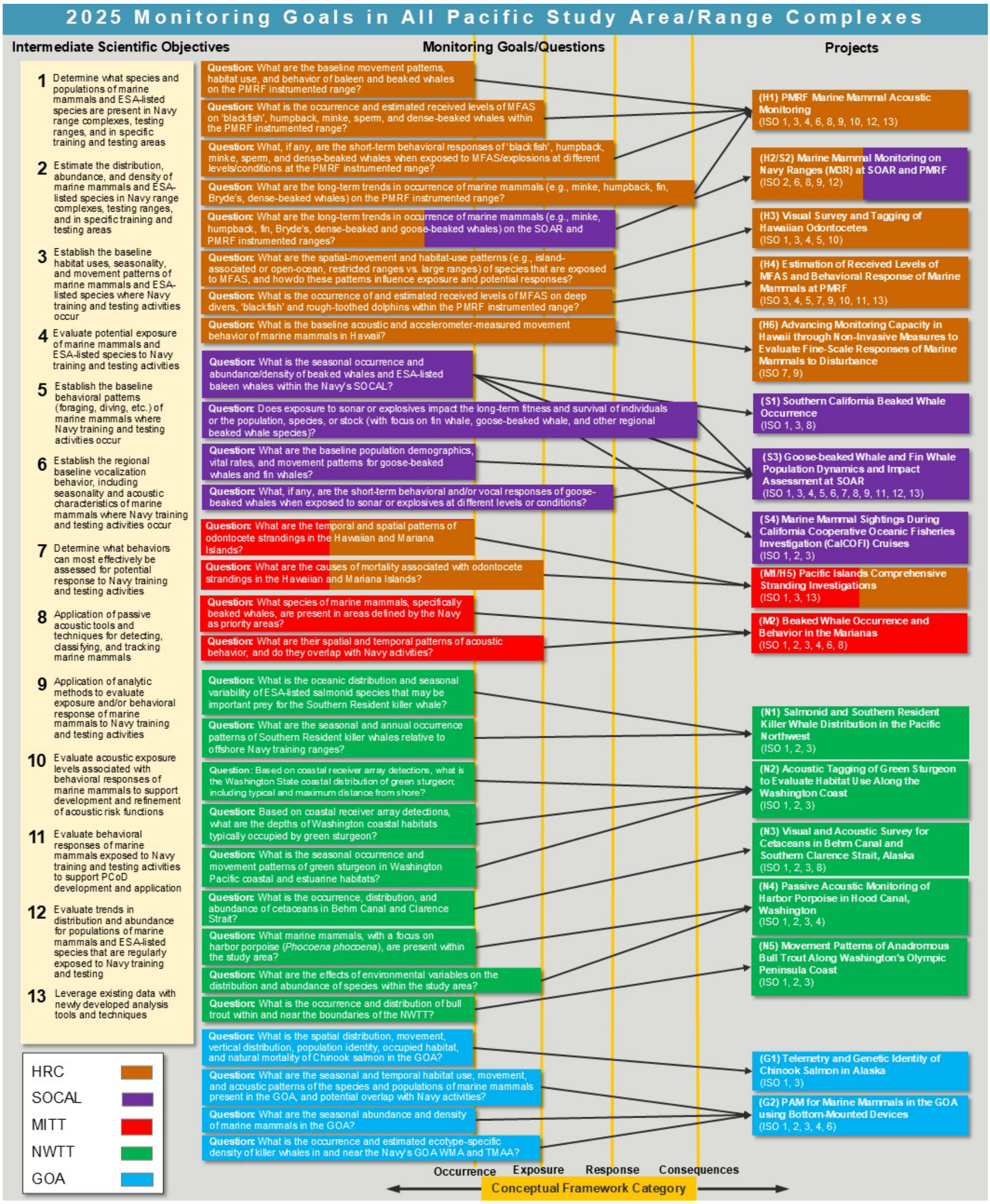

Figure 1. 2025 Monitoring goals/questions in all Pacific study areas/range complexes by project. Study Area color under Projects indicates fieldwork location and under Monitoring Goals/Questions indicates where the questions are being addressed.

Table 1. Monitoring questions and accomplishments for U.S. Navy study areas in 2025.

