U.S. Navy

MARINE SPECIES MONITORING PROGRAM

2024

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 2025

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NAVAL SEA SYSTEMS COMMAND

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 §218.75(d), §218.95(e), §218.145(f), and §218.155(f).

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), Christopher Hunt (ManTech, Inc.), Chip Johnson (U.S. Pacific Fleet), James Powell (Naval Facilities Engineering Systems Command, Pacific), Julie A. Rivers (U.S. Pacific Fleet), and Bridget H. Watts (Naval Sea Systems Command).

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

Russel D. Andrews, Robin W. Baird, Colin J. Cornforth, Annette E. Harnish, Michaela A. Kratofil, Jordan K. Lerma, Sabre D. Mahaffy, and Mark A. Mohler (Cascadia Research Collective); Andrew Ilachinski and Ronald Filadelfo (Center for Naval Analysis); Gustavo Cárdenas Hinojosa (CONANP); Holger Klinck (Cornell University); Shannon N. Coates, Erin A. Falcone, Erin L. Keene, Brenda K. Rone, Gregory S. Schorr, and David A. Sweeney (Marine Ecology and Telemetry Research); Amy Kennedy, Manolo Castellote, Dana Wright, and Alexandre N. Zerbini (University of Washington); Gabriela C. Alongi, Regina A. Guazzo, Tyler A. Helble, E. Elizabeth Henderson, and Cameron R. Martin (Naval Information Warfare Center Pacific); Stephen W. Martin (National Marine Mammal Foundation); Alexandra Carroll, Nancy A. DiMarzio, Karen Dolan, Finnegan B. Hoyer, L. Moniz, Ron P. Morrissey, and Stephanie Watwood (Naval Undersea Warfare Center Division Newport); Robyn Angliss, Catherine L. Berchok, and Jessica Crance (National Oceanic and Atmospheric Administration-Alaska Fisheries Science Center); David D. Huff (National Oceanic and Atmospheric Administration-Northwest Fisheries Science Center); Jonathan B. Armstrong, Lisa T. Ballance, Hannah S. Barrett, Taylor K. Chapple, P.S. Dominguez-Sánchez, A.M. Lopez, H.J. Myers, Ethan M. Personius, H. Sawyer, Kim M. Stafford, and J.D. Stewart (Oregon State University); Simone Baumann-Pickering, Kaitlin E. Frasier, John A. Hildebrand, Natalie Posdaljian (Scripps Institution of Oceanography); Michael B. Courtney and Andrew C. Seitz (University of Alaska, Fairbanks); Lars Bejder, Cody W. Clifton, William Gough, Nicholas Hofmann, Connor Humann, S. Jones, Nelmarie Landrau-Giovannetti, Aude Pacini, Jana E. Phipps, Sydney Traina, Ilse Silva-Krott, and Kristi L. West (University of Hawai'i at Manoa); 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 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 area: the Hawaii-Southern California Training and Testing (HSTT) area (Department of the Navy [DON] 2018a), the Mariana Islands Training and Testing (MITT) area (DON 2020a), the Northwest Training and Testing (NWTT) area (DON 2020b), and the Gulf of Alaska Training (GOA) area (DON 2022a). The U.S. 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 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 2024 calendar year (CY) and presents results and progress made during the period of 1 January 2024 to 31 December 2024. This is the Navy's 16th annual monitoring report since the program began in 2008. The marine species monitoring (MSM) described was conducted in accordance with objectives listed on the U.S. Navy's MSM Program website:

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

In this report, monitoring goals for the 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 2024, with additional details in **Section 2**. **Section 3** lists the 2025 Monitoring Goals.

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

- Several projects in the HSTT and MITT Study Areas resulted in peer-reviewed publications or presentations in 2024, including Goose-beaked Whale (*Ziphius cavirostris*) and Fin Whale (*Balaenoptera physalus*) Population Dynamics and Impact Assessment at Southern California Anti-Submarine Warfare Range (SOAR); Marine Mammal Monitoring on Pacific Missile Range Facility (PMRF); Odontocete Studies on Pacific Missile Range Facility; and Pacific Islands Comprehensive Stranding Investigations (see **Appendix A**).

- With regard to the conceptual framework categories of *occurrence, exposure, response, consequence* (DON 2010), several projects in CY 2024 demonstrated progress beyond the category for *occurrence* and estimated the *exposure* of animals to mid-frequency active sonar (MFAS) and explosives, assessed animals' *responses* to underwater noise generated by U.S.

Navy training and testing activities, and continued to make strides toward assessing any population *consequences* resulting from these activities by investigating population trends.

U.S. Navy range-specific progress highlights include the following:

MITT

- Conducted passive acoustic monitoring (PAM) off the island of Guam with the goal of detecting, classifying, locating, and deriving abundance and densities of beaked whale (BW) species where the array is deployed; preliminary results showed goose-beaked whales were most commonly detected and occurred almost exclusively at night, while sonar events were detected less frequently and during the day. Preliminary densities were produced. Additional data are being processed and are expected to validate the preliminary data.

- Assessed historical stranding patterns in the Mariana and Hawaiian Islands and examined correlations with environmental factors. Strandings were found to occur more often in certain areas or hotspots and were correlated with sea surface wind speed and year.

- Developed statistical tools and a refined framework that assesses correlation between sonar and stranding events.

HSTT HRC

- Acoustic data collection and analysis continued at PMRF. Updates and improvements to the analysis algorithms and workflow processes include improvements to tracking code for all baleen whale species; improvements to the BW classification algorithms, including a new classification for Longman's BWs or tropical bottlenose whales (*Indopacetus pacificus*); and inclusion of all three primary MFAS sources for behavioral response analysis.

- The Marine Mammal Monitoring on U.S. Navy Ranges (M3R) program continued to add to their acoustic data collection and conducted trend analysis for abundance goose-beaked whale group vocal periods during sonar events on SOAR.

- Thirteen satellite tags were deployed on four odontocete species: short-finned pilot whale (*Globicephala macrorhynchus*), humpback whale (*Megaptera novaeangliae*), Blainville's BW or the dense-beaked whale (*Mesoplodon densirostris*), and bottlenose dolphin (*Tursiops truncatus*). All tags except the BW transmitted data. Six of the tag deployments overlapped temporally with Phase A of the Submarine Command Course (SCC), and 12 overlapped temporally with Phase B of the SCC.

- Data from 22 satellite tags deployed in 2023–2024 were analyzed for exposure and response to Navy training activity at PMRF. All but one were exposed to MFAS, with exposures from at least two different sources with median received sound levels between 68.2 and 156.4 dB re 1 µPa.

