

# LMR news

ISSUE 33

SCIENCE • STEWARDSHIP • NAVY READINESS

## Welcome!

Welcome to the latest issue of *LMR News*—the newsletter from the Living Marine Resources (LMR) program. Our goal is to provide you with the latest information about program operations, significant accomplishments and future focus areas for the LMR program. We hope you will find the content useful and that it provides insights into our efforts to improve our understanding of how Navy at-sea training and testing activities could affect marine species—their occurrence in training areas and potential exposure, response and consequences.



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## WHO WE ARE

The LMR program is one of the U.S. Navy's applied research (6.4) programs, sponsored by the Chief of Naval Operations Installations (OPNAV N4I) and managed by the Naval Facilities Command Engineering and Expeditionary Warfare Center (NAVFAC EXWC) in Port Hueneme, CA. The LMR program's fundamental mission is to support the Navy's ability to conduct uninterrupted training and testing, which preserves core Navy readiness capabilities. Our efforts to achieve that mission include working to improve the best available science regarding the potential impacts to marine species from Navy activities, demonstrating and validating projects ready for applied research, and broadening and improving the technology and methods available to the U.S. Navy Marine Species Monitoring Program.

## PROGRAM OFFICE INSIGHTS

It has been a busy spring and summer with proposal reviews and project selections, conferences, the Navy Marine Species Monitoring program's review meeting, field work on multiple projects and getting our 2022 annual report distributed. We cover all of this and more in this issue.

First off, we are saying farewell to one of our LMR Advisory Committee (LMRAC) members, Danielle Kitchen. Danielle has supported the LMR program in two positions over the last decade—for eight years representing our resource sponsor at OPNAV N4I, then for two years representing the Office of the Deputy Assistant Secretary of the Navy, Environment and Mission Readiness (DASN(E&MR)). Danielle brought valuable insights on science, policy and funding to LMR and helped to guide the program's progress. She is now the Branch Chief for the U.S. Geological Survey's Wildlife, Imperiled, and Invasive Species branch within the Wetlands and Aquatic Research Center (WARC). We miss her already and wish her well in her new life in Florida.



Program Manager Anu Kumar and Deputy Program Manager Mandy Shoemaker.

We have three Fiscal Year 2023 (FY23) projects to announce.

Investment Area	Project Number & Title	Principal Investigator(s)	Need
Data to Support Risk Threshold Criteria	Project 64: 3S4—Effect of Continuously Active Sonar and Longer Duration Sonar Exposures	Frans-Peter Lam	N-0238-21 Understanding marine mammal hearing and behavioral response to continuously active sonar
Data to Support Risk Threshold Criteria	Project 67: Measuring Behavioral Responses of Cuvier’s Beaked Whales to Continuously Active Sonar	Brandon Southall Doug Nowacek	N-0238-21 Understanding marine mammal hearing and behavioral response to continuously active sonar
Standards and Metrics	Project 66: SoundCoop	Carrie Bell	N-0260-22 Research that pertains to the LMR Program Investment Areas: Standards and Metrics

Fact sheets on these projects will soon be available on the LMR website.

The FY24 project cycle has started with the Navy Needs process. When the need statements are finalized, we will prepare our pre-proposal solicitation, which we anticipate issuing in October.

We are pleased to share that our most recent annual report, LMR 2022 U.S. Navy’s Living Marine Resources Program Annual Report, is available under the Annual Reports tab on our website, [exwc.navfac.navy.mil/LMR](http://exwc.navfac.navy.mil/LMR). Our annual reports provide an overview of the LMR program’s mission, history and process, updates on all the projects we oversee and a list of the publications that became available during the year.

For a list of the most recent LMR publications, go to the Recent Publications section of this issue. For a spreadsheet listing all LMR-related publications, checkout the Publications tab at our website.

This issue’s Project Spotlight is on two recently completed projects under Investment Area 1: Data to Support Risk Threshold Criteria. See that section to read about the projects.



## IN-PROGRESS REVIEW

A reminder to all principal investigators (PI) and LMR Advisory Committee (LMRAC) members that the 2023 In-progress Review (IPR) is scheduled for the week of November 13, 2023. All PIs and LMRAC members should have received an email from Anu Kumar with hotel details.

