FALL 2016

LMR news

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Welcome!

Welcome to the fall 2016 issue of *LMR News*—the quarterly 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 mammals—their occurrence in training areas and potential exposure, response and consequences.

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Cuvier's beaked whale.

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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 mission of the LMR program is to improve the best available science regarding the potential impacts to marine species from Navy activities, and improve the technology and methods available to the U.S. Navy Marine Species Monitoring program, while preserving core Navy readiness capabilities.

PROGRAM OFFICE INSIGHTS

The fall quarter is always a busy time for the LMR program—many of our Principal Investigators finish up their summer field season efforts, we get our latest round of program contracts in place, we close out our fiscal year, pre-proposals from the Broad Agency Announcement (BAA) arrive on our website and we hold our In-progress Review (IPR). This fall quarter was no different and we are pleased to provide highlights from some of these below.

We received 22 pre-proposals in response to the Fiscal Year 2017 (FY17) BAA and the LMRAC has requested full proposals for a select few that most closely met the needs. Final selections will be made by early summer. (For more information on the three needs defined in the BAA, please see our summer-16 issue of LMR News.)

Anu Kumar, Program Manager

We are glad to note that the program achieved an important budgetary measure—meeting our FY16 year-end expenditure benchmarks. This administrative milestone supports the program's ability to fund projects that ultimately support Navy readiness while improving the knowledge base needed for criteria and permits. Thank you to all the Principal Investigators (PIs) and their institutions who submitted their invoices in a timely fashion, helping us to meet the benchmarks.

The program's 2016 IPR was, once again, an all-around success. This event brings together all project PIs and the LMRAC to review and discuss progress and challenges within each project. More on the meeting is provided later in this issue.

PROGRAM INVESTMENT AREAS

The LMR program's five key investment areas are:

1. **Data to Support Risk Threshold Criteria**
   Research regarding potential impacts to marine species from Navy training and testing activities, primarily focused on potential impacts from sound (e.g., hearing studies, sound exposure and behavioral response studies).

2. **Improved Collection and Processing of Protected Species Data in Areas of Navy Interest**
   Develop methods to improve the ability to process large amounts of marine species data and provide cost-effective solutions to enhance marine species monitoring capabilities (e.g., new detection and classification algorithms, automated processing tools for passive acoustic monitoring data).

3. **Monitoring and Mitigation Technology Demonstrations**
   Demonstrate technologies that offer to enhance marine species monitoring capabilities (e.g., new passive acoustic monitoring technologies and platforms such as gliders).

4. **Standards and Metrics**
   Establish interagency and scientific community standards and metrics to evaluate marine species data to provide comparable results (e.g., standards for hearing studies, detector and classifier performance analysis standards).

Bottlenose dolphins.
Mark H. Deakos, NMFS Permit 14451

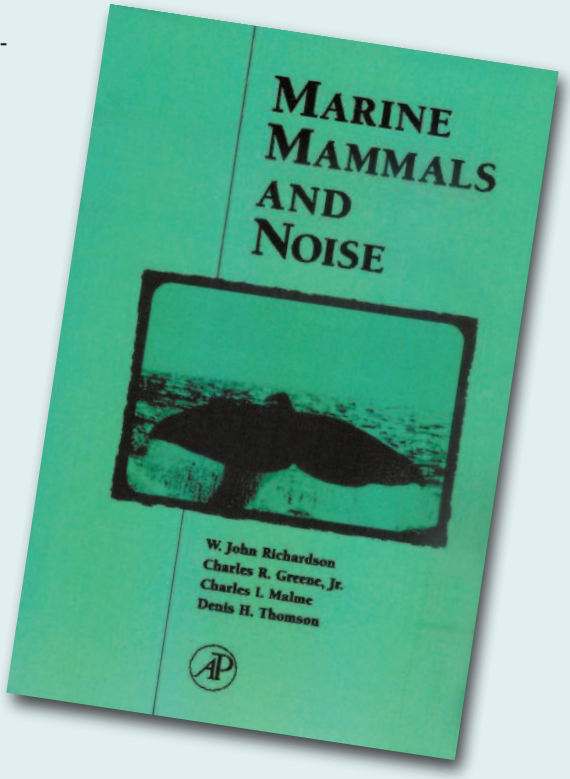
5. **Education and Outreach, Emergent Opportunities**
   Support education and outreach on LMR-funded research investments and new scientific methods available to the broader scientific community. Emergent research topics of priority interest to the Navy (e.g., LMR website and program outreach on investments, Introduction to Density Estimation from Acoustics (IDEA) training, other study topics needed by the Navy).