- The University of Hawaii (UH) Health and Stranding Lab continued to conduct comprehensive stranding response, necropsy, and cause of death investigations, covering 12 stranding events that occurred in CY 2024 in the Pacific Islands Region. Detailed analysis of marine debris ingestion and investigation of stranding patterns in the Pacific Islands region between 1848 and

2023 resulted in multiple draft manuscripts.

- A UH project to advance tagging capabilities in Hawaii continued, including running a workshop on tag data processing.

HSTT SOCAL

- Data recorded by High-frequency Acoustic Recording Packages deployed at four sites within the Southern California Bight between August 2023 and December 2024 was analyzed, and one recorder was at a new Central California location in November 2024. Published five manuscripts.

- Continued to study the distribution and demographics of BWs and fin whales within SOCAL, conducting 28 days of small vessel surveys in SOAR, resulting in 29 sightings of goose-beaked whales with 80 individuals identified and 34 sightings of 60 fin whales, including a calf. Five Sound Motion Recording and Telemetry tags were deployed on goose-beaked whales.

- The species of BW that produces the BW43 pulse was identified as the ginkgo-toothed BW. It is believed they also produce the BWB signal.

- A publication of blue and fin whale residence time and occupancy in Navy training and testing areas off the US West Coast was completed based on data from a previous Navy funded tagging project.

NWTT

- An array of moorings designed to detect both acoustically tagged fishes and vocalizing marine mammals was maintained on the outer coast of Washington State from February to October 2024, and data are currently being analyzed. Thirteen of 62 tagged Chinook salmon (*Oncorhynchus tshawytscha*) have been detected on the moorings. An initial analysis of previously archived data showed seasonality in the movements of Southern Resident killer whales (*Orcinus orca*) along the Washington coast. A new classification algorithm was developed and tested.

- 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 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, which resulted in estimates for humpback, fin, and killer whales, and harbor (*Phocoena phocoena*) and Dall's (*Phocoenoides dalli*) porpoises.

- 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 and Oregon coast, with some individuals detected off the coast of British Columbia or California. 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.

- Permitting, receiver deployment, and programming of 69 kHz tags was completed in preparation

for tagging of bull trout to occur Q1 of 2025.

GOA

- Pop-up Satellite Archival Tags were deployed on 16 Chinook salmon within the GOA to characterize their horizontal and vertical distribution, habitat use, natural mortality of tagged individuals, and occupancy in the GOA. Data analysis is ongoing with additional tagging efforts planned for 2025.

- Three PAM moorings were recovered and two redeployed in the western GOA in fall 2024. Data collected from these will allow investigation into the seasonal occurrence of several species, including North Pacific right whales (*Eubalaena japonica*), killer whales, and BWs. Previously archived data was analyzed for killer whale occurrence and ecotype.

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Acronyms and Abbreviations

°C	degrees Celsius
BW	beaked whale
BWCV	beaked whale *Circovirus*
CalCOFI	California Cooperative Oceanic Fisheries Investigations
CAS	continuous active sonar
CeMV	cetacean *Morbillivirus*
CeNCOOS	Central and Northern California Ocean Observing System
CRC	Cascadia Research Collective
CY	calendar year
DASBR	Drifting Acoustic Spar Buoy Recorder
dB re 1µPa	decibel(s) referenced to 1 microPascal
DCLDE	Detection, Classification, Localization, and Density Estimation
DEMVAL	Demonstration-Validation
DON	Department of the Navy
DPS	Distinct Population Segment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FM	frequency-modulated
FY	fiscal year
GOA	Gulf of Alaska Training
GPS	Global Positioning System
GVP	group vocal period
HARP	High-frequency Acoustic Recording Package
HF	high-frequency
hr	hour(s)
HRC	Hawaii Range Complex
HSTT	Hawaii-Southern California Training and Testing
Hz	Hertz
ICMP	Integrated Comprehensive Monitoring Program
individuals/km^2	individuals per square kilometer(s)
ISO	Intermediate Scientific Objective(s)
kHz	kilohertz
km	kilometer(s)
LOA	Letters of Authorization
m	meter(s)
M3R	Marine Mammal Monitoring on U.S. Navy Ranges
MACS	Mariana Archipelago Cetacean Survey
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
nDPS	northern distinct population segment
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NWTRC	Northwest Training Range Complex
NWTT	Northwest Training and Testing
OEIS	Overseas Environmental Impact Statement
PAM	passive acoustic monitoring
PAS	pulsed active sonar
PCoD	Population Consequences of Disturbance
Photo-ID	photo-identification
PMRF	Pacific Missile Range Facility
PPR	peste des petits ruminants
PSAT	Pop-up Satellite Archival Tag
qPCR	quantitative polymerase chain reaction
RL	received level
s	second(s)
SCC	Submarine Command Course
SCCOOS	Southern California Coastal Ocean Observing System
SCTTR	Southern California Testing and Training Range
SD	standard deviation
sDPS	southern distinct population segment
SEAFAC	Southeast Alaska Acoustic Measurement Facility
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
UH	University of Hawaii
U.S.	United States

1 Introduction

The United States (U.S.) 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 area: the Hawaii-Southern California Training and Testing (HSTT) area (Department of the Navy [DON] 2018a), the Mariana Islands Training and Testing (MITT) area (DON 2020a), the Northwest Training and Testing (NWTT) area (DON 2020b), and the Gulf of Alaska Training (GOA) area (DON 2022a).

The U.S. 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 area; the Mariana Islands Range Complex (MIRC), which is part of the MITT 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 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 2018a, 2020j), 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 2018c, 2018d, 2020h, 2020i), MITT (NMFS 2020f), NWTT (NMFS 2020b, 2020c), and GOA (NMFS 2023b); (3) and Biological Opinions under the Endangered Species Act (ESA) for HSTT (NMFS 2018b, 2020k, 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 U.S. 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 U.S. 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). 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 2024 reporting period. Additional information about the ICMP and Strategic Planning Process is available on the U.S. Navy’s MSM Program website at:

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

Prior-year reports and associated publications are available on the U.S. 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 2024 to 31 December 2024, with some variation in the reporting period of individual technical reports.

MSM was conducted in accordance with project objectives listed on the U.S. Navy's MSM Program website at:

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

Section 2 of this report summarizes monitoring results reported in 2024. Detailed technical reports for the individual MSM projects are provided as supporting documents to this report (Baird et al. 2024; Barrett et al. 2025; Berchok et al. 2025; Dolan et al. 2025; Henderson et al. 2025a, 2025b; Ilachinski and Filadelfo 2025; Martin et al. 2025; Posdaljian et al. 2025; Schorr et al. 2025; Seitz and Courtney 2025; Stewart et al. 2025; Sturza et al. 2025; West et al. 2024, 2025a, 2025b; and Zerbini et al. 2024).

Section 3 of this report summarizes monitoring projects for the next year of 2025.