## LMR PROJECT SPOTLIGHT

Wondering about some of the LMR-supported projects? This section provides a brief overview of one or more projects underway in the LMR program.

For this issue we present an overview of two closely coordinated projects from Investment Area 1: Data to Support Risk Threshold Criteria that were recently completed.

### Project 23—Cuvier’s Beaked Whale and Fin Whale Behavior During Military Sonar Operations: Using Medium-term Tag Technology to Develop Empirical Risk Functions

### Project 30—Measuring the Effect of Range on the Behavioral Response of Marine Mammals Through the Use of Navy Sonar

These two closely related projects looked at cetacean responses to the mid-frequency active sonar (MFAS) systems used by ships and helicopters. Project 23, led by Greg Schorr and Erin Falcone from Marine Ecology and Telemetry Research (MarEcoTel), used an opportunistic exposure (OE) approach using high-resolution, medium-duration tags to record the behavior of whales before, during and after routine training exercises. Project 30, led by Stephanie Watwood from the Naval Undersea Warfare Center (NUWC) Newport, leveraged

data collection opportunities of Project 23 by adding coordinated sonar exposure experiments (CSEEs) in which helicopter-deployed “dipping” sonar was deployed at specific distances to tagged whales. The focal species were Cuvier’s beaked whales (*Ziphius cavirostris*) and ESA-listed fin whales (*Balaenoptera physalus*),

and the joint goal of these projects was to collect and analyze a comprehensive set of response data across the range of distances and sonar use scenarios under which whales are exposed in the region.

During these projects, whales were tagged on the Southern California Anti-submarine Warfare Range (SOAR). Early efforts used the Lander2 tag,





which captured high-resolution diving, movement, and location data, but did not record acoustics. For these deployments, the team used acoustic data archives from the NUWC Marine Mammal Monitoring on Navy Ranges (M3R) system, combining automated sonar detector outputs and a ship tracking database to model the received levels at the tag during opportunistic sonar exposures. In 2019, Sound and Motion Recording and Telemetry (SMRT) tag replaced Lander2 tag. This new tag, which was developed with funding from the Office of Naval Research, could record acoustic data (including animal vocalizations and sonar at the whale) for up to eight days at 96 kHz, as well as record depth, GPS locations and 3-axis accelerometer and magnetometer readings, for the duration of attachment. Both types of tags could collect these latter data for periods of several weeks, which resulted in hundreds of well-documented sonar exposures.



*Brenda K. Rone, permit 14809*

Under Project 30, the joint MarEcoTel-NUWC field team coordinated with a Navy helicopter squadron to deploy their lower-power sonar systems at pre-defined distances to tagged whales under both exposure and control (i.e., where the sonar was deployed but no sound was transmitted) scenarios. Standard mitigation measures were conducted prior to all CSEEs. This more controlled approach was motivated by prior response studies on SOAR that indicated animals may react more strongly to dipping helicopter sonar than to the more powerful ship sonar at similar received sound levels. This suggested that factors other than just sound level, including the distance to the source, the type of source and perhaps the context in which the source is used, contribute to the animals' reactions. Augmenting the opportunistic data with the controlled dipping exposures offered a way to tease apart some of these factors and to ensure data were collected across a broad range of distances and received levels. It also provided more precise knowledge of the sonar timing, distance and the source characteristics, which can sometimes be difficult to ascertain from purely opportunistic data.

Field efforts under Project 23 began in 2017 and continued in 2018, 2019, 2021 and 2022. The CSEEs began in 2018, with three coordinated helicopter dips, two with exposure and one as a silent control, of two tagged Cuvier's beaked whales that year. Four additional CSEEs were completed in 2019.

Unfortunately, CSEE efforts planned for 2020 were canceled due to COVID restrictions. OE tagging resumed in 2021, with tag deployments for both projects totaling 21 by the close of 2022.