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
HRC			
[H1] PMRF Marine Mammal Acoustic Monitoring (Martin et al. 2026)	Occurrence, Exposure, Response, Consequences	• What is the occurrence and estimated received levels of MFAS on 'blackfish', humpback, minke, sperm, and dense-beaked whales within the PMRF instrumented range? • What, if any, are the short-term behavioral responses of 'blackfish,' humpback, minke, sperm, and dense-beaked whales when exposed to MFAS/explosions at different levels/conditions at PMRF instrumented range? • What are the baseline movement patterns, habitat use, and behavior of baleen and beaked whales on the PMRF instrumented range? • What are the long-term trends in occurrence of marine mammals (e.g., minke, humpback, fin, Bryde's, dense-beaked) on the PMRF instrumented range?	In 2025: • Raw acoustic data from 63 bottom-mounted hydrophones at PMRF were recorded at a sampling rate of 96 kHz. 5,200.6 hr of new data were collected and analyzed from September 2024 to August 2025 for FY25. • The Baseline 5 code base was finalized, which involved formalizing improvements to the localization, tracking, and autogrouping algorithms; switching to a kernel-matching based beaked whale detector; and refining the snapshot metrics used to measure tracked species. • Beaked whale acoustic detection rates increased in 2021, concurrent with the deployment of the new WARP recording system at PMRF. Causes for this increase were investigated and were due partially to changes to the data acquisition system and an overall increase in the amount of data being recorded, which may better capture the species' maximum presence on the range. • Abundance results for baleen whales from September 2024 through August 2025 are presented using the mean number of whale tracks present in 2.5-min snapshots per hr and for each month using the new analysis method that includes data with zero detections, so the mean number of tracks is lower than has been reported in prior years. Automatically detected and localized blue whale calls were manually verified in December and January; as in previous years, these included both northwestern Pacific and northeastern Pacific B blue whale vocalizations, as well as an additional 54-Hz tonal. In previous years this was tentatively attributed to the Watkin's (or 52 Hz) whale, but additional features noted this year suggest it is a distinct type of tonal signal. In addition, for the first time, blue whale D-call downsweeps were detected at PMRF in January. • Abundance results of odontocetes from September 2024 to August 2025 included dense-beaked whales, goose-beaked whales, Cross Seamount beaked whales, tropical bottlenose whales (*Indopacetus pacificus*), killer whales, and sperm whales (*Physeter macrocephalus*). The highest group vocal period (GVP) rates for a full month of data for each beaked whale species were 3.0 GVPs/hr in July for dense-beaked whales; 0.3 GVPs/hr in June for goose-beaked whales; 0.3 GVPs/hr in December for Cross Seamount beaked whales; and 0.3 GVPs/hr in November for tropical bottlenose whales. Killer whales were detected throughout the available FY25 data, and eight manually validated groups occurred. The highest mean number of sperm whale tracks in all 2.5-min snapshots in a month was 0.08 in December. • During the February 2025 SCC, a total of four acoustically tracked whales were exposed to MFAS. One sperm whale was exposed to surface ship MFAS, and two minke whales and one humpback whale were exposed to both surface ship and sonobuoy MFAS. Median RLs were estimated using propagation modeling over a three-dimensional area around each animal's location along their tracks. The highest median estimated RL for all four whales were from the surface ship exposures; these ranged from 122 dB re 1 µPa for one of the minke whales to 152 dB re 1 µPa for the humpback whale. The RL for the sonobuoys were much lower, with median RL ranging between 92 and 99 dB re 1 µPa. No changes in movement behavior along their tracks were noted for any of the animals; all animals maintained their headings throughout their exposure periods. • Group foraging dive rates for all beaked whale species were analyzed before, during, and after the February and August 2025 SCCs. During both SCCs, rates of GVPs/hr decreased for dense-beaked, goose-beaked, and Cross Seamount beaked whales from Before to Phase A and/or the Interphase. For both dense-beaked and goose-beaked whales, the GVP/hr rates decreased further during Phase B but increased again After the SCC and returned to normal rates in the following month, at least in March (as the data from September following the August SCC was not available for this report). This pattern was true for Cross Seamount beaked whales in February as well, but in August their GVP rate increased in Phase B and doubled in the After phase to almost their highest rate of the year. Tropical bottlenose whales had no detections in February and had very low rates Before the August SCC, which increased slightly during Phase A, and then there were no further detections for the remainder of August. • The two RIMPAC SINKEX exercises that occurred near the PMRF range in July 2024 were analyzed to assess 1) how far down range the different event sounds propagated and 2) whether any noticeable acoustic or possible movement effects occurred in any odontocete species that were on the range at the time. While some possible vocal responses were detected, with both increased and decreased vocalizations following different events, both sperm whales and delphinids continued to be detected throughout the SINKEX, with one or more groups of delphinids appearing to cross the range. The sounds of most events propagated long distances (64–83 km), but there were some interaction effects with bottom topography that blocked some sound transmissions from propagating. • Published three manuscripts in *Frontiers in Marine Science,* "Twelve years of fin whale song evolution in the central North Pacific" (Helble et al. 2025); *Movement Ecology,* "Exposure and response of satellite-tagged Blainville's beaked whales to mid-frequency active sonar off Kaua'i, Hawaii" (Henderson et al. 2025); and *Marine Mammal Science,* "First at-sea identifications of ginkgo-toothed beaked whale *(Mesoplodon ginkgodens*): acoustics, genetics, and biological observations off Baja, California, Mexico" (Henderson et al. 2025). • Presented results at the 7th International Conference on the Effects of Aquatic Noise on Marine Life in Prague in June–July 2025.

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
HRC (continued)			
[H2/S2] Marine Mammal Monitoring on Navy Ranges (M3R) at SOAR and PMRF (Dolan et al. 2026) This project is also linked to Projects **[H3]** and **[S3]**.	Occurrence, Exposure, Response	• What are the long-term trends in occurrence of marine mammals (e.g., minke, humpback, fin, Bryde's, dense-beaked and goose-beaked whales) on the PMRF and SOAR instrumented ranges?	In 2025: • Conducted two real-time monitoring efforts at SOAR (January and November 2025) in collaboration with MarEcoTel (see **Project [S3]**); logged 215 acoustic detections; and directed MarEcoTel to animals of interest for 26 of the detections, leading to 11 visual verifications, including eight goose-beaked whale, one fin whale, one Pacific white-sided dolphin, and one long-beaked common dolphin sightings. • Conducted one real-time monitoring effort at PMRF (in February 2025) with CRC (see **Project [H3]**), logged 197 acoustic detections, and directed CRC to 39 of the detections, leading to 16 visual verifications, including two sightings of dense-beaked whales, six short-finned pilot whales, six rough-toothed dolphins, one melon-headed whale, and one false killer whale sighting. • Collected and processed over 223 days of archive data and 107 hr of broadband recordings at SOAR up to November 2025. • Collected and processed 187 days of archive and 74.2 hr of broadband recordings from PMRF up to September 2025.
[H3] Visual Survey and Tagging of Hawaiian Odontocetes (Baird et al. 2025) Tag telemetry data collected was also used in Project **[H4]**. This project is also linked to Project **[H2].** [This project was formerly titled "Odontocete Studies on PMRF"]	Occurrence, Exposure, Response	• What are the spatial-movement and habitat-use patterns (e.g., island-associated or open-ocean, restricted ranges vs. large ranges) of species that are exposed to MFAS, and how do these patterns influence exposure and potential responses?	In 2025: • Conducted a 9-day survey at PMRF in February 2025, including over 66 survey hr and had 54 encounters with 11 species of cetaceans and one brief sighting of an unidentified delphinid. • 19 sightings (35%) were cued by analysts interpreting acoustic detections from the PMRF range hydrophones (see **Project [H2]**). • 26,107 photos for species and individual identification, two environmental DNA samples, two fecal samples, one breath sample, and five biopsy samples were taken. • Deployed a total of 10 satellite tags on four different species: four short-finned pilot whales (from three different groups), three rough-toothed dolphins, two false killer whales, and one Blainville's beaked whale, and all successfully transmitted location and behavior data. • Six of the tag deployments overlapped temporally with Phase A of the SCC, and all ten overlapped temporally with Phase B. • Fin whales were sighted for the second time off Kauai in CRC's 17-year history and were the first mother-calf pair encountered in the Hawaiian Islands. • Blainville's beaked whales were encountered three times, a substantial increase from the 10 total sightings in previous years, with one individual in the first two encounters matched to the long-term photo-ID catalog for the species, and no matches between encounters. • Northwestern Hawaiian Island false killer whales were sighted for the 7th time with individuals matched to the existing photo-ID catalog. • Pygmy killer whales were sighted for the 5th time off Kaua'i, with no individuals matched to the existing photo-ID catalog, further supporting previous evidence that pygmy killer whales off Kaua'i are not part of a resident, island-associated population. • Published three manuscripts in *Endangered Species Research*, "Accounting for sampling bias reveals a decline in abundance of endangered false killer whales in the main Hawaiian Islands" (Badger et al. 2025); *Marine Mammal Science*, "Variation in social structure among multiple stocks of island-associated common bottlenose dolphins (*Tursiops truncatus*) in Hawaiian waters" (Corsi et al. 2026); and *Marine Mammal Science,* "Deriving probabilistic age estimates using common photo-identification catalog information: an application to endangered Hawaiian false killer whales (*Pseudorca crassidens*)" (Kratofil et al. 2026). • Submitted four manuscripts to: *Molecular Ecology Resources,* "Epigenetic age estimation for Hawaiian false killer whales (*Pseudorca crassidens*) in the absence of 'known-age' individuals" (Martien et al. submitted); *Marine Mammal Science*, "Social life in the deep: variation in network structure and association patterns of rough-toothed dolphins (*Steno bredanensis*) around the main Hawaiian Islands" (Corsi et al. submitted); *Marine Mammal Science*, "Diving behavior of common bottlenose dolphins around the main Hawaiian Islands: individual variation and responses to diel and lunar cycles" (Harnish et al. submitted); and *Movement Ecology*, "Ecological contexts of diving behavior in Hawaiian false killer whales" (Kratofil et al. submitted). • Data contributed to one master's thesis and one doctoral dissertation in 2025 by University of Hawaii students.