Appendix A provides a list of 2024 publications and conference presentations from U.S. Navy-funded monitoring by author's last name.

2 Marine Species Monitoring in the Pacific Ocean – 2024 Goals and Implementation

The U.S. Navy training and testing ranges within the Pacific Ocean are located within the HSTT Study Area, MITT Study Area, NWTT Study Area, and GOA Training 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 2018a, 2018b, 2018c, 2018d, 2020a, 2020b, 2020c, 2020d, 2020e, 2020f, 2020g, 2020h, 2020i, 2020j, 2020k, 2022, 2023a, 2023b, 2024).

Figure 1 provides an overview of all MSM projects and goals across all the Pacific training and testing areas. **Figure 1** shows the distribution of monitoring questions and study objectives 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 (2024). Readers may refer to previous Annual Monitoring Reports (DON 2016, 2017, 2018b, 2019, 2020c, 2021, 2022b, 2023, 2024) for project accomplishments from previous years.

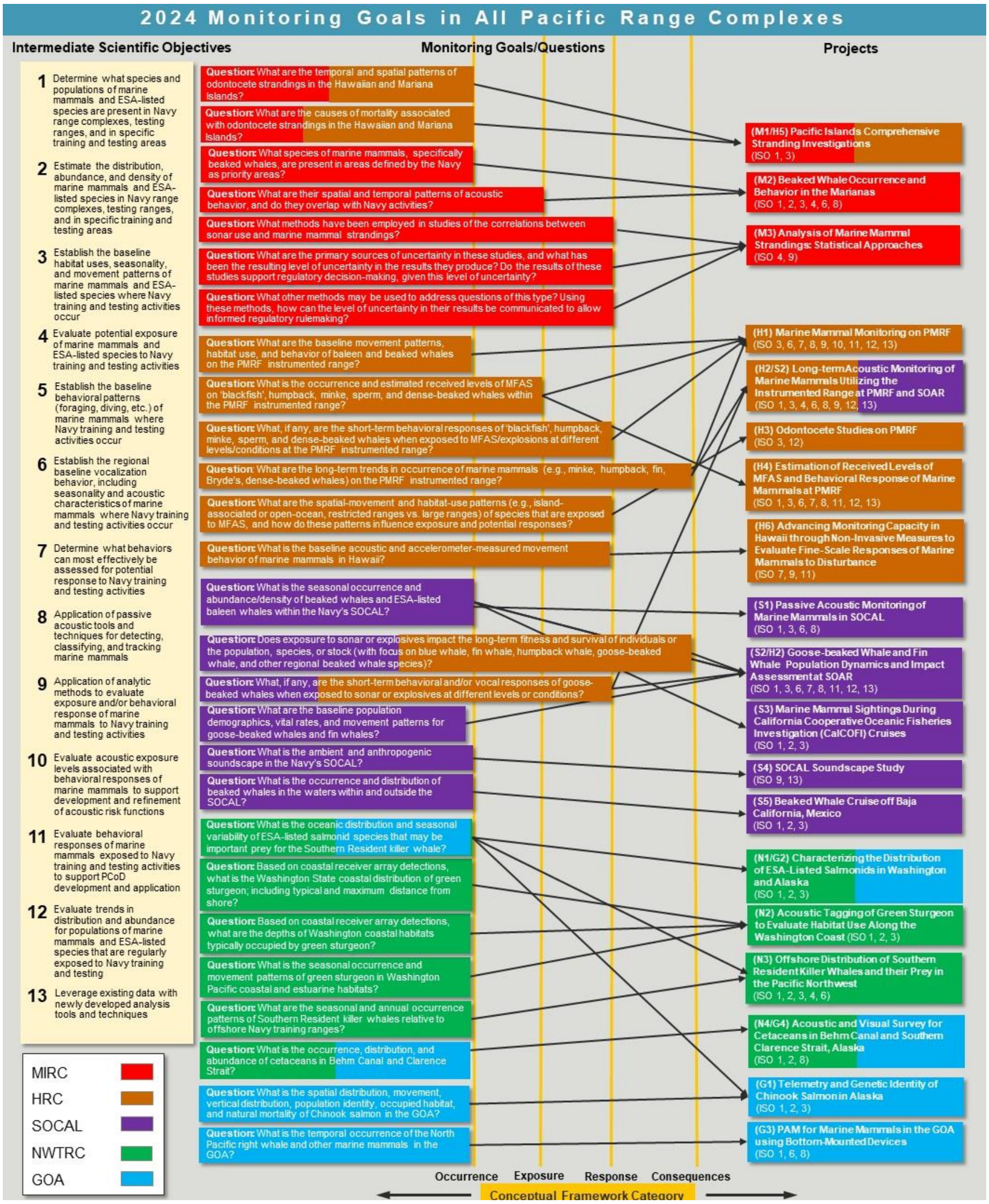

Figure 1. 2024 Monitoring goals in all Pacific range complexes by project. Range color under Projects indicates fieldwork location and under Monitoring Goals/Questions indicates where the questions are being addressed.

Table 1. Monitoring goals and accomplishments for U.S. Navy study areas/ranges in 2024.