The joint project teams completed tag audits and sonar data compilation and integrated all data into an analytical framework developed for this work via a collaboration with Stacy DeRuiter at Calvin University, which supported both fine and coarse time scale analyses. The fine scale framework applied a hierarchical hidden Markov model to all data from SMRT tags that had acoustics. In addition to this primary analysis, the team also used the concurrent accelerometer and acoustic data from SMRT tags to develop a method to identify foraging behavior when acoustic data are not available, such as from the Lander2 tags. An article summarizing this method was published in 2022, along with two other manuscripts that used collateral data collected during these projects (see Publications sidebar for citations). Several additional manuscripts using project data are in preparation.

These projects have collected invaluable high-resolution behavioral data, including accurate horizontal movements, surrounding real MFAS exposure from both beaked and fin whales. These extensive data sets include responses to novel sonar signal types, such as Continuous Active Sonar (CAS), as well as to explosives or other impulsive sounds and predators. A total of three CAS exposures were captured (one exposure was captured by two different animals), representing the first time an animal-borne tag on a Cuvier's beaked whale captured CAS exposures. The CAS exposure with the highest received level (131 dB re 1  $\mu$ Pa RMS) was associated with a 17.7-hour foraging disruption, the longest recorded out of our entire data set of more than 5,700 hours of tag data, suggesting further research is needed on this signal type in this area.

Another valuable outcome of Project 30 was an evaluation of received level modeling approaches. The team compared received levels from the Naval Postgraduate School model and from the Navy Acoustics Effects Model (NAEMO) to those recorded on exposed tags. The results of this work can also help refine analytical methods and to inform the use of acoustic modeling results in this and other response studies.

While results are still being finalized, the best fitting model of the SMRT tag data with acoustics from both the CSEE and OE data sets continues to suggest that the probability of transition to the 'response' state depends more on source-whale distance than on sonar received level, with whales more likely to transition to a response as the distance to sonar decreases. The improved understanding of how and when whales respond supports better estimates of the potential effects of sonar use on Cuvier's beaked whales and fin whales within the Southern California ranges. In addition to the behavioral response

results, these projects demonstrated successful coordination with the Navy helicopter squadron that made possible the results. Collateral data, such as individual identification photographs and cue rate data, are contributing to multiple Navy-funded studies. Data analysis methods developed for use with medium-duration archival tags are being contributed to an existing online repository ([animaltags.org](http://animaltags.org)), along with documentation and instructional vignettes. These methods are readily transferrable to other species and geographic regions where the Navy needs similar data to estimate the effects of its activities.

## PUBLICATIONS TO DATE

Sweeney, D., Schorr, G., Falcone, E., Rone, B., Andrews, R., Coates, S., Watwood, S., DeRuiter, S., Johnson, M. and Moretti, D. (2022). Cuvier's beaked whale foraging dives identified via machine learning using depth and triaxial acceleration. *Marine Ecology Progress Series*, 692:195-208. DOI 10.3354/meps14068.

Coomber, F.G., Falcone, E.A., Keene, E.L., Cárdenas-Hinojosa, G., Huerta-Patiño, R. and Rosso, M. (2022). Multi-regional comparison of scarring and pigmentation patterns in Cuvier's beaked whales. *Mammalian Biology*, 102:733-750. DOI 10.1007/s42991-022-00226-6.

Curtis, K.A., Falcone, E.A., Schorr, G.S., Moore, J.E., Moretti, D.J., Barlow, J. and Keene, E. (2020). Abundance, survival, and annual rate of change of Cuvier's beaked whales (*Ziphius cavirostris*) on a Navy sonar range. *Marine Mammal Science*, 37(2):399-419. DOI 10.1111/mms.12747.

Barlow, J., Schorr, G.S., Falcone, E.A. and Moretti, D. (2020). Variation in dive behavior of Cuvier's beaked whales with seafloor depth, time-of-day, and lunar illumination. *Marine Ecology Progress Series*, 644:199-214. DOI 10.3354/meps13350.

## Publications acknowledging data from these projects

Falcone, E.A., Keene, E.L., Keen, E.M., Barlow, J., Stewart, J., Cheeseman, T., Hayslip, C. and Palacios, D.M. (2022). Movements and residency of fin whales (*Balaenoptera physalus*) in the California Current System. *Mammalian Biology*, 102:1445-1462. DOI 10.1007/s42991-022-00298-4.