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
HRC (continued)			
[H4] Estimation of Received Levels of MFAS and Behavioral Response of Marine Mammals at PMRF (Henderson et al. 2026) Data used in this project were collected from Projects **[H1]** and **[H3].**	Occurrence, Exposure, Response	• What is the occurrence of and estimated received levels of MFAS on deep divers, 'blackfish' and rough-toothed dolphins within the PMRF instrumented range?	In 2025: • 10 tags were deployed on four species during the February 2025 survey (see **Project** [**H3**]). • All four tagged pilot whales were matched to previously photo-identified individuals. One was identified as a member of the western community of pilot whales, and the second is likely a member. A third individual was previously considered a member of the central community but is now being reconsidered due to its association with other individuals. The fourth individual is unclassified. • All three tagged rough-toothed dolphins are considered members of the Kauai/Niihau population. • The tagged dense-beaked whale was not in the photo-ID catalog and therefore had an unknown population assignment. • Both tagged false killer whales belonged to the Northwestern Hawaiian Island population. • RLs were estimated for nine of the 10 individuals from three sources, including helicopter-dipping sonar, active sonobuoys, and hull-mounted sonar from two source types. • Highest median RLs ranged from below ambient noise levels to 159 ± 5 dB re 1 µPa from ship MFAS at a rough-toothed dolphin. Generally, hull-mounted sonar was received at the highest levels with helicopter-dipping sonar at lower levels and active sonobuoys at the quietest levels. • Dive rates and surface time percentages varied across SCC phases, species, individuals, and times of day, with no apparent consistent relationships across tagged individuals with SCC phase when sufficient data were available for analysis. • Differences in dive rates and surface time across SCC phases were not statistically tested, due to the nature of how these values were calculated. No statistically significant differences in dive depth or duration were detected among dawn dive behavior records for any tagged individual. • During the daytime, statistically significant differences in dive depth and duration were detected for three of the tagged pilot whales, GmTag260, GmTag261, and GmTag262. The nature of the differences in daytime dive depth and duration between SCC phases were not always consistent between the three individuals, an effect likely driven by differences in movement patterns relative to PMRF, as well as group behavior. • Submitted a book chapter, "A Review of the Long-Term Study of Resident Odontocetes off Kaua'i and Ni'ihau and the Analysis of Exposures to Mid-Frequency Active Sonar" (Henderson et al. submitted).
[H5/M1] Pacific Islands Comprehensive Stranding Investigations (West et al. 2026)	Occurrence, Exposure	• What are the temporal and spatial patterns of odontocete strandings in the Hawaiian and Mariana Islands? • What are the causes of mortality associated with odontocete strandings in the Hawaiian and Mariana Islands?	*See Project M1/H5 (below, in MITT)*
[H6] Advancing Monitoring Capacity in Hawaii through Non-Invasive Measures to Evaluate Fine-Scale Responses of Marine Mammals to Disturbance (Bejder et al. 2025)	Response	• What is the baseline acoustic and accelerometer-measured movement behavior of marine mammals in Hawaii?	In 2025: • Supported 10 biologging field efforts in Hawaii and Alaska over the course of the project (2022–2025). Projects deployed biologging devices 95 times on humpback whales, short-finned pilot whales, false killer whales, and a Hawaiian monk seal. • Monitoring capacity support and expertise provided under this project advanced the studies of 12 students, including 10 graduate and two undergraduate projects. • Established a section of the lab for tag setup, calibration, diagnostics, and data processing. A network-attached server and a cloud-synced backup system were set up for data storage, transfer, and backup. • Contributed to four published peer-reviewed journal articles, one manuscript in review, and eight manuscripts in preparation over the course of the project. • Published three manuscripts in *Journal of Experimental Biology,* "Daily energetic expenditure and energy consumption of short-finned pilot whales" (Gough et al. 2025); *Royal Society Open Science*, "Acoustic behaviour of endangered Hawaiian false killer whales" (Madrigal et al. 2026); and *Journal of Experimental Science*, "The key to bubble-net feeding: how humpback whale morphology functionally differs from other baleen whales" (Nemeth et al. 2025).