Project Title (Technical Report for 2024)	Conceptual Framework Category	Monitoring Questions	Accomplishments[b]
MITT			
[M1/H5] Pacific Islands Comprehensive Stranding Investigations (West et al. 2024, 2025a, 2025b)	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 2024: • Examined historical data from 535 odontocete stranding events in the Mariana archipelago and Hawaiian Islands by date, location, and species, spanning the period of 1848 to 2023, and identified stranding location patterns and hotspots (West et al. 2024). • Analyzed 271 stranding events occurring between 2003 and 2021 in relation to environmental data, including surface temperature and winds, chlorophyll A, bathymetry, and the extra-tropical Northern Oscillation Index, using a best-fit model for the Hawaiian and Mariana Islands and found sea surface wind speed and year of stranding to be significant. • Reported on the stranding response, necropsy, and cause of death investigations on 12 stranding events that occurred during the 2024 CY, including a striped dolphin where *Brucella* screening by PCR of cerebrospinal fluid and lymph nodes was positive. This represents the first of a second strain of *Brucella ceti* in Hawaiian cetaceans (West et al. 2025a). • Conducted experimental trials associated with the development of laboratory research protocols to reliably measure fecal hormone concentrations in Hawaiian cetaceans. Technical validations for each new species of interest and sampling matrix are necessary. Efforts are focused on false killer whales, pygmy sperm whales, and pilot whale validations. • Completed parallelism and spike and recovery technical validations for the reproductive hormone progesterone and stress hormone cortisol for pooled fecal samples from false killer whales and pygmy sperm whales. • Cortisol and progesterone concentrations were detected successfully in the individual fecal samples from four pygmy sperm whales tested, including elevated levels in a pregnant female, strongly suggesting that fecal progesterone concentrations in pygmy sperm whales can be used to detect pregnancy. It supports high biological relevance in the in-house fecal assays validated as part of the project for pygmy sperm whales and false killer whales. • Categorized, counted, and weighed the marine debris found in 3 out of 13 stranded pilot whales necropsied between 2010 and 2023 in the Hawaiian Islands (Phipps et al. in preparation). • The total weights of the marine debris masses in the three individuals ranged from 561.4 grams to 1870.6 grams. • In each of the three whales, approximately 80% of the debris was made up of monofilament and multifilament line, rope, and netting from fishing gear. The next most common category of debris was sheet plastic. • Developed a reliable system documentation of estimating viral load for BWCV using the number of amplification cycles required to detect positive cases as a proxy for viral load concentration in tissues where BWCV was previously detected using qPCR (West et al. 2025b). Viral load was estimated into three categories: high, moderate, and low. • Tested tissue samples and fluids collected from a Fraser's dolphin and a Longman's beaked whale confirmed to have different strains of CeMV with a commercial enzyme immunoassay intended for the agricultural morbillivirus PPR. Antibodies were detected in all tissues and fluids tested for the Fraser's dolphin except for urine and in tissue fluid from two of four tissues tested in the Longman's beaked whale, confirming validity for use in cetaceans. • Serum samples collected from 27 stranded cetaceans represented ten species with unknown infection status. Ten individuals were seropositive for CeMV antibodies, indicating a 37% exposure rate. Further investigated the presence of CeMV antibodies among cetacean meat juice samples with results suggesting viable results but at a lower detection rate than serum. • Evaluated cetacean exposure to the *Toxoplasma gondii* parasite by testing serum samples collected from 35 individuals of 12 different cetacean species via enzyme immunoassay for the presence of *T. gondii* antibodies. Three individuals tested positive for a rate of 8.6%. • Matching meat juice samples were tested for *T. gondii* antibody presence, and consistent results were found. Therefore, meat juice samples from an additional 159 animals where serum was unavailable were tested, resulting in 16 additional positive animals and an exposure rate of 9.7%. • Prepared four manuscripts for publication in peer-reviewed journals: "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 preparation); "Causes of mortality and pathologic findings in Pacific Island cetaceans: A review of strandings from 2006–2022" (West et al. submitted); "Beaked whale stranding events on Pacific Islands (1950–2023): What do they tell us?" (West et al. in preparation); and "Historic odontocete stranding events in the Hawaiian and Mariana Islands (1848–2023) and how strandings correlate with environmental parameters over an 18 year timespan" (West et al. in preparation). • Presented results at the 25th Biennial Conference on the Biology of Marine Mammals in Perth, Australia, November 2024.

Project Title (Technical Report for 2024)	Conceptual Framework Category	Monitoring Questions	Accomplishments[b]
MITT (continued)			
[M2] Beaked Whale Occurrence and Behavior in the Marianas	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 2024: • Six Rockhopper passive acoustic recording units were deployed and recovered off the west coast of Guam for six months. • Analysis is in progress. • Final report expected in summer 2025.
[M3] Analysis of Marine Mammal Strandings: Statistical Approaches (Ilachinski and Filadelfo 2025) This project may eventually be applied to multiple range areas.	Exposure, Response	• What methods have been employed in studies of the correlations between sonar use and marine mammal strandings? • What are the primary sources of uncertainty in these studies, and what has been the resulting level of uncertainty in the results they produce? Do the results of these studies support regulatory decision-making, given this level of uncertainty? • What other methods may be used to address questions of this type? Using these methods, how can the level of uncertainty in their results be communicated to allow informed regulatory rulemaking?	In 2024: • Examined past approaches used to evaluate whether strandings are correlated with sonar. Found past analyses use basic statistics and ignore statistical power. • Developed a step-by-step analysis framework to credibly determine whether stranding events are correlated with sonar by refining the existing methodology, developing additional statistical tests to strengthen inferences, and developing methods to account for uncertainties in the data. • Working on developing a “Stranding Correlation Analysis Playbook” as a stand-alone interactive decision aid tailored to individual stakeholders. • A public release report or manuscript is expected in 2025.
HRC			
[H1] Marine Mammal Monitoring on PMRF (Martin et al. 2025)	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 2024: • Collected, processed, and analyzed 7,001 hr of new acoustic data from August 2023 to September 2024 (Martin et al. 2025). • Made improvements to the analysis algorithms. • Recorded and analyzed the highest monthly mean number of baleen whales: 1.6 for minke in January 2024; 0.3 for humpback in January 2024; 0.2 for sei in November 2023; 0.5 for fin in December 2023; 0.09 for Bryde’s in July 2024; 0.07 for the 20-Hz downsweep category in January 2024; and 0.08 for the 40-Hz downsweep category in January 2024. • Abundance of GVPs was highest in March 2024 for dense-beaked whales at 3.1 GVPs/hr; 0.3 GVPs/hr in March 2024 for goose-beaked whales; 0.2 GVPs/hr in July 2024 for Cross Seamount BWs; and 0.1 GVPs/hr in December 2023 for tropical bottlenose whales. • Detected killer whales throughout the available FY24 data, and 7 manually validated groups occurred. The highest mean number of sperm whale tracks in all 2.5-min snapshots in a month was 0.2 in December 2023. • Eleven tracked whales were exposed to MFAS during the February 2024 SCC (one fin whale was exposed to all three primary sources of MFAS; two humpback whales were exposed to surface ship hull-mounted MFAS; two humpback whales were exposed to active sonobuoy and helicopter-dipping MFAS; and two fin, one sperm, and three humpback whales were exposed to active sonobuoys). • Estimated median received sound level by source by propagation modeling; the highest median estimated RL for each source occurred for the same fin whale that had very close points of approach to all three sources: 138.7 dB re 1 µPa (active sonobuoy), 124.5 dB re 1 µPa (helicopter dipping sonar), and 166.7 dB re 1 µPa (surface ship hull-mounted sonar). Two humpback whales also had their highest median estimated RLs at 147.0 dB re 1 µPa from surface ship hull-mounted MFAS. • Manually verified blue whale calls that were detected and localized in December 2023, February 2024, and March 2024; these included both northwestern Pacific and northeastern Pacific B blue whale vocalizations, as well as an additional 54-Hz tonal potentially attributable to a Watkin’s whale. • Published three manuscripts in: *IEEE Explore* “Automated Acoustic Tracking of a Sperm Whale (*Physeter macrocephalus*) using a Wide Baseline Array of Sensors” (Gruden et al. 2024); *Frontiers in Marine Science* “A decade of change and stability for fin whale song in the North Atlantic” (Guazzo et al. 2024); *Frontiers in Marine Science* “Swimming and acoustic calling behavior attributed to Bryde’s whales in the Central North Pacific” (Helble et al. 2024). • Submitted two manuscripts to: Scientific Reports, “MAMBAT: A framework to track and localize multiple marine mammals with wide baseline, stationary arrays” (Gruden et al. submitted); and Movement Ecology, “Exposure and response of satellite-tagged Blainville’s beaked whales to mid-frequency active sonar off Kaua‘i, Hawai‘i” (Henderson et al. submitted). • Presented results at the 8th International Bio-Logging Science Symposium in Tokyo, Japan, in March 2024; the DCLDE of Marine Mammals Workshop in Rotterdam, The Netherlands, in June 2024; and the 27th International Conference on Information Fusion in Venice, Italy, in July 2024.