Jones-Todd, C.M., Pirodda, E., Durban, J.W., Claridge, D.E., Baird, R.W., Falcone, E.A., Schorr, G.S., Watwood, S.L. and Thomas, L. (2022). Discrete-space continuous-time models of marine mammal exposure to Navy sonar. *Ecological Applications*, 2(1):e02475. DOI 10.1002/eap.2475.

Barlow, J., Fregosi, S., Thomas, L., Harris, D. and Griffiths, E.T. (2021). Acoustic detection range and population density of Cuvier's beaked whales estimated from near-surface hydrophones. *The Journal of the Acoustical Society of America*, 149(1):111. DOI 10.1121/10.0002881.

Keen, E.M., Scales, K.L., Rone, B.K., Hazen, E.L., Falcone, E.A. and Schorr, G.S. (2019). Night and day: Diel differences in ship strike risk for fin whales (*Balaenoptera physalus*) in the California Current system. *Frontiers in Marine Science*, 6:730. DOI 10.3389/fmars.2019.00730.

## PROGRAM PARTICIPANT UPDATES

### Marine Species Monitoring Program

The Seymour Marine Discovery Center at the University of California Santa Cruz coastal campus was the setting for a recent research and monitoring summit organized by the Navy Marine Species Monitoring (MSM) program. With significant advancements in scientific knowledge and monitoring technologies during the 15 years since the program was established, the MSM program is looking ahead to a refreshed strategic plan. The first two days of the three-day meeting were dedicated to presentations on the MSM program history, projects that

have been expanding our knowledge about marine species on Navy ranges, and the monitoring work conducted to meet requirements of the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) for at-sea



training and testing activities. The second day also included an informal tour of the adjacent Joseph M. Long Marine Laboratory to see dolphins, a Hawaiian monk seal, a bearded seal and a California sea lion who are all participating in important hearing, bioacoustics and cognition studies.

The third day focused on discussions among Navy, National Marine Fisheries Service (NMFS) and Marine Mammal Commission (MMC) representatives regarding the evolving science, changing climate and future priorities for ESA and MMPA compliance monitoring.

To promote a variety of perspectives, the roughly 60 participants (mostly in-person with some online) represented NMFS, MMC, Bureau of Ocean Energy Management and scientific experts supporting related research and monitoring efforts. Navy participants represented the Secretary of the Navy, Office of the Chief of Naval Operations, both the Atlantic and Pacific fleets, multiple commands (Naval Facilities Engineering Systems, Naval Sea Systems, Naval Air Systems, Naval Information Warfare Center Pacific and Naval Undersea Warfare Center Newport), and the MSM program's research and development partners, Office of Naval Research Marine Mammal Biology program and LMR.

The valuable input from the both the formal and informal discussions will help to direct the Navy's marine species monitoring strategic planning process and continue the evolution of the MSM program. For more information on the MSM program, see [www.navy-marine-species-monitoring.us](http://www.navy-marine-species-monitoring.us).



## Acoustical Society of America meeting

This year's Acoustical Society of America meeting in Chicago had several great presentations on advancements in bioacoustics research. One session of note for LMR was hosted by two LMR-funded scientists, Dorian Houser and Jim Finneran. It was a special session on the captive animals Dorian and Jim work with and the animals' contributions to science. Many of the studies they presented were funded by the Navy and LMR. It was a fun twist on traditional science presentations, with the scientists highlighting how the individual animals are major participants in and contributors to research. Many of the animals have unique abilities to be trained to partake in complex and sometimes adventurous tasks. It was humbling to hear the scientists talk about the animals with such admiration and respect for their roles in the research, leaving barely a dry eye in the audience. It reminds us that we have a limited opportunity to work with these animals in captivity and we should prioritize their involvement in future research.

## Hawaii Region Meeting

The LMR program strives to keep up with the latest research and future research needs in Navy regions. This summer, the program managers traveled to Oahu to meet with personnel at the National Oceanic and Atmospheric Administration's

Pacific Islands Fisheries Science Center, researchers at the University of Hawaii, and NAVFAC Pacific, Commander Pacific Fleet to learn about their current work and discuss future directions.