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
SOCAL			
[S1] Southern California Beaked Whale Occurrence (Posdaljian et al. 2026) Additional results from this project data reported in Project **[S4].**	Occurrence	• What is the seasonal occurrence and abundance/density of beaked whales and ESA-listed baleen whales within the Navy's SOCAL?	In 2025: • Conducted PAM with HARPs from November 2024 to December 2025 at five locations (four in SOCAL and one in Morro Bay, central California). • Shifted focus from annual presence/absence analyses to scientific publications. • Published three manuscripts in *Scientific Reports*, "Long-term monitoring of *Ziphius cavirostris* behavior using 3D tracking from fixed hydrophone arrays off Southern California" (Baggett et al. 2025); *Marine Ecology Progress Series*, "Seasonal changes in physical oceanography modulate cetacean predator-prey dynamics in the San Diego Trough" (Bloom et al. 2025); and *The Journal of the Acoustical Society of America*, "Climatic and economic fluctuations revealed by decadal ocean soundscapes" (ZoBell et al. 2025). • Presented results at three conferences—Meeting of the Acoustical Society of America in Honolulu, Hawaii; Humpback Whale World Congress in Tadoussac, Quebec; and International Bioacoustics Congress in Kerteminde, Denmark. • Data contributed to one master's thesis completed in 2025 and two International Baccalaureate reports. • Additional results reported under **Project [S4]**.
[S2/H2] Marine Mammal Monitoring on Navy Ranges (M3R) at SOAR and PMRF (Dolan et al. 2026) This project is also linked to project **[S3]**.	Occurrence, Exposure, Response	• What are the long-term trends in occurrence of marine mammals (e.g., minke, humpback, fin, Bryde's, dense-beaked and goose-beaked whales) on the PMRF and SOAR instrumented ranges?	*See Project H2 (above, in HRC)*
[S3] Goose-beaked Whale and Fin Whale Surveys at the Southern California Offshore Anti-submarine Warfare Range (SOAR) (Schorr et al. 2026) This project is also linked to Project **[S2/H2]**.	Occurrence, Exposure, Response, Consequences	• What are the baseline population demographics, vital rates, and movement patterns for goose-beaked whales and fin whales? • What, if any, are the short-term behavioral and/or vocal responses of goose-beaked whales when exposed to sonar or explosives at different levels or conditions? • What is the seasonal occurrence and abundance/density of beaked whales and ESA-listed baleen whales within the Navy's SOCAL? • Does exposure to sonar or explosives impact the long-term fitness and survival of individuals or the population, species, or stock (with focus on fin whale, goose-beaked whale, and other regional beaked whale species)?	In 2025: • Conducted 18 boat days of survey effort during January, February, March, April, and November 2025. 95 sightings of 11 different cetacean species occurred, including 12 sightings totaling 41 individual goose-beaked whales and 40 sightings of 69 individual fin whales. • Deployed one SMRT tag on a goose-beaked whale in January and collected a tissue sample from the tag. • Deployed three SPLASH10-A tags on fin whales in March and April and collected a single biopsy sample. • Collected photogrammetry data, including an estimated 30 goose-beaked and 25 fin whales, and processed collected photo-ID data. • Non-focal species encountered included minke whales, gray whales, humpback whales, Risso's dolphins, long- and short-beaked common dolphins, northern right whale dolphins, Pacific white-sided dolphins, and bottlenose dolphins. • Analyzed data from six SMRT tags deployed on goose-beaked whales in 2024 and 2025 for dive metrics. • Published three manuscripts in *Journal of Cetacean Research and Management,* "Visual assessment of LIMPET tag site healing in Cuvier's beaked whales and fin whales" (Keene et al. 2025); *Experimental Physiology,* "Modelling the effect of varying metabolic rate and cardiac output on estimated tissue and blood O_2 and CO_2 levels in an extreme deep diver, the goose-beaked whale (*Ziphius cavirostris*)" (Fahlman et al. 2025); and *Marine Mammal Science,* "A comparison of diving behavior of goose-beaked and dense-beaked whales from tagging studies in multiple ocean basins" (Barlow et al. 2025). • Submitted a manuscript to *Movement Ecology*, "Assessment of goose-beaked whale responses to mid-frequency active sonar using a hierarchical hidden Markov model" (DeRuiter et al. submitted).

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
SOCAL (continued)			
[S4] Marine Mammal Sightings During CalCOFI Cruises (Posdaljian et al. 2026) Additional results from this project data reported in Project **[S1]**. [This project was formerly titled "Marine Mammal Sightings during CalCOFI Cruises" from 2004–2017].	Occurrence	• What is the seasonal occurrence and abundance/density of marine mammals and ESA-listed baleen whales within the Navy's SOCAL?	In 2025: • Four CalCOFI cruises were conducted between January and November 2025 and included a total of 83 days at sea. • Data from CalCOFI cruises continues to be used for derivation of select marine mammal densities. • Results from collected data will be published in peer-reviewed journals in the future. See **Project [S1]** for manuscripts published in 2025, which may include data from CalCOFI efforts.
MITT			
[M1/H5] Pacific Islands Comprehensive Stranding Investigations (West et al. 2026)	Occurrence, Exposure	• What are the temporal and spatial patterns of odontocete strandings in the Hawaiian and Mariana Islands? • What are the causes of mortality associated with odontocete strandings in the Hawaiian and Mariana Islands?	In 2025: • Stranding response, necropsy, and COD investigative summaries were provided for 19 stranding events during CY25 in which specimen samples were given a unique specimen identification number that allows for long-term tracking of any analyses within the UH Health and Stranding Lab, in addition to responses mounted for confirmed stranding events where no samples were collected and no identification number was assigned. • Responded to stranding events on Kaua'i (1), Maui (3), O'ahu (10), and Midway Atoll (4) for seven species, including the first recorded stranding of a Bryde's whale in Hawaiian waters. • Missed an opportunity to conduct both a COD investigation and to provide hands-on necropsy training in Saipan for a short-finned pilot whale stranded on 11 November 2025, during the 2025 U.S. government shutdown. Responders in Saipan notified NOAA, but partners at the Division of Fish and Wildlife at the Commonwealth of the Northern Mariana Islands did not receive a response, and the animal was disposed of in a landfill. The Health and Stranding Lab learned of the stranding event after disposal. • Developed a modified ultrasonic extraction protocol to reliably quantify lipid percentage during contaminant extraction from stranded cetaceans to support in-house contaminant analysis (e.g., persistent organic pollutants). • 10 pygmy sperm whale and one goose-beaked whale tooth specimens were prepared for tooth aging. The preliminary age estimate for one of the pygmy sperm whales was 13 years, and the goose-beaked whale was a minimum of 35 years old. • Initiated investigations into the presence of microplastics in tissues of stranded cetaceans, with an initial focus on blubber and reproductive organs (testis), using selected matched tissue samples from the three adult male short-finned pilot whales with documented macroplastic ingestion and for which marine debris items had been previously characterized (see submitted manuscript below). Preliminary results indicate the presence of microplastics in a sample from a pilot whale with substantial plastic debris in the stomach, suggesting the experimental approach is effective. • Began development of hybrid capture-based enrichment, a novel next generation sequencing method for viral discovery that is expected to lead to detection of yet-unknown virus sequences in tissue samples. • Conducted experimental trials to further the development of laboratory research protocols to reliably measure fecal hormone concentrations in cetaceans, conducting technical validations for the reproductive hormone testosterone for false killer whales and pygmy sperm whales. • Published two manuscripts in *Journal of Wildlife Diseases*, "Detection of *Brucella ceti* and *Brucella*-associated disease in stranded cetaceans in Hawaii, USA, 2000–24" (Silva-Krott et al. 2025); and *Diseases of Aquatic Organisms*, "Pacific Island cetaceans: a review of strandings from 2006–2024" (West et al. 2025). • Submitted a manuscript to Marine Pollution Bulletin, "Characterization of macroplastics ingested by 23% of stranded short-finned pilot whales (*Globicephala macrorhynchus*) in the main Hawaiian Islands (2010-2023)" (Phipps et al. in review).

