WINTER/SPRING 2018

LMR news

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.

INSIDE THIS ISSUE

Hawaiian monk seal.
Morgan W. Richie

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NAVFAC Naval Facilities Engineering Command
ENGINEERING AND EXPEDITIONARY WARFARE CENTER

WHO WE ARE

The LMR program is one of the Navy's applied research (6.4) programs, sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division (OPNAV N45) 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 preserve 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

In addition to all of the information provided throughout this issue of *LMR News*, we have a few topics we want to highlight.

Members of the LMR Advisory Committee (LMRAC) and program staff have been focused on careful review of full proposals for 2018 projects. The final decisions on project proposals are anticipated in June 2018.

It is time for us to collect Need topics. The needs chosen through this annual process are an important part of defining the LMR research portfolio. Anyone within the Navy may submit needs for consideration by the LMR program. Non-Navy personnel can discuss need ideas with a Navy employee for consideration. The Navy employee can choose to sponsor and submit externally-generated needs as appropriate. Submitted needs are validated and ranked by the LMRAC, and then recommendations are made to the OPNAV N45 resource sponsor. The deadline for submitting needs is June 29, 2018. For additional details on submitting needs, see the program website at navysustainability.dodlive.mil/lmr.

Anu Kumar, Program Manager

We presented our annual programmatic brief to our sponsor, OPNAV N45, in January. This event is a valuable opportunity not only for us to present the current status of the program to our leaders in Washington but to receive feedback on what the Navy needs from LMR's work. It is critical that all program participants maintain their efforts to ensure that their projects remain focused on LMR's fundamental mission—supporting the Navy's ability to conduct uninterrupted at-sea training and testing, which preserve core Navy readiness capabilities. It reinvigorates our commitment to keeping projects trained on the needs of the Navy end-user.

Watch you email and our website for the soon-to-be-released 2017 LMR Program Report on the status of the LMR program. This annual document reviews the program's mission and history and provides updates on LMR projects.

This issue's LMR Partnership Updates section focuses on sonobuoys; our Project Spotlight summarizes one of our 2017 projects; the Program Participants Update section highlights two field efforts, an M3R award and the annual monitoring program meeting; and we list recent publications from program projects.

Right whales.
NOAA/NMFS

LMR PARTNERSHIP UPDATES

The Sonobuoy Liaison Working Group (SLWG) assisted the LMR program in submitting a request to augment the sonobuoy allotment for FY18. The request was generously granted by Naval Air Systems Command (NAVAIR), which increased the number of sonobuoys available for researchers this year. The base request of 480 sonobuoys was augmented by 192 for a total of 672 devices. This enabled the LMR program to meet some of the added requests for the 2018 field season. These sonobuoys are playing a significant role in expanding our data sets, and thus knowledge, related to where animals occur and when they are present.

Projects and organizations receiving sonobuoys are listed in the following table.

Project	Organization
Atlantic Marine Assessment Program for Protected Species (AMAPPS) and North Atlantic right whale aerial surveys	NOAA Northeast Fisheries Science Center
California Cooperative Oceanic Fisheries Investigations (CalCOFI) surveys	Scripps (UC San Diego)
Density Estimation for Cetaceans from Acoustic Fixed Sensors in Testing and Evaluation Areas (DECAF-TEA) and controlled exposure experiments	Naval Undersea Warfare Center (NUWC)
Gulf of Mexico Assessment Program for Protected Species (GOMAPPS) surveys	National Marine Fisheries Service Southeast (NMFS SE)
International Whaling Commission Pacific Ocean Whale and Ecosystem Research (IWC POWER), North Pacific Research Board (NPRB), Arctic Integrated Ecosystem Research Program (IERP), and NOAA Pacific Marine Environmental Laboratory surveys	NOAA Marine Mammal Laboratory/ Alaska Fisheries Science Center
Southern California (SOCAL) offshore surveys	National Marine Fisheries Service Southwest (NMFS SW)
Washington/Alaska surveys	Bio-Waves, Inc.