Project Title (Technical Report for 2024)	Conceptual Framework Category	Monitoring Questions	Accomplishments[b]
HRC (continued)			
[H2/S2] Long-term Acoustic Monitoring of Marine Mammals Utilizing the Instrumented Range at PMRF and SOAR (Dolan et al. 2025) This shares components with **[H3]** "Odontocete Studies on PMRF"	Consequences	• 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 instrumented range?	In 2024: • Conducted two field surveys at SOAR (22 to 28 February and 22 November and 1 December 2024) in collaboration with MarEcoTel (see **Project [S2]**), logged 300 acoustic detections, and directed MarEcoTel to animals of interest for 46 of the detections, leading to 23 visual verifications, including 20 goose-beaked whales, two fin whales, and one Risso's dolphin. • Conducted one field test at PMRF (in February 2024) with CRC (see **Project [H4]**), logged 128 acoustic detections, and directed CRC to nine of the detections, leading to five visual verifications, including three groups of short-finned pilot whales and one group each of dense-beaked whale and bottlenose dolphins. • Examined goose-beaked whale GVPs before, during, and after CAS events and identified 52 potential goose-beaked whale CAS events that might be found on SOAR hydrophones. CAS signals on SOAR range hydrophones were only detected in 13 of the 52 events. No conclusions on the effects of CAS signals on GVPs could be drawn due to the small sample size and mixed results. • Detected PAS signals in 23 events, and eight events included both CAS and PAS on SOAR. • Collected archive data at SOAR with a minimum of 312.4 days collected during calendar year 2024. Additional data were collected between September 2023 and January 2024 but have not been processed yet. • Collected archive data at PMRF with a total of 378.3 days collected since the publication of the FY23 report (Dolan et al. 2024).
[H3] Odontocete Studies on PMRF (Baird et al. 2024) Tag telemetry data collected was also used in Project **[H4]**. This project is conducted in conjunction with Project **[H2].**	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 2024: • Conducted a 9-day survey at PMRF in February 2024 and had 20 encounters with seven species of cetaceans and one sighting of a Hawaiian monk seal. • Deployed a total of 13 satellite tags on four different species. All odontocete and one humpback whale tag remained on or near PMRF for the duration of the SCC. • Received location and high-resolution time series and/or dive behavior data from 12 tags. • Six of the tag deployments overlapped temporally with Phase A of the SCC, and 12 overlapped temporally with Phase B. • Pygmy killer whales were sighted for only the 4th time off Kaua'i, with no individuals matched to the existing photo-identification catalog, indicating that pygmy killer whales off Kaua'i are not part of a resident, island-associated population. • The Blainville's BW encounter was only the 10th encounter of this species off Kaua'i or Ni'ihau by CRC, and two of the five individuals were re-sightings of individuals seen off Kaua'i in 2009 and 2021, including a previously satellite-tagged adult male. • Presented results at the 25th Biennial Conference on the Biology of Marine Mammals in Perth, Australia, November 2024; and the 8th International Bio-logging Science Symposium, Tokyo, Japan, March 2024. • Published manuscripts in *Pacific Conservation Biology*, "Long-term strategies for studying rare species: results and lessons from a multi-species study of odontocetes around the main Hawaiian Islands" (Baird et al. 2024, see Appendix A), *Endangered Species Research*, "False killer whales and fisheries in Hawaiian waters: evidence from mouthline and dorsal fin injuries reveal ongoing and repeated interactions" (Harnish et al. 2024), *Marine Ecology Progress Series*, "Beaked whales and El Niño: evidence for ENSO effects on Blainville's beaked and goose-beaked whale space use in Hawaiian waters" (Barrios et al. 2024); and submitted one for publication in a peer-reviewed journal, "A protocol for photo-identification catalog-based age estimation: An application to endangered Hawaiian false killer whales (*Pseudorca crassidens*)" (Kratofil et al. submitted).
[H4] Estimation of Received Levels of MFAS and Behavioral Response of Marine Mammals at PMRF (Henderson et al. 2025) Data used in this project were collected from projects **[H3]** and **[H1].**	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 2024: • Tagging was conducted August 6–13, 2023, and February 11–19, 2024. In 2023, six short-finned pilot whales, two bottlenose dolphins, one striped dolphin, and one melon-headed whale were tagged, while in 2024, eight pilot whales, one bottlenose dolphin, and three humpback whales were tagged. • Every tagged animal except one humpback whale was exposed to MFAS, with exposures from at least two different sources. The number of bouts of exposure ranged between 3 and 16 (an exposure bout is defined as a period of MFAS from one or more sources with gaps between pings less than 30 min). Bout durations ranged from 1 to 148 minutes, and the highest median received SPL ranged between 68.2 and 156.4 dB re 1 µPa (median ± 2*SD received levels below 60 dB re 1 µPa were not reported as that is at or below the approximate ambient noise floor for Hawaiian waters above 100 Hz). • Presented results at the 25th Biennial Conference on the Biology of Marine Mammals in November 2024 and the 8th International Bio-Logging Science Symposium in Tokyo, Japan, in March 2024. • Submitted a manuscript to Movement Ecology, "Exposure and response of satellite-tagged Blainville's beaked whales to mid-frequency active sonar off Kaua'i, Hawai'i" (Henderson et al. submitted).