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
MITT (continued)			
[M2] Beaked Whale Occurrence and Behavior in the Marianas (Klinck et al. 2026)	Occurrence, Exposure	• What species of marine mammals, specifically beaked whales, are present in areas defined by the Navy as priority areas? • What are their spatial and temporal patterns of acoustic behavior and do they overlap with Navy activities?	In 2025: • Analyzed data from six Rockhopper PAM units deployed off the west coast of Guam from 7 March through 4 September 2024. • A total of 192 beaked whale encounters were registered across the two sites (up from 132 in the 2022 survey [Klinck et al. 2024]). • Goose-beaked whales comprised 115 encounters (down from 122 in 2022) and occurred almost exclusively at night. The density of goose-beaked whales was estimated by applying a Spatial Capture Recapture framework. Average densities ranged from 1.48 animals per 1,000 km^2 (CV: 8.99%) in August 2024 to 11.64 animals per 1,000 km^2 (CV: 7.01%) in March 2024. These numbers fall within the same range as those reported for the 2022 survey. • There was a significant increase in Cross Seamount beaked whale detections compared to the 2022 survey. A total of 70 encounters were registered across the two sites, with detections predominantly occurring during daylight hours, indicating niche partitioning with goose-beaked whales. While a detection probability function was derived for Cross Seamount beaked whales, densities could not be estimated due to a lack of auxiliary information (e.g., group size). • Sonar activity was low, with only two brief (3–4 hr) MFAS encounters observed, with direction-of-arrival analysis indicating that signals came from due west of the deployment site. There were no beaked whale detections close in time to the MFAS events, although it is important to note that detection ranges for both signal types differ greatly.
NWTT			
[N1] Salmonid and Southern Resident Killer Whale Distribution in the Pacific Northwest (Stewart et al. 2026) This project is linked to Project **[N5]**. [SRKW focus 2014–2018; 2018–2022 focus on killer whale prey (ESA-listed salmonids); 2023–2025 combined effort]. [This project was formerly titled "Distribution of Southern Resident Killer Whales and their Prey in the Pacific Northwest"].	Occurrence	• What are the seasonal and annual occurrence patterns of Southern Resident killer whales relative to offshore Navy training ranges? • What is the oceanic distribution and seasonal variability of ESA-listed salmonid species that may be important prey for the Southern Resident killer whale?	In 2025: • Analyzed data collected from 2018 to 2024 from a coordinated acoustic monitoring program conducted along the outer coast of Washington State to quantify the spatial and seasonal occurrence of SRKW and acoustically tagged Chinook salmon. The monitoring network consisted of PAM and acoustic tag detectors deployed from the mouth of the Columbia River to Cape Flattery, with additional offshore coverage west of the Strait of Juan de Fuca. Array design and sampling intensity varied across years in response to evolving research objectives, but near-continuous coverage of the Washington coast was maintained throughout the study period. • Between 2019 and 2024, the Chinook salmon telemetry program collected 101,026 receiver-days of effort. A total of 498 Chinook salmon were acoustically tagged in Alaska and along the U.S. West Coast, of which 238 individuals were detected on the Washington coast array, resulting in 4,269 daily detection events. • Tagged salmon represented multiple genetic stock aggregates, with Interior Ocean-type Chinook comprising the largest proportion of detections. • The highest detection rates of Chinook salmon generally occurred during spring and summer. Chinook exhibited elevated use of the north-central Washington coast, the Strait of Juan de Fuca, and, in some years, the southern coast near the Columbia River. Spatiotemporal models revealed substantial interannual variability in Chinook occurrence patterns, likely reflecting differences in stock composition of tagged individuals and oceanographic conditions. • From 2018 to 2024, hydrophones recorded 8,305 days of acoustic effort across five core sites and detected SRKW on 900 recording-days. In 2023 and 2024, hydrophones added 5,016 days of effort across 15 sites, with SRKW detected on 378 recording-days. • SRKW were detected most frequently at northern sites near the Strait of Juan de Fuca and Swiftsure Bank, where mean detection rates during summer reached approximately 2–5 days per week. Across all years, SRKW occurrence peaked consistently from July through November in the northern portion of the study area. On the southern Washington coast near the Columbia River mouth, SRKW detections were infrequent and occurred primarily during early spring. Spatiotemporal modeling showed a stable seasonal pattern across years, with the highest occurrence in the far north during summer and early fall and lower, but persistent, winter presence.