While in Kauai, the program managers observed and participated in a study funded by the Navy's Marine Species Monitoring Program during a Submarine Commanders Course (SCC) training event. The study involved passive acoustic monitoring by the Naval Undersea Warfare Center and Naval Information Warfare Center and tagging by Cascadia Research Collective. These meetings and experiences provided valuable insight on future LMR research needs that would support the Navy's Pacific region interests.



LMR program managers Mandy Shoemaker (left) and Anu Kumar (right) with Beau Richter, curator at Sea Life Park, at the Park's monk seal exhibit. Kekoa, the monk seal in this exhibit, was the first monk seal to participate in LMR's Project 32 Behavioral Assessment of Auditory Sensitivity in Hawaiian Monk Seals.

## LMR INVESTMENT AREAS

The LMR program focuses its research funding in five investment areas:

### 1. Data to Support Risk Threshold Criteria

Collect data to improve the Navy's acoustic and explosive impact assessments and validate mitigation requirements, information critical to the Navy's environmental compliance and permitting process. This includes data on how well animals can hear, how and when animals may be exposed to acoustic and explosive sources, and how animals respond or are affected when exposed. Projects in this area can include hearing studies, sound exposure and behavioral response studies.

### 2. Data Analysis and Processing Tools

Make required monitoring program data processing and analysis more efficient and cost-effective. This includes developing tools to automate the processing of large amounts of data to reduce costs, increase efficiency and provide consistency. These tools support the Navy's environmental compliance process and permitting process. Projects in this area can include new detection and classification algorithms, improvements to software programs, or development of novel analytical methods.

### 3. Monitoring Technology Demonstrations

Continue to develop and demonstrate technologies that can improve field data collection methods. The technologies enable efficient and cost-effective implementation of the Navy's Marine Species Monitoring program. Examples include new monitoring technologies and platforms, including sensors, tags, moored devices, buoys, gliders and REMUS 600s.

### 4. Standards and Metrics

Work to establish interagency and scientific community standards and metrics for data collection, management and analysis. This promotes data comparability and enables data aggregation from different data sets. It ensures consistent, agreed-upon standards and metrics in order to provide cost-effective improvements to data and results that can be incorporated into the environmental compliance process. Projects in this area can include standards for data collection methods, standardized data management tools, and new metrics for reporting performance of data analysis methods.

### 5. Emergent Topics

This investment area is reserved for other priority topics needed by the Navy that may come up and do not fall within the preceding topics.

## PROJECT STATUS UPDATES

We have updates of field efforts from five different projects.

### Project 35—Multi-spaced Measurement of Underwater Sound Fields from Explosive Sources

*Peter Dabl, PI*

This project is working to update the Navy's Acoustic Effects Model (NAEMO) by conducting calibrated underwater acoustic field measurements associated with explosive detonations.

After multiple COVID-related scheduling delays, the project team successfully completed a field test in July off the coast of San Clemente Island. The University of Washington and Naval Research Laboratory teams successfully obtained *in-situ* data on the acoustic propagation of six near surface detonations. The Explosive Ordnance Disposal Mobile Unit Three (EODMU THREE) coordinated with the teams to conduct these detonations in a controlled manner so that detailed information on the depth, shape and size of the charge could be obtained. Prior to the detonations, the tagging team from Marine Ecology and Telemetry research group tagged two Cuvier's beaked whales, two blue whales and a fin whale with SMRT tags. These tags will provide acoustic and behavioral data from these animals before and after the detonations. The *in-situ* data will be compared to the NAEMO results for the same input details (depth, shape, size of charge).



Near surface detonation.  
*Anu Kumar*



## Project 37—Collection of AEP Thresholds in Minke Whales

*Dorian Houser, PI*

This project, one of three projects funded under the Subcommittee on Ocean Science and Technology (SOST) partnership, is collecting auditory evoked potential (AEP) hearing thresholds for one mysticete species, the minke whale (*Balaenoptera acutorostrata*). (For background information, see the SOST Partnership tab on the LMR website, [exwc.navfac.navy.mil/LMR](http://exwc.navfac.navy.mil/LMR))