Project Title (Technical Report for 2024)	Conceptual Framework Category	Monitoring Questions	Accomplishments[b]
HRC (continued)			
[H5/M1] Pacific Islands Comprehensive Stranding Investigations (West et al. 2024, 2025a, 2025b)			*See Project M1/H5 (above, in MIRC)*
[H6] Advancing Monitoring Capacity in Hawaii through Non-Invasive Measures to Evaluate Fine-Scale Responses of Marine Mammals to Disturbance (Bejder et al. 2024)	Response	• What is the baseline acoustic and accelerometer-measured movement behavior of marine mammals in Hawaii?	In 2024: • Supported five biologging field seasons in Hawaii. Projects deployed biologging devices 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 7 students including 6 graduate and 1 undergraduate projects, contributing to many dissertations. • Conducted a tag data processing workshop in March-April 2024 and additional on-on-one training sessions disseminating training to students and other local biologists. • Published a manuscript in *Royal Society Open Science* “Solitary humpback whales manufacture bubble-nets as tools to increase prey intake” (Szabo et al., 2024).
SOCAL			
[S1] Passive Acoustic Monitoring of Marine Mammals in SOCAL (Posdaljian et al. 2025) 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 2024: • Conducted passive acoustic monitoring with HARPs from August 2023 to December 2024 at four locations and deployed one recorder at a new Central California location in November 2024. • Shifted focus from annual presence/absence analyses to scientific publications. • Published five manuscripts: “Biogeographic patterns of Pacific white-sided dolphins based on long-term passive acoustic records” (Alksne et al. 2024); “Sperm whale demographics in the Gulf of Alaska and Bering Sea/Aleutian Islands: An overlooked female habitat” (Posdaljian et al. 2024); “*Ziphius cavirostris* presence relative to the vertical and temporal variability of oceanographic conditions in the Southern California Bight” (Schoenbeck et al. 2024); “Where’s Whaledo: A software toolkit for array localization of animal vocalizations” (Snyder et al. 2024); “State of the California Current Ecosystem report in 2022: a tale of two La Niñas” (Thompson et al. 2024). • One manuscript is in press: “Seasonal changes in oceanographic conditions and mesoscale variability modulate cetacean predator-prey dynamics in the San Diego Trough” (Bloom et al. submitted). • Presented results at DCLDE of Marine Mammals Workshop in Rotterdam, The Netherlands, in June 2024, and Joint conference by SCCOOS, CeNCOOS, and CalCOFI in San Diego, CA. • Data contributed to four theses completed in 2023 and one thesis completed in 2024 by University of California San Diego students.

Project Title (Technical Report for 2024)	Conceptual Framework Category	Monitoring Questions	Accomplishments[b]
SOCAL (continued)			
[S2/H2] Goose-beaked Whale and Fin Whale Population Dynamics and Impact Assessment at the SOAR Schorr et al. 2025; Dolan et al. 2025)	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 fin whale, goose-beaked whale, and other regional beaked whale species)?	In 2024: • Conducted 28 boat days of survey effort during February, March, November, and December 2024. 190 sightings of 12 different cetacean species occurred, including 29 sightings totaling 80 goose-beaked whales and 34 sightings of 60 fin whales, including a calf (Schorr et al. 2025). • Deployed five SMRT tags on goose-beaked whales and collected two tissue samples from a single individual. • Non-focal species encountered across the SCTTR include blue, gray, and humpback whales, Risso's dolphins, and other small delphinids. • Collaborated with the M3R team to verify acoustically detected species. • Published a manuscript in *Frontiers in Marine Science*, "Insights into foraging behavior from multi-day sound recording tags on goose-beaked whales (*Ziphius cavirostris*) in the Southern California Bight" (Coates et al. 2024). • Presented results at the Effects of Sound on Marine Mammals meeting. • See **[H2]** for additional results from Dolan et al. (2025).
[S3] Marine Mammal Sightings During CalCOFI Cruises (Posdaljian et al. 2025) [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 2024: • Four CalCOFI cruises were conducted from fall 2023 to summer 2024 and included a total of 86 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 **[S1]** for manuscripts published in 2024, which may include data from CalCOFI efforts.
[S4] SOCAL Soundscape Study (Posdaljian et al. 2025) Additional results reported in Project **[S1]**.	Occurrence	• What is the ambient and anthropogenic soundscape in the Navy's SOCAL?	In 2024: • Shifted focus from annual sound level updates to scientific publications. See **[S1]** for manuscripts published in 2024, which may include soundscape data.
[S5] Beaked Whale Cruise off Baja California, Mexico (Henderson et al. 2025)	Occurrence	• What is the occurrence and distribution of beaked whales in the waters within and south of SOCAL?	In 2024: • Conducted an expedition from 31 May to 20 June 2024 in the primary study area off the western coast of the Baja California Peninsula. • Six BWs were encountered, one of which was a goose-beaked whale and five unidentified *Mesoplodon* species that were later determined to be ginkgo-toothed BWs through photographs, genetic, and/or acoustic analyses. • The ginkgo-toothed BW sightings are the first recorded sightings of this species at sea. • Sighted nine other cetacean species and two pinniped species, including encounters of sperm whales that may have impacted the ability to detect BWs. • There were 19 acoustic detections of BW43 echolocation pulses between the towed array and the DASPRs, two mixed BW43/BWB, and three detections of unidentified BWs. • Recorded 45 acoustic detections of goose-beaked whales and several detections of sperm whales over multiple days. • BW43 detection events lasted from 0.05 to 28.83 min and had a mean acoustic encounter duration of 4.72 min. • BWB and BW43 clicks are likely produced by the same species and extend the ginkgo-toothed BW range considerably. • Determined that the BW43 echolocation pulse does not belong to Perrin's BW that had previously been hypothesized, and their echolocation pulse may be the BW40 echolocation pulse but still needs to be confirmed.

Project Title (Technical Report for 2024)	Conceptual Framework Category	Monitoring Questions	Accomplishments[b]
NWTT			
[N1] Characterizing the Distribution of ESA-Listed Salmonids in Washington (Barrett et al. 2025) This project is also linked to projects **[G1]** and **[N3]**. [This project was formerly titled "Characterizing the Distribution of ESA-Listed Salmonids in Washington and Alaska].	Occurrence	• 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 2024: • Work plan for bull trout tagging and receiver deployment in 2025 was developed. • Permitting, receiver deployment, and programming of 69 kHz tags were completed in preparation for tagging to occur in Q1 of 2025.
[N2] Acoustic Tagging of Green Sturgeon to Evaluate Habitat Use Along the Washington Coast (Sturza et al. 2025)	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 2024: • Reported on cumulative results of green sturgeon tagging efforts from 2020 to the present. 174 green sturgeon were implanted with acoustic transmitting tags, 188 fish were genetically sampled, and a large number of acoustic receivers were deployed and recovered in various configurations throughout the time period. • Of the 188 fish genetically sampled, 134, or 71%, were assigned to the nDPS, and 54, or 29%, were assigned to the sDPS. • 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, and Grays Harbor during this period, though some individuals displayed long migrations up the coast and were 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 DPSs in 2019–2024; 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.
[N3] Distribution of Southern Resident Killer Whales and their Prey in the Pacific Northwest (Stewart et al. 2025) This project is linked to projects **[N1]** and **[G1]**. [SRKW focus 2014–2018; 2018–2022 focus on killer whale prey (ESA-listed salmonids)].	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 2024: • Array of moorings designed to detect both acoustically tagged fishes and vocalizing marine mammals was maintained on the outer coast of Washington State from February to October 2024. Data from a number of moorings that detect tagged fish or vocalizing marine mammals were also obtained. • 62 Chinook salmon were caught and implanted with acoustic tags. Of these, 13 were detected by at least one acoustic receiver within the Washington coast array. Additional Chinook salmon and other species, such as sharks and green sturgeon tagged by other researchers, were also detected on the acoustic array. • 90,465 hours of passive acoustic recordings have been collected since March 2023 for analysis of SRKW. Data from February to October 2024 are currently being analyzed. • Preliminary analyses of existing acoustic data found seasonal variation in the probability of SRKW presence at three mooring stations spanning the coast of Washington State. • A custom classifier was built to detect and classify sounds from fish-eating killer whales, mammal-eating killer whales, humpback whales, Pacific white-sided dolphins, vessel noise, mooring self-noise, and background sound. To minimize the number of false positives, refinements to the process are in progress, including grouping individual detections into "acoustic encounters" and further filtering encounters.