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
NWTT (continued)			
[N2] Acoustic Tagging of Green Sturgeon to Evaluate Habitat Use Along the Washington Coast (Sturza et al. 2026)	Occurrence	• Based on coastal receiver array detections, what is the Washington State coastal distribution of green sturgeon; including typical and maximum distance from shore? • Based on coastal receiver array detections, what are the depths of Washington coastal habitats typically occupied by green sturgeon? • What is the seasonal occurrence and movement patterns of green sturgeon in Washington Pacific coastal and estuarine habitats?	In 2025: • Data from multiple acoustic receiver arrays placed along the Pacific Northwest coast and estuaries were used to analyze the migratory patterns of green sturgeon and other migratory species through a multi-agency collaborative effort. Data were aggregated from an offshore acoustic receiver array along the coast of Washington and Oregon, a freshwater array within and at the mouth of Grays Harbor, Washington, a freshwater array within and at the mouth of Willapa Bay, Washington, and a freshwater array within the Columbia River Estuary, Washington. • A total of 332 green sturgeon were handled in Grays Harbor and Willapa Bay, Washington, in 2020, 2021, and 2023. Of these, 174 were implanted with VEMCO 69 kHz V16 acoustic transmitters, 172 of which were also newly tagged with Biomark 12 mm Passive Integrated Transponder tags. • Fin clips collected for genetic assignment to distinct population segments (DPS) from 188 fish sampled, including 109 of the fish implanted with acoustic transmitters, were assigned to either the nDPS (*n* = 134 fish; 71%) or sDPS (*n* = 54 fish; 29%). Of just the fish implanted with acoustic transmitters, 71 fish (65%) were assigned to the nDPS, and 38 fish (35%) were assigned to the sDPS. Fin clips collected in 2023 have not been analyzed for genetic assignment to DPS as of this report. • Acoustic data indicates that some green sturgeon can be detected on the offshore acoustic receiver array year-round, with peak detections occurring around May. A majority of individual fish were detected on the offshore acoustic receiver array moving back and forth between the Columbia River Estuary, Willapa Bay, Grays Harbor, and California during this period, though some individuals displayed long migrations up the coast and were detected off the coast of British Columbia. • Within the NWTT Study Area, there were no significant differences in residence time between DPSs from 2019 to 2024; however, inconsistent and limited array coverage within the NWTT Study Area limits further analysis within this area. • Within the coastal estuaries, there were no significant differences in residence time between DPSs in any estuary in 2019–2024, with the exception of 2019 and 2020, in which the nDPS spent significantly more time than the sDPS fish within Grays Harbor. • With additional data provided from collaborators operating acoustic receivers within the San Francisco Estuary and in the Sacramento River, fish were most likely to be migrating between California and the Pacific Northwest between October and March. On average, fish migrating south were at large for approximately 5 months, while fish migrating north averaged 8 months at large.
[N3] Acoustic and Visual Survey for Cetaceans in Behm Canal and Southern Clarence Strait, Alaska (Berchok et al. 2026)	Occurrence	• What is the occurrence, distribution, and abundance of cetaceans in Behm Canal and Clarence Strait?	In 2025: • Sonobuoys were deployed during the 2023 and 2024 surveys (15 successful buoys in 2023, 23 in 2024); killer whales and fin whales were detected only in Clarence Strait (fin whales in 2024 and killer whales in both years). Humpback whales were detected in both Behm and Clarence Straits, but only in 2024. • A PAM package was deployed eight times from the SEAFAC facility between February 2023 and February 2024. • Data from the PAM package were analyzed in 2025. Humpback whales, killer whales, porpoises, and unidentified species were detected, as well as vessel noise.
[N4] Passive Acoustic Monitoring of Harbor Porpoise in Hood Canal, Washington (Bergman and Grebner 2026)	Occurrence, Exposure	• What marine mammals, with a focus on harbor porpoise (*Phocoena phocoena*), are present within the study area? • What are the effects of environmental variables on the distribution and abundance of within the study area?	In 2025: • Full-bandwidth, VHF autonomous recorders were deployed at four survey sites within the Dabob Bay Range Complex four times during 2025 (February, May, August, and October) for approximately 4–6 weeks per deployment. • Acoustic data were processed using a custom-built harbor porpoise click detector to identify and extract echolocation clicks contained within each recording. Data processing and preliminary analysis for the 2025 dataset are currently ongoing. • In 2026, the dataset will be used to describe seasonal occurrence and distribution patterns of harbor porpoises in Hood Canal. The relationships between harbor porpoise click activity and other variables (e.g., temporal, spatial, and environmental) will be explored as potential indicators/predictors of presence. This project will support future behavioral response studies (BRS) in Hood Canal, as continued identification and monitoring of harbor porpoise “hot spots” (i.e., areas with relatively high occurrence) are needed to inform BRS site selection and study design.