During its third field season, the team safely conducted the first-ever hearing tests on two wild minke whales in Norway. The team successfully measured the auditory brainstem response (ABR) of the first whale using broadband chirps (short frequency upsweeps). Identifying the ABR was the first step in determining the hearing test parameters necessary to move to more frequency-specific hearing tests. In the second whale, the team replicated measurements with the ABR with chirp stimuli and then performed more frequency-specific hearing tests with tone pips (short bursts of sound at a particular frequency). Although insufficient time was available to take any individual frequency tests of hearing threshold (the lowest level of sound that can be heard), the team was able to gather enough information to estimate the upper-frequency limit of hearing in the minke whale. Information on the upper-frequency limit of hearing in the minke significantly improves the government's posture on how it addresses potential acoustic impacts to mysticete whales by delineating sound sources of concern based on their operational frequencies. Additional testing should provide information on frequency-specific hearing thresholds, as well as the decline in hearing sensitivity at lower frequencies.

*Lofoten, Norway field effort photos by Anu Kumar and Mandy Shoemaker.*









## Project 57—Demonstrating Suction-cup Tag Systems to Support Behavioral Response Studies

*Patrick Miller, PI*

This project is working to demonstrate, maintain and iteratively improve the capabilities of existing state-of-the-art mixed-DTAG++ and integrated-DTAG systems.

During June and July, the team tagged 14 whales (eight killer whales, two humpbacks and four long-finned pilot whales). Capabilities tested included ARGOS and GPS-Argos, Goniometer tracking and video-data recording units. ARGOS and GPS-Argos performance was quantified for 11 of the 14 deployments that had a duration greater than one hour. Real-time Goniometer tracking was conducted for five deployments. The performance of both Mixed-DTAG++ and integrated DTAGs was evaluated with outstanding performance for functionality of the LOTEK GPS-Argos units (with both tag types), and the Little Leonardo video-data units (with Mixed-Dtag++). Nine of the 14 deployments of the Mixed-Dtag++ included the new Little Leonardo video-data recording units. All nine deployments recorded high-quality video for 6–8 hours and high-quality depth and accelerometer data for 24 hours. The data from this field demonstration and testing will allow the team to finalize the new design that will be used for the upcoming field effort for LMR project 64 3S4: Effect of Continuously Active Sonar and Longer Duration Sonar Exposures.



Mixed-Dtag++ being attached to a humpback whale in Iceland.

*Tatiana Marchon*



Integrated-Dtag attached to a long-finned pilot whale in Iceland.

*Tatiana Marchon*

## Project 59—Long-term Sparse Array Localization Feasibility Study using a SonarPoint System

*Marco Flagg, PI*

This project is assessing the functionality and durability of a SonarPoint sparse array for detecting and locating a variety of marine mammal species.

The project has completed its first two instrument deployments in Monterey Bay. In each effort, the project team deployed five SonarPoint devices. The first effort, initiated in late April and completed in late May, successfully deployed and retrieved all five devices. The second deployment, from late July to mid-August, had retrieval issues, with only two devices retrieved. The project team is continuing work to retrieve the remaining three devices.

## Project 63—Caller-ID [CETACID]: Validating Approaches for Identifying Focal Communication Signals Using Acoustic Recording Tags

*Frants Jensen, PI*

This project is testing a suite of methods to identify calls of both baleen and toothed whales in tag data to identify which of the detected calls are associated with the tagged individual. This field effort began collecting acoustic data for project analyses.

The project team successfully tagged a total of 23 humpback whales with new DTAG-4 tags during a 10-day field effort in Stellwagen Bank during July. The new DTAG-4 configuration, from LMR project 56 Integration and Field Evaluation of the Next

Generation High-fidelity Sound and Movement Tags to Investigate Behavioral Response, worked well. The team was able to conduct targeted tagging of small groups of humpback whales on the foraging ground and to test different accelerometer sensitivity settings to trial caller-ID algorithms. The results will inform next year's field experiments.



Humpback whales.

## RECENT PUBLICATIONS

This section includes recent publications and reports resulting from projects that are or have been partially or fully funded by the LMR program. The information provided in the publications is of significant value to the Navy's at-sea environmental compliance process and directly feeds into the National Environmental Policy Act, Marine Mammal Protection Act and Endangered Species Act compliance documentation.