Project Title (Technical Report for 2024)	Conceptual Framework Category	Monitoring Questions	Accomplishments[b]
NWTT (continued)			
[N4/G3] Acoustic and Visual Survey for Cetaceans in Behm Canal and Southern Clarence Strait, Alaska (Zerbini et al. 2024)	Occurrence	• What is the occurrence, distribution, and abundance of cetaceans in Behm Canal and Clarence Strait?	In 2024: • Conducted a visual-based vessel survey in Behm Canal and Clarence Strait, including the SEAFAC range, in September 2024 over 298 nm with a total of 72 cetacean sightings of five species recorded. The most frequently sighted species were humpback whales and Dall's porpoises. • Estimated group size, abundance, and seasonal densities using line transect methods for each region of interest for species with a reasonable sample size (approximately 20 or more sightings) across the three surveys in 2019, 2023, and 2024, which resulted in estimates for humpback, fin, and killer whales and harbor and Dall's porpoises. • Detected a total of 1,345 sightings of marine mammals over the three-year period, including 958 cetacean sightings, 225 pinniped sightings, and 162 sea otter sightings. The majority of these data include sightings documented during the summer 2019 abundance cruise outside of the study area of Behm Canal and lower Clarence Strait. Cetacean sightings in the survey area (Behm Canal and lower Clarence Strait) consisted of a total of 140 sightings (125 on effort and 15 off effort) of seven species or groups of species. • Preliminary seasonal group and individual densities for Dall's porpoise, harbor porpoise, humpback whales, fin whales, and killer whales were provided.
GOA			
[G1] Telemetry and Genetic Identity of Chinook Salmon in Alaska (Seitz and Courtney 2025) This project is linked to projects **[N1]** and **[N3]**.	Occurrence	• What is the spatial distribution, movement, vertical distribution, population identity, occupied habitat, and natural mortality of Chinook salmon in the GOA?	In 2024: • Captured 41 Chinook salmon near Sand Point, Alaska; 16 were tagged with pop-up archival transmitting tags (PSATs) and released. Additionally, 200 other Pacific salmon (coho and pink salmon) were captured. • No target-sized Chinook salmon were captured in 12 days of fishing at Dutch Harbor; however, other species caught included juvenile coho salmon, Pacific halibut, black rockfish, and walleye pollock. • 14 tags provided approximately 400 days of depth, temperature, and location data. Two remaining tags are still attached to Chinook salmon and are scheduled to report to satellites in winter/spring 2025. Eleven tags showed signs of predation: 1 by an ectothermic fish; 8 by salmon sharks with a stomach temperature of ~25ºC; 2 by marine mammal(s) with a stomach temperature of 38ºC. Predation events suggest that consumption of tagged Chinook salmon was concentrated in the western GOA. One tag was recaptured in fisheries, and two tags were released for unknown reasons. • Chinook salmon spatial distribution and movement was estimated using a hidden Markov model. • Track distance (curvilinear distance produced from daily location estimates) for fish tagged near Sand Point ranged from 13 km to 181 km (85 ± 58 km, mean ± SD) and 69 km to 1087 km (338 ± 317 km, mean ± SD). • Tissue samples from tagged Chinook salmon will be analyzed by the NMFS Northwest Fisheries Science Center genetics lab to produce stock-origin estimates in 2025. • Preliminary analyses of depth data revealed that mean depths occupied by individual tagged Chinook salmon ranged from 13 m to 70 m.
[G2] PAM for Marine Mammals in the GOA using Bottom-Mounted Devices (Berchok et al. 2025)	Occurrence	• What is the temporal occurrence of the North Pacific right whale and other marine mammals in the GOA?	In 2024: • Recovered three subsurface passive acoustic moorings (PAMs) deployed in the western GOA in fall 2023: the Patton Seamount mooring in August 2024 and the Sanak Bank and Chirikof Island moorings were recovered and redeployed in September 2024. • Processed archived data from three sites for HF sounds; there were no signal detections from beluga whales, ribbon seals, bearded seals, or minke whales. Signals of killer and sperm whales were detected. • Detections of killer whale calls, occurring 81% of the 441 days, were more persistent at the Umnak Pass Site, followed by the Barnabus Trough Site with detections 56% of the 398 days and the Shumagin Islands Site with 28% of the 357 days. • Detections of sperm whales occurred at the Umnak Pass Site only on 34% of the 441 days. • Recovery is planned during the September 2025 mooring cruise for the Sanak Bank Site and Chirikof Island Site moorings. • Analyses of the data recovered in 2024, archival HF, and killer whale ecotypes are ongoing.
[G3/N4] Acoustic and Visual Survey for Cetaceans in Behm Canal and Southern Clarence Strait, Alaska (Zerbini et al. 2024)	*See Project N4 (above, in NWTT)*		

[a] Key: °C = degrees Celsius; BW = beaked whale; BWCV = beaked whale *Circovirus*; CalCOFI = California Cooperative Oceanic Fisheries Investigations; CAS = continuous active sonar; CeMV = cetacean *Morbillivirus*; CeNCOOS = Central and Northern California Ocean Observing System; CRC = Cascadia Research Collective; CY = calendar year; DASBR = Drifting Acoustic Spar Buoy Recorders; dB re 1 µPa = decibels referenced to 1 microPascal; DCLDE = Detection, Classification, Localization, and Density Estimation; DPS = Distinct Population Segment; ESA = Endangered Species Act; FY = fiscal year; GOA = Gulf of Alaska Training; GVP = group vocal periods; HARP = High-frequency Acoustic Recording Package; HF = high-frequency; hr = hour(s); HRC = Hawaii Range Complex; Hz = Hertz; individuals/km^2 = individuals per square kilometer(s); kHz = kilohertz; km = kilometer; m = meter; 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; nDPS = northern distinct population segment; nm = nautical miles; NMFS = National Marine Fisheries Service; NWTT = Northwest Training and Testing; PAM = passive acoustic monitoring; PAS = pulsed active sonar; PMRF = Pacific Missile Range Facility; PPR = peste des petits ruminants; PSAT = pop-up satellite archival tag; qPCR = quantitative polymerase chain reaction; RL = received level; SCC = Submarine Command Course; SCCOOS = Southern California Coastal Ocean Observing System; SCTTR = Southern California Testing and Training Range; SD = Standard Deviation; sDPS = southern distinct population segment; 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.

3 2025 Monitoring Goals

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 (FY).

A quick summary of continuing monitoring projects for CY 2025 are listed in **Table 2** and on the U.S. Navy's MSM Program website:

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

Table 2. 2025 Monitoring projects for U.S. Navy Pacific ranges/study areas.

Range/Study Area	Project Title	Continuing or Proposed New Start
HRC	Marine Mammal Monitoring on PMRF	Continuing from 2003
HRC	Odontocete Studies on PMRF	Continuing from 2011
HRC, SOCAL	Long-term Passive Acoustic Monitoring of Cetaceans at PMRF and SOAR [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
SOCAL	Goose-beaked Whale and Fin Whale Population Dynamics and Impact Assessment at SOAR [a]	Continuing from 2016
SOCAL	Southern California Beaked Whale Occurrence [formerly Passive Acoustic Monitoring of Marine Mammals in SOCAL] [b]	Continuing from 1999
SOCAL	Marine Mammal Sightings During CalCOFI Cruises	Continuing from 2004
MITT	Beaked Whale Occurrence and Behavior in the Marianas	Continuing from 2022
MITT, HRC	Pacific Islands Comprehensive Stranding Investigations	Continuing from 2017
MITT	Analysis of Marine Mammal Strandings: Statistical Approaches	New start in 2024
NWTT	Pacific Northwest Distribution of Southern Resident Killer Whales and Prey	Continuing from 2014[c]
NWTT	Visual and Acoustic Survey for Cetaceans in Behm Canal and Southern Clarence Strait, Alaska	Continuing from 2022
NWTT	Passive Acoustic Monitoring of Harbor Porpoise in Hood Canal, WA	Proposed new start in 2025
NWTT	Acoustic Tagging of Green Sturgeon to Evaluate Habitat Use Along the Washington Coast	Continuing from 2020
NWTT, GOA	Characterizing the Distribution of ESA-listed Salmonids in Washington and Alaska	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	New start in 2024

Notes:

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

[b] Funding permitting, new PAM deployments off Central California are planned in support of Phase IV monitoring; a shift is planned for SOCAL monitoring to change focus from annual observations to specific scientific publications.

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

Key: CalCOFI = California Cooperative Oceanic Fisheries Investigations; ESA = Endangered Species Act; GOA = Gulf of Alaska Training; HRC = Hawaii Range Complex; MFAS = mid-frequency active sonar; MITT = Mariana Islands Training and Testing; NWTT = Northwest Training and Testing; PMRF = Pacific Missile Range Facility; SOAR = Southern California Offshore Anti-Submarine Warfare Range; SOCAL = Southern California Range Complex.

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Phipps, J., I. Silva-Krott, and K.L. West. (in preparation). *Characterization of Macroplastics Ingested by 23% of Stranded Short-finned Pilot Whales (Globicephala macrorhynchus) in the Main Hawaiian Islands (2010–2023).* To be submitted to *Marine Pollution Bulletin*.

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2024 Conference Presentations from U.S. Navy-funded Monitoring

Alongi, G.C., T.A. Helble, R.A. Guazzo, S.W. Martin, C.R. Martin, and E.E. Henderson. 2024. Strengths and weaknesses of using DCLDE algorithms to track baleen whales and examine their behavior using long-term acoustic recordings with a large-scale hydrophone array. Detection, Classification, Localization, and Density Estimation of Marine Mammals Workshop. 3–7 June 2024. Rotterdam, The Netherlands.

Arrieta, G.M., S.M. Wiggins, K.K. Cohen, B.J. Thayre, A. Širović, and S. Baumann-Pickering. 2024. Calling behavior and localization of blue whales in Southern California. Detection, Classification, Localization, and Density Estimation of Marine Mammals using Passive Acoustics. 3–7 June 2024. Rotterdam, Netherlands.

Baggett, L.M., E.R. Snyder, A. Solsona-Berga, K.E. Frasier, J.A. Hildebrand, A. Širović, and S. Baumann-Pickering. 2024. Diving deep: 3D tracking of goose-beaked whale diving behavior in Southern California using fixed hydrophone arrays. Detection, Classification, Localization, and Density Estimation of Marine Mammals using Passive Acoustics. 3–7June 2024. Rotterdam, Netherlands.

Baird, R., A. Harnish, S. Mahaffy, A. Douglas, M. Kratofil, J. Shaff, T. Cullins, S. Stack, J. Currie, and A. Bradford. 2024. The Ongoing Issue of Fishery Interactions Among Endangered Hawaiian False Killer Whales: Repeated Mouthline and Dorsal Fin Injuries, Stock and Sex-specific Trends, and Early-life Interactions. Presentation: 25th Biennial Conference on the Biology of Marine Mammals. 11–15 November 2024. Perth, Australia.

Barrios, D., R. Baird, and M. Kratofil. 2024. Beaked Whales and El Niño: Evidence for ENSO Effects on Blainville's Beaked and Goose-Beaked Whale Space Use in Hawaiian Waters. Presentation: 25th Biennial Conference on the Biology of Marine Mammals. 11–15 November 2024. Perth, Australia.

Brownell, R.L., K.L. West, C.W. Clifton, N.J. Hofmann, and I. Silva-Krott. 2024. Beaked whale stranding events on Pacific Islands (1950-2023): What do they tell us? Poster: 25th Biennial Conference on the Biology of Marine Mammals. 11–15 November 2024. Perth, Australia.

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Henderson, E.E., R.W. Baird, C.R. Martin, M.A. Kratofil, A.E. Harnish, S.W. Martin, and B.L. Southall. 2024. Behavioral Response of Blainville's Beaked Whales (*Mesoplodon densirostris*) to U.S. Navy Training Activity. 8th International Bio-Logging Science Symposium. 4–8 March 2024. Tokyo, Japan.

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Kratofil, M., R. Baird, J. Kiszka, M. Caputo, G. Ylitalo, and D.M. Palacios. 2024. The Role of Environmental and Social Contexts on Space Use of Endangered Hawaiian False Killer Whales. Presentation: 25th Biennial Conference on the Biology of Marine Mammals. 11–15 November 2024. Perth, Australia.

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