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
NWTT (continued)			
[N5] Movement Patterns of Anadromous Bull Trout Along Washington's Olympic Peninsula Coast (Barrett et al. 2026) This project is also linked to Project **[N1]**. [This project was formerly titled "Characterizing the Distribution of ESA-Listed Salmonids in Washington and Alaska].	Occurrence	• What is the occurrence and distribution of bull trout within and near the boundaries of the NWTT?	In 2025: • An acoustic receiver array consisting of 42 receivers was deployed along the 3-nm boundary off Washington State's Olympic Peninsula from April to October 2025, along with two receivers in Kalaloch Creek. Receivers were recovered and redeployed in a reduced 21 receiver configuration in October 2025, scheduled for recovery in spring 2026. Data were also used from nine receivers in the Hoh River, managed and maintained by the Hoh Tribe. • A total of 30 bull trout were tagged during the study period, including 15 individuals in Kalaloch Creek and 15 individuals in the Hoh River. Tagging occurred from April to August 2025. • Ten of the 15 bull trout tagged in Kalaloch Creek were detected on Hoh River receivers, with first detections occurring beginning in May 2025; however, none of these individuals were detected on the 42-receiver array. • One tag was detected by multiple receivers in the 3-nm array near Destruction Island; however, the observed movement pattern was inconsistent with typical bull trout behavior and likely reflects tag transport by a marine predator. A second bull trout tagged in the Hoh River was detected on a receiver deployed in Grays Harbor, with no intervening detections on marine receivers prior to its subsequent detection at the mouth of the Hoh River. • Five tagged bull trout (four originally tagged in Kalaloch Creek and one originally tagged in the Hoh River) were detected on the Kalaloch Creek receiver beginning in December 2025, indicating a return movement that involved marine transit. Data from the winter deployment of the 3-nm array are needed to determine whether these individuals crossed the 3-nm boundary or entered the NWTT Study Area.
GOA			
[G1] Telemetry and Genetic Identity of Chinook Salmon in Alaska (Courtney and Seitz 2026)	Occurrence	• What is the spatial distribution, movement, vertical distribution, population identity, occupied habitat, and natural mortality of Chinook salmon in the GOA?	In 2025: • Captured 41 Chinook salmon near Sand Point, Alaska, in August 2024; 16 were tagged with pop-up archival transmitting tags (PSATs) and released. Additionally, 200 coho and pink salmon were captured. • No Chinook salmon were captured in 12 days of fishing at Dutch Harbor in November 2024; however, other species caught included juvenile coho salmon, Pacific halibut, black rockfish, and walleye pollock. • Captured 45 Chinook salmon near Craig, Alaska, in March 2025; 24 were tagged with PSATs and released. • Data from recent deployments were analyzed collectively with tags deployed since 2013 from the central Bering Sea to the coastal Southeast Alaska, with a total of 223 PSATs deployed, 209 of which provided data, and 133 had data records longer than 21 days and were used in movement path reconstruction and depth and temperature occupancy analyses (Hidden-Markov model). • Reporting locations of tags were widespread across the eastern North Pacific Ocean, ranging as far west as the central Bering Sea to as far east as the U.S. Pacific Northwest (Washington and Oregon). • Reconstructed movement paths suggested that the majority of tagged fish remained over the continental shelf within relatively close proximity (<500 km) to their tagging location. • Chinook salmon occupied depths ranging from 0 to 538 meters and experienced a thermal environment ranging from -0.5 to 21.1°C. Twenty-two tagged Chinook salmon (of 133 used in analyses) were inferred to have occupied the TMAA (311 aggregated days), during which time they were mainly found in the northern portion while over the continental shelf. • Natural mortality of tagged fish caused by endothermic fish(es) (*n* = 42), ectothermic fish(es) (*n* = 11), marine mammals (*n* = 10), and unknown (*n* = 20) causes. • Genetic analyses suggested that the subset of tagged Chinook salmon used in Genetic Stock Identification analyses were from populations originating in Southeast Alaska, British Columbia, Washington, and Oregon, including some (*n* = 6) from ESA-listed stocks from the Columbia River. Analysis is ongoing. • Presented results at the 2025 Alaska Marine Science Symposium, Anchorage, Alaska, in January 2025.

Project Title (Technical Report for 2025)	Conceptual Framework Category	Monitoring Questions	Accomplishments
GOA (continued)			
[G2] PAM for Marine Mammals in the GOA using Bottom-Mounted Devices (Zerbini et al. 2026)	Occurrence, Exposure	• What are the seasonal abundance and density of marine mammals in the GOA? • What are the seasonal and temporal habitat use, movement, and acoustic patterns of the species and populations of marine mammals present in the GOA, and potential overlap with Navy activities? • What is the occurrence and estimated ecotype-specific density of killer whales in and near the Navy's GOA WMA and TMAA?	In 2025: • One subsurface PAM mooring (Portlock Bank) was deployed in June 2025 (prior to exercise Northern Edge 2025), and two PAMs (Chirikof Island and Sanak Bank) were recovered and redeployed in fall 2025 and are scheduled to be recovered in summer 2026. • Reviewed past surveys and reports of killer whale presence in the GOA and worked on the survey plan for summer 2026. • Visual data from previous AFSC/NOAA surveys have been collated and are formatted for analysis. Once the 2026 survey data are processed, the visual survey data will be integrated to compute killer whale ecotype-specific estimates of density. • From the three archival mooring sites previously analyzed, over 29,600 individual killer whale calls were extracted. These are currently being ranked for quality, classified, and matched to ecotype based on the call library created for this project. • Acoustic recording analysis from previously deployed moorings is in progress for low-frequency species, completed for mid-frequency species, and ongoing for high-frequency species. • Processed data from previous surveys (2009, 2013, 2015, and 2021) for density modeling and the Navy's acoustic effects modeling team.

3 2026 Monitoring Projects

The Strategic Planning Process is used to set ISOs, identify potential species of interest at a regional scale, and evaluate and select specific monitoring projects to fund or continue supporting for a given fiscal year.

A quick summary of continuing and new monitoring projects for CY26 is listed in **Table 2.**

Table 2. 2026 Monitoring projects for U.S. Navy Pacific ranges/study areas.

Range/Study Area	Project Title	Continuing or New Start
HRC	PMRF Marine Mammal Acoustic Monitoring	Continuing from 2003
HRC	Visual Survey and Tagging of Hawaiian Odontocetes	Continuing from 2011
HRC, SOCAL	Marine Mammal Monitoring on Navy Ranges (M3R) at SOAR and PMRF[a]	Continuing from 2006
HRC	Estimation of Received Levels of MFAS and Behavioral Response of Marine Mammals at PMRF	Continuing from 2011
HRC	Advancing Monitoring Capacity in Hawaii through Non-invasive Triaxial Accelerometry Tags to Evaluate Fine-scale Responses of Marine Mammals to Disturbance	Continuing from 2022
HRC	Feasibility Pilot Study to Tag Rough-toothed Dolphins at PMRF	New start in 2026
SOCAL	Goose-beaked Whale and Fin Whale Population Dynamics and Impact Assessment at SOAR[a]	Continuing from 2005
SOCAL	Southern California Beaked Whale Occurrence [formerly Passive Acoustic Monitoring of Marine Mammals in SOCAL]	Continuing from 1999
SOCAL	Marine Mammal Sightings During CalCOFI Cruises	Continuing from 2004
MITT, HRC	Pacific Islands Comprehensive Stranding Investigations	Continuing from 2017
MITT	Marianas Humpback Whale Habitat Use	New start in 2026
MITT	PACMAPPS MITT Density Survey	New start in 2026
MITT	FDM Coral Survey (every 5-year cycle)	Continuing from 2017
NWTT	Salmonid and Southern Resident Killer Whale Distribution in the Pacific Northwest	Continuing from 2014[b]
NWTT	Visual and Acoustic Survey for Cetaceans in Behm Canal and Southern Clarence Strait, Alaska	Ending in 2026
NWTT	Passive Acoustic Monitoring of Harbor Porpoise in Hood Canal, Washington	Continuing from 2025
NWTT	Acoustic Tagging of Green Sturgeon to Evaluate Habitat Use Along the Washington Coast	Continuing from 2020
NWTT	Movement Patterns of Anadromous Bull Trout Along Washington's Olympic Peninsula Coast	Continuing from 2018
GOA	Telemetry and Genetic Identity of Chinook Salmon in Alaska	Continuing from 2020
GOA	PAM for Marine Mammals in the GOA using Bottom-Mounted Devices	Continuing from 2024

Notes:

[a]Focus shift for two SOCAL programs to concentrate on opportunistic exposure response and, in particular, Continuous Active Sonar response.

[b]SRKW focus 2014–2018; 2018–2024 focus on killer whale prey (ESA-listed salmonids).

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2025 Publications and Conference Presentations from U.S. Navy-funded Monitoring

2025 Publications from U.S. Navy-funded Monitoring

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Corsi, E., R.W. Baird, S.D. Mahaffy, and J.J. Kiszka. (submitted). Social life in the deep: variation in network structure and association patterns of rough-toothed dolphins (*Steno bredanensis*) around the main Hawaiian Islands. Submitted to *Marine Mammal Science*.

Currie, J.J., B. Stirling, G. Olson, M. van Aswegen, L. Evans, S.H. Stack, N. Kobayashi, K. Ueda, S. Higa, W.T. Gough, F. Vivier, L. McPherson, K. Fertitta, and L. Bejder. (in preparation). Body condition differs among social clusters and across years in endangered false killer whales in Hawai‘i.

DeRuiter, S.L., E.A. Falcone, S.N Coates, B.K. Rone, D.A. Sweeney, K.A. Dolan, S.M. Jarvis, R.D. Andrews, S.L. Watwood, and G.S. Schorr. (submitted). Assessment of goose-beaked whale responses to mid-frequency active sonar using a hierarchical hidden Markov model. Submitted to *Movement Ecology*.

Gough, W.T., M. van Aswegen, L. Evans, A. Szabo, J. Currie, A. Fahlman, F. Christiansen, A. Hollers, F.E. Fish, K. West, J. Phipps, N. Hofmann, and L. Bejder. (in preparation). Hot wings: quantifying the impact of large appendages on the heat loss potential and migratory decision-making of humpback whales.

Harnish, A.E., R.W. Baird, M.A. Kratofil. (submitted). Diving behavior of common bottlenose dolphins around the main Hawaiian Islands: individual variation and responses to diel and lunar cycles. Submitted to *Marine Mammal Science*.

Henderson, E.E., R.W. Baird, S.W. Martin, M.A. Kratofil, A.E. Harnish, S.D. Mahaffy, C.R. Martin, and B.L. Southall. (submitted). A review of the long-term study of resident odontocetes off Kauaʻi and Niʻihau and the analysis of exposures to mid-frequency active sonar. Submitted to *Aquatic Noise*.

Hollers, A., W.T. Gough, M. van Aswegen, A. Szabo, L. Evans, J. Currie, A. Blawas, A. Fahlman, J. Goldbogen, and L. Bejder. (in preparation). Energetic benefits of resting behavior in humpback whale mother-calf pairs revealed by biologging and UAS-photogrammetry.

Kratofil, M.A., J.F. Shaff, H.K. Hoffbauer, M. Cantor, M.C. Hill, and R.W. Baird. (submitted). Ecological contexts of diving behavior in Hawaiian false killer whales. Submitted to *Movement Ecology*.

Martien, K.K., R.W. Baird, K.M. Robertson, M.A. Kratofil, S.D. Mahaffy, K.L. West, S.J. Chivers, and F.I. Archer. (in press). Epigenetic age estimation for Hawaiian false killer whales (*Pseudorca crassidens*) in the absence of 'known-age' individuals. Submitted to *Molecular Ecology Resources*.

Nemeth, C., W.T. Gough, M. van Aswegen, A. Hollers, L. Evans, A. Szabo, and L. Bejder. (in preparation). Energetic scaling of propulsive costs across body sizes in humpback whales.

Phipps, J., I. Silva-Krott, and K.L. West. (submitted). Characterization of macroplastics ingested by 23% of stranded short-finned pilot whales (*Globicephala macrorhynchus*) in the main Hawaiian Islands (2010–2023). Submitted to *Marine Pollution Bulletin*.

Szabo, A., W.T. Gough, M. van Aswegen, D. Bloch, M.M. Kosma, F. Sharpe, L.E. Eckert, and L. Bejder. (in preparation). Division of labor with role specialization among group bubble-net foraging humpback whales.

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Alksne, M.N., D. Adesanya, I. Jeuris, K. Cohen, J. Zingale, X. Zhang, X. Liu, J.M. Jones, K.E. Frasier, A. Širović, J.A. Hildebrand, M.A. Roch, and S. Baumann-Pickering. 2025. Big whales and big data: a convolutional neural network approach to investigating long-term spatial-temporal patterns of blue and fin whales in the Southern California Bight. Poster presentation: The XXIX International Bioacoustics Congress, 7–12 September 2025, Kerteminde, Denmark.

Alksne, M.N., B.X. Semmens, A. Solsona Berga, E. Wisely, N. Patin, E. Jacobson, J. Dinasquet, L. Thomas, E. Ward, J. Thorson, and S. Baumann-Pickering. 2025. An integrated species distribution model for humpback whales in the California Current Ecosystem. Oral presentation: Humpback Whale World Congress, 15–19 October, Tadoussac, Québec.

Bowlin, N. 2025. CalCOFI: past, present, and future role in the ecosystem approach to fishery research. Presentation—2025 Alaska Marine Science Symposium. 27–31 January 2025, Anchorage, Alaska.

Courtney, M., and A. Seitz. 2025. Habitats occupied by Chinook salmon in the Gulf of Alaska and in the U.S. Navy's Training Areas. Poster Presentation—2025 Alaska Marine Science Symposium. 27–31 January 2025, Anchorage, Alaska.

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