Finneran, J.J., Lally, K., Strahan, M.G., Donohoe, K., Mulsow, J. and Houser, D.S. (2023). Dolphin conditioned hearing attenuation in response to repetitive tones with increasing level. *The Journal of the Acoustical Society of America*, 153(1). DOI 10.1121/10.0016868.

Finneran, J.J., Schlundt, C.E., Bowman, V. and Jenkins, K. (2023). Dolphins reduce hearing sensitivity in anticipation of repetitive impulsive noise exposures. *The Journal of the Acoustical Society of America*, 153 (6). DOI 10.1121/10.0019751.

Helble, T.A., Guazzo, R.A., Durbach, I.N., Martin, C.R., Alongi, G.C., Martin, S.W. and Henderson, E.E. (2023). Minke whales change their swimming behavior with respect to their calling behavior, nearby conspecifics, and the environment in the central North Pacific. *Frontiers in Marine Science*, 10. DOI 10.3389/fmars.2023.1148987.

Kastelein, R.A., Smink, A. and Jennings, N. (2023). Atlantic Green Turtles and Hawksbill Turtles: Behavioral Responses to Sound. In: Popper, A.N., Sisneros, J., Hawkins, A.D., Thomsen, F. (eds) *The Effects of Noise on Aquatic Life*, Springer, Cham. [https://doi.org/10.1007/978-3-031-10417-6\\_75-1](https://doi.org/10.1007/978-3-031-10417-6_75-1).

Mulsow, J., Finneran, J.J., Strahan, M.G., Houser, D.S. and Burkard, R.F. (2023). Input compensation of dolphin and sea lion auditory brainstem responses using frequency-modulated up-chirps. *The Journal of the Acoustical Society of America*, 154(2):739–750. DOI 10.1121/10.0020566.



Bottlenose dolphins.  
Wayne Hoggard, NOAA



Mulsoy, J., Schlundt, C. E., Accomando, A. W., and Finneran, J. J. (2022). Temporary threshold shift from continuous 20-40 kHz hyperbolic upsweeps in bottlenose dolphins (*Tursiops truncatus*). *The Journal of the Acoustical Society of America*, 152(4):A108. DOI 10.1121/10.0015705.

Salas, A.K., Capuano, A.M., Harms, C.A., Piniak, W.E.D. and Mooney, T.A. (2023). Calculating Underwater Auditory Thresholds in the Freshwater Turtle *Trachemys scripta elegans*. In: Popper, A.N., Sisneros, J., Hawkins, A.D., Thomsen, F. (eds) *The Effects of Noise on Aquatic Life*. Springer, Cham. [https://doi.org/10.1007/978-3-031-10417-6\\_142-1](https://doi.org/10.1007/978-3-031-10417-6_142-1)

Smith, A.B., Fischer-McMorrow, I., Kolbeinsson, Y., Rasmussen, M.H., Shero, M., McElwaine J.N. and Mooney, T.A. (2023). Acoustic ecology of a deep-diving seabird: Sensitive aerial hearing and noisy nesting soundscapes in the common murre (*Uria aalge*). *Marine Ecology Progress Series*, 714: 87-104. DOI 10.3354/meps14346.

Smith, A.B., Kissling, M., Capuano, A.M., Lewis, S.B. and Mooney, T.A. (2023). Aerial hearing thresholds and ecoacoustics of a threatened pursuit-diving seabird, the marbled murrelet (*Brachyramphus marmoratus*). *Endangered Species Research*, 50:167-179. DOI 10.3354/esr01234.

Zeh, J.M., Dombroski, J.R. and Parks, S.E. (2022). Preferred shallow-water nursery sites provide acoustic crypsis to southern right whale mother-calf pairs. *Royal Society Open Science*, 9(5):220241. DOI 10.1098/rsos.220241.