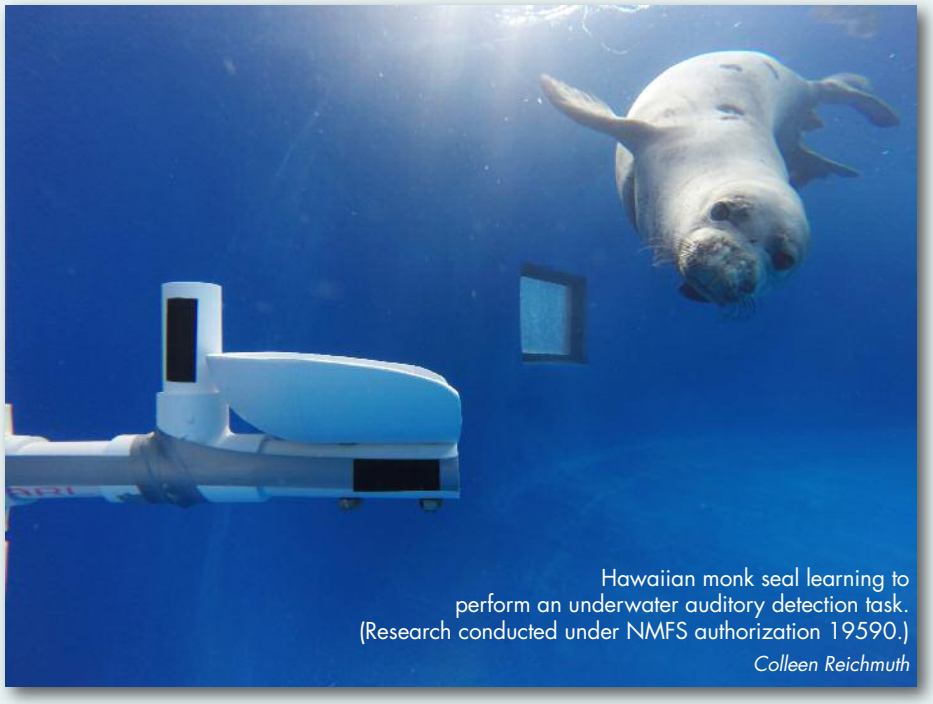
LMR PROJECT SPOTLIGHT

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 a project started in 2017, *Behavioral Assessment of Auditory Sensitivity in Hawaiian Monk Seals*.

Behavioral Assessment of Auditory Sensitivity in Hawaiian Monk Seals

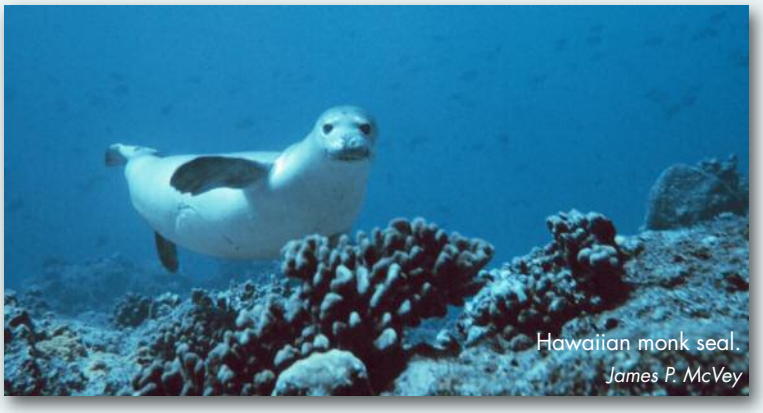
Navy training and testing activities occur in waters surrounding the Hawaiian Islands, with some activities in areas overlapping habitat for the ESA-listed Hawaiian monk seal (*Neomonachus schauinslandi*). As with other species, the Navy works to have appropriate information that supports science-based decisions relative to possible effects of naval and other anthropogenic activities on these marine mammals. However, in the case of the monk seal, there is little bioacoustic information such as hearing abilities and production of underwater sounds.



Hawaiian monk seal learning to perform an underwater auditory detection task. (Research conducted under NMFS authorization 19590.)
Colleen Reichmuth

This project, being conducted by Drs. Colleen Reichmuth and Jillian Sills at the Institute of Marine Sciences, University of California at Santa Cruz, is obtaining reliable measures of underwater auditory sensitivity thresholds across the full frequency range of hearing. The resulting data will be used to generate an underwater audiogram that will help to support impact assessments of the Hawaiian monk seal's sensitivity to sound.

The team is working with an adult male Hawaiian monk seal currently in residence at the University of California at Santa Cruz's Long Marine Laboratory. The seal was previously trained for cooperative physiological research. The seal's hearing is being tested during auditory signal detection trials while diving in an acoustically calibrated pool. The seal is trained to report the presence of a tone by touching a target, and to withhold responding in the absence of the tone. During the test, the tone's amplitude (generally considered to be the sound level) is progressively varied from an easily detectible level to an undetectable level. This approach makes it possible to measure the minimum sound levels reliably detected by the seal at a range of frequencies.



Hawaiian monk seal.
James P. McVey

The seal is trained to report the presence of a tone by touching a target, and to withhold responding in the absence of the tone.

Experimental conditions are carefully controlled to minimize potential effects of unintended environmental sounds or behavioral cueing. The resulting underwater hearing profile, or audiogram, will provide reliable information about the monk seal's ability to detect sounds that may be present in natural environments.

The results will allow the Navy to improve impact assessments and better estimate the potential acoustic effects on monk seals resulting from Navy training and testing activities.

LMR PROGRAM PARTICIPANT UPDATES

Field efforts, an award and an annual monitoring meeting are among some of the recent highlights for LMR participants.

Field efforts

IRAP technology demonstration

The OASIS Inc. project team completed a demonstration of the Integrated Real-time Autonomous Passive Acoustic Monitoring System (IRAP) at the Southern California Offshore Range (SCORE) in January, 2018. This technology demonstration for LMR project 12 sought to autonomously detect and classify both high frequency (HF) beaked whale click trains and low frequency (LF) humpback whale vocalizations. The demonstration used a REMUS 600 with the OASIS high frequency and low frequency sensors.

The team worked with the Space and Warfare Systems Center range tracking and the M3R (Marine Mammal Monitoring on Ranges) systems for real time localization. This information revealed areas for the IRAP system operation and provided comparison with IRAP system observations. Preliminary examination of results show probable detection and classification of beaked whale click trains on the HF sensor (>40 hours of HF and LF sensor data collected). A report of complete results is being prepared.

Humpback whale. *NOAA/NMFS*

Medium-term tags on beaked whales

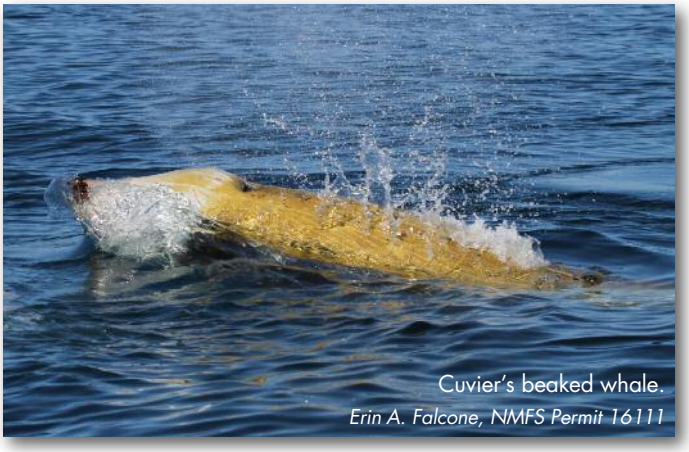
The MarEcoTel team, leading the field-effort portion of LMR projects 23 and 30, successfully deployed multiple new medium-term archival tags on Cuvier's beaked whale on SCORE. These tags are providing the longest continuous, high-resolution dive data from Cuvier's that have ever been collected. The long attachment times provided detailed data for both baseline and exposed behavior. These tags are bridging gaps previously experienced when choosing between either high-resolution but very short-term suction cup attached tags or longer-term low-resolution satellite tags to assess Cuvier's behavioral response to sonar.

These projects together are using two approaches to assessing response to sonar exposures:

1) Collecting data on responses to opportunistic exposures, which occur simply due to the tag attachment time and the operational tempo of SCORE.

2) Conducting coordinated sonar exposure experiments with helicopters deploying dipping sonar. This second effort entails coordinating a sonar exposure from helicopter at a known time and location with known sonar parameters, all based around the location of the tagged whale. Having retrievable, high-resolution tags that stay on the animal for longer times supports a more detailed understanding of behavioral response.

Many thanks to SCORE, the Third Fleet and Helicopter Strike Wing, U.S. Pacific Fleet for making this work possible and to the M3R team for helping to locate animals on-range.



Cuvier's beaked whale.
Erin A. Falcone, NMFS Permit 16111

Awarded

Congratulations to the M3R team

The National Association of Environmental Professionals (NAEP) presented its 2018 Best Available Environmental Technology award to the Naval Undersea Warfare Center Division Newport's Marine Mammal Monitoring on Navy Ranges (M3R) Team. The team was honored during the NAEP annual conference in March, 2018. The award in this category recognizes those "using creative and effective adaptations of existing, new, or emerging technologies or methodologies."

This project was initiated under the Office of Naval Research Marine Mammal Biology program, then transferred to the LMR program for testing and demonstration. The LMR phase of the project was completed in 2016 when M3R was ready to be implemented. M3R continues to play an important role in several ongoing LMR projects, providing both localization data during field efforts and valuable data for later analyses.

For more on these three projects, see the project summary on the LMR website, navysustainability.dodlive.mil/LMR, under the Current Projects tab.

2018 US Navy Marine Species Monitoring Technical Review Meeting

Several members of the LMR program, including Program Manager Anu Kumar and Deputy Program Manager Mandy Shoemaker, participated in the Navy Marine Species program's annual technical review. This meeting provides an important forum for representatives from Navy, National Marine Fisheries Service, and Marine Mammal Commission to hear about the Navy-supported monitoring work done in both the Atlantic and Pacific during 2017. The presentations and discussions help to identify what is working well and where new approaches might be needed in the marine species monitoring efforts. For more information, go to www.navymarinespeciesmonitoring.us/news.

IN-PROGRESS REVIEW 2018

LMR Principal Investigators and LMRAC members are reminded to mark their calendars for the 2018 IPR. It will be held the week of 03 December in Ventura, California. Email with specific details will be sent soon.

RECENT PUBLICATIONS

This section includes recent publications and reports resulting from projects that are 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.

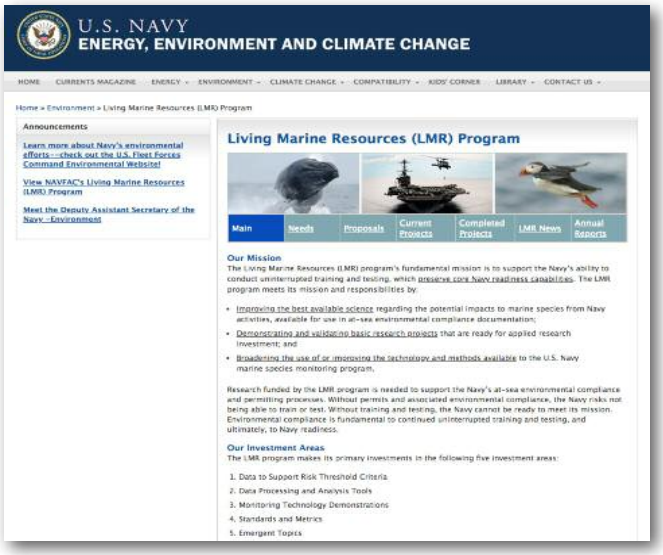
Pilot whales.
Rune Roland Hansen, Norwegian Animal Research Authority permit 2015/223222

Harris C.M., Thomas L,. Falcone E.A., et al. (2018). Marine mammals and sonar: dose–response studies, the risk-disturbance hypothesis and the role of exposure context. *Journal of Applied Ecology* 2018; 55:396–404.

Henderson, E. E., Helble, T. A., Ierley, G., and Martin, S. (2018). Identifying behavioral states and habitat use of acoustically tracked humpback whales in Hawaii. *Marine Mammal Science*, 05 January 2018.

Mellinger, D.K., Lending C., Nieukirk, S.L., and Heimlich, S.L. (2018). Extensible detection and classification in Ishmael. *The Journal of the Acoustical Society of America* 143, 1727.

For lists of other publications, please see our FY16, FY15 and FY14 program reports and recent issues of *LMR News*.



OUR WEBSITE

Our website address has changed. The new address is navysustainability.dodlive.mil/LMR. There you can find project highlights, our annual reports and other LMR information.

navysustainability.dodlive.mil/LMR

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.

PROGRAM SCHEDULE

No.	What	When
1.	**Proposal Solicitation & Review**	
a.	FY18 BAA Notify Submitters of full proposal evaluation results	May/June, 2018
b.	FY19 Needs Submissions	June 29, 2018
c.	FY19 BAA	August, 2018
2.	**Project & Contracts Management**	
a.	FY18 New Start Contracts	September 30, 2018
3.	**Quarterly Status Reports (QSR)**	
a.	Submit summer QSR	July 31, 2018
b.	Submit fall QSR	October 31, 2018
c.	Submit winter QSR	January 31, 2019
d.	Submit spring QSR	April 30, 2019

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If you want to subscribe to, or unsubscribe from, *LMR News*, please send your email address to Lorraine Wass at ljwass@outlook.com.

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 and 805-982-4853.

IN THE NEXT ISSUE OF *LMR NEWS*

Our next issue will provide updates on project field tests and more as available.

The winter 2018 issue of *Currents* magazine includes two articles of interest, one on LMR's four 2017 "new start" projects and the cover article on how Navy sonobuoys helped NOAA scientists site the rare North Pacific right whale. View the issue at navysustainability.dodlive.mil/currents-magazine/.