LMR PROJECT SPOTLIGHT

Wondering about some of the LMR-supported projects? This section provides a brief overview of one or more projects in each issue of *LMR News*.

This quarter we present one of our projects that will be closing out within FY17, *Marine Mammals and Noise—Progress Since 1995*, Principal Investigators Christine Erbe, Curtin University, Perth, Australia and Dorian Houser, National Marine Mammal Foundation, San Diego, California.

The book *Marine Mammals and Noise* (Richardson et al.) has been the single most cited resource for information on the effects of noise on marine mammals since its 1995 publication. It has been a valuable resource for the Navy, environmental planners, regulators and scientists. However, in the last 20 years the literature related to the issue of marine mammals and noise has expanded greatly and there is more information to consider when assessing effects of noise on marine mammals.



The LMR program is one of four stakeholders contributing funds to this important update. The other contributors are Office of Naval Research's Marine Mammal Biology program, the National Oceanic and Atmospheric Administration and the Oil & Gas Joint Industry Program.

Three tasks funded by the LMR program are:

1. Writing a critical review of the literature and publicly available data on the sounds produced by marine mammals and on marine mammal hearing
2. Developing a publicly accessible database of literature on marine mammal bioacoustics
3. Preparing a subsequent essay on how marine mammal bioacoustic data can inform both conservation efforts and the management of marine resources based on the literature review conducted.

Project team members have drawn upon their own individual research databases, as well as identifying appropriate articles and reports from the scientific community and "grey" literature (reports that were not published in scientific journals) to develop a bibliographic database.

This database presents data on sounds generated by marine mammals, including a review of the literature on production anatomy and physiology, and on the functional characteristics of marine mammal vocalizations. The database also reflects a review of the state of research on marine mammal acoustics with such categories as:

- Review of marine mammal biological classification
- Sound production by order
- Hearing (behavioral and electrophysiological)
- Noise effects (audibility, behavioral response, masking, effects on auditory physiology, effects on non-auditory physiology, chronic effects, biological significance, cumulative stressors, mitigation).

Humpback whale.
Dr. Elliott Hazen, NOAA Permit 14245

The research team has also completed the following for the summary and analysis of available information about the sounds produced by marine mammals:

- Literature review on sound production
- Tabular summary of acoustic characteristics by taxon
- A taxonomic breakdown
- Summary of regional differences
- Spectogram collections of the best documented and illustrative vocalizations
- Overall critical summary of source levels, call structure and regional differences.

As of November 2016, the team had added 5,144 references to the database. The book, organized into ten chapters, is expected to be approximately 700 pages. At the close of the project in 2017 the team will submit the manuscript for publication and make the database publicly available online.

LMR PROGRAM PARTICIPANT UPDATES

One summer field season effort of particular note for this issue is the Southern California Behavioral Response Study (SOCAL BRS) 2016 field work. Started in 2010, the 2016 field effort represents the project's final at-sea effort. It encompassed three trials with actual mid-frequency active sonar (MFAS), including the first with dipping helicopter sonar. The SOCAL BRS team will complete its data analysis in 2017, including comparing the responses to real versus scaled MFAS.

In other LMR-funded topics, two organizations participating in passive acoustic monitoring projects will be conducting a passive acoustic training workshop from 18-20 January 2017 in San Diego. Oregon State University and Bio-Waves, Inc. will present a hands-on workshop on new features of Ishmael, a free sound analysis software system. For more information, contact Liz Ferguson at eferguson@bio-waves.net.

Orca whale.
NOAA/NMFS

IN-PROGRESS REVIEW 2016

Collaboration was one of the many important outcomes of this year's IPR. Almost 50 people participated in the meeting, held 16–18 November 2016 at NAVFAC EXWC in Port Hueneme, California.

With multiple projects, both ongoing and new starts, addressing different aspects of related topics, the IPR provides a face-to-face forum for project PIs to discuss methods and goals. They have a direct opportunity to share why they are taking a particular approach and what data and analyses have been completed to date. By understanding the details of each other's projects, PIs can improve coordination both within and across topics, which helps to bolster the value of project results.

This year's meeting also included the final IPR brief on six projects, listed in the table on the following page. The updates provided are preliminary and do not reflect final analyses. Final results and reports will be completed by the end of FY17.

Project No.	Project Title	Project Updates	Principal Investigator(s)
01	Marine Mammal Monitoring on Ranges (M3R)	The last year of effort was focused largely on hardware and software updates to support transferring capabilities to ranges. Many of the automated detection and classification tools within the M3R system are already being used by the Marine Species Monitoring program to collect long-term marine mammal and sonar use data. Work also included collaboration projects with visual surveys and tagging of animals to look at species demographics and potential responses to the presence of Navy activities. Journal manuscripts and final report expected in 2017.	Dave Moretti
04	Demonstration of Commercially Available High-Performance PAM Glider and Profiler Float	Project has completed multiple field tests to gather data needed to compare sea gliders and quephone detection performance against HARPS and M3R. Final data analysis and report preparation are ongoing, but are expected to be complete by the end of 2017.	Haru Matsumoto
06	Database and Metrics for Testing Automated Signal Processing for Passive Acoustic Monitoring	Project has completed the West Coast test data set (and is continuing work on an East Coast test data set) for assessing new PAM signal processing algorithms. In addition, the metrics committee is continuing work on developing and evaluating performance metrics for assessing the detection and classification of marine mammal sounds.	John Hildebrand
08	Improving the Navy's Automated Methods for Passive Underwater Acoustic Monitoring of Marine Mammals	Project has developed a suite of automated signal conditioning tools for normalizing data sets from different ambient acoustic environments prior to submitting such data to standardized automated signal processing systems. Produced environmentally calibrated call counts for humpback and blue whales, adapted localization software to work on the SCORE range data, and worked to transition documentation and software to stakeholders. Journal manuscript submissions and final report expected in 2017.	Tyler Helble
10	The Effects of Noise on Marine Mammals	This project, focused on an updated review of the scientific information relevant to the effects of underwater sound on marine mammals, has developed a database with more than 5,000 references and is preparing a manuscript for publication in 2017. The contents will support at-sea environmental compliance documentation. (See the LMR Project Spotlight section in this newsletter for more on the project.)	Christine Erbe Dorian Houser
14	Behavioral Audiometry in Multiple Killer Whales	The project collected the first demographic hearing data from killer whales to understand how potential acoustic impacts might vary within a mixed population of animals (across age and gender). Completed one partial and seven full audiograms, contributing to a composite hearing data set for killer whales. Journal manuscript submission expected by early 2017.	Brian Branstetter

Prior to the full IPR, the LMRAC members toured the Navy's San Nicolas Island (SNI). Their LMRAC colleague, John Ugoretz (Naval Air Systems Command representative), provided insights into the mission and challenges faced by NAVAIR on SNI. The location also provided uninterrupted time for LMRAC members to discuss LMR business. Committee members all agreed that the tour and committee meetings were of great value.

Fin whale.

Program PIs can mark their calendars now for the next IPR, which will be held during the week of 13 November 2017 back in Port Hueneme.

RECENT PUBLICATIONS

This