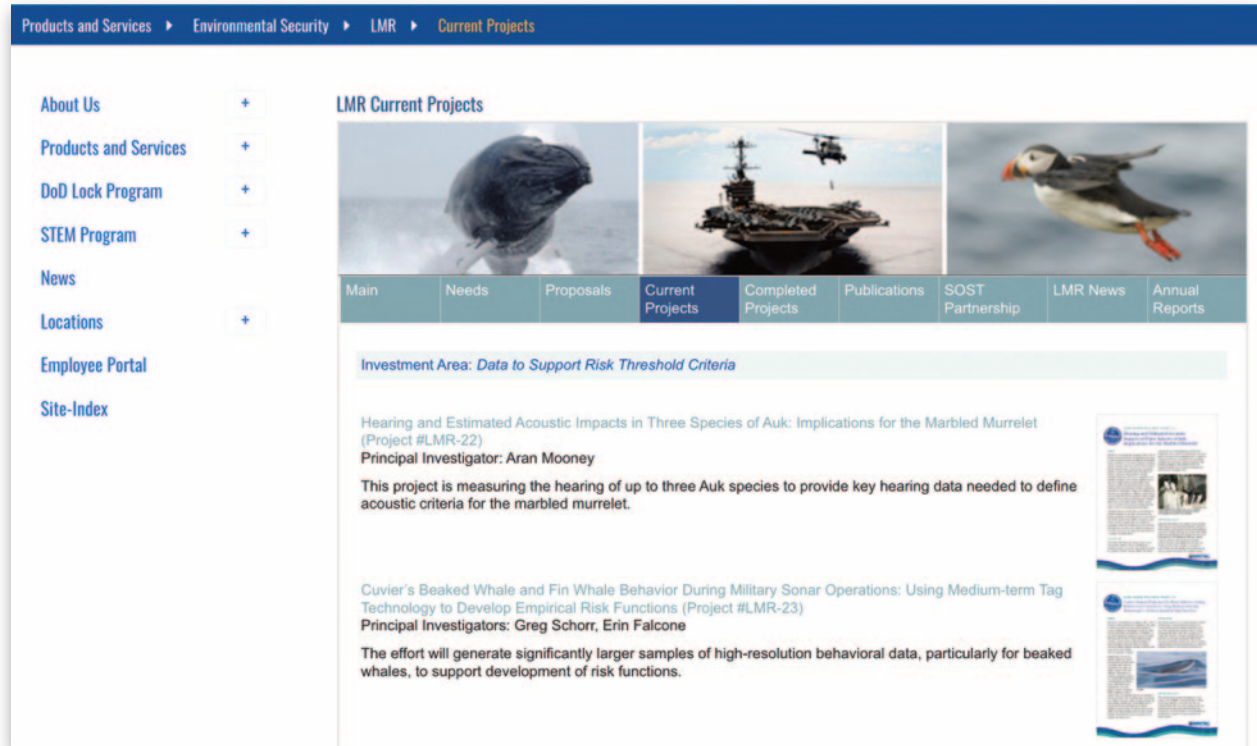
As a reminder, the full and updated publication spreadsheet, which includes these entries, is available on our website.

## PROGRAM SCHEDULE

No.	What	When
1.	Proposal Solicitation & Review	
a.	FY24 Needs Approval	September 2023
b.	FY24 Pre-proposal Solicitation Announcement	October 2023
2.	Quarterly Status Reports (QSR)	
a.	Submit fall QSR	October 31, 2023 (effort from July–September)
b.	Submit winter QSR	January 31, 2024 (effort from October–December)
c.	Submit spring QSR	April 28, 2023 (effort from January–March)
d.	Submit summer QSR	July 31, 2023 (effort from April–June)
3.	In-progress Review	November 13–17, 2023

## OUR WEBSITE

At our website—[exwc.navfac.navy.mil/lmr](http://exwc.navfac.navy.mil/lmr)—you can find links to all our informational materials, including fact sheets, an updated publication spreadsheet and our 2022 annual report.



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## CONTACT THE LMR PROGRAM

For more information about the LMR program and its operations, contact Anu Kumar, Program Manager, at [exwc\\_lmr\\_program@navy.mil](mailto:exwc_lmr_program@navy.mil) and 805-982-4853.

## IN THE NEXT ISSUE OF *LMR NEWS*

Our next issue will provide available information on the pre-proposal selection process and updates on multiple ongoing projects.

# [exwc.navfac.navy.mil/lmr](http://exwc.navfac.navy.mil/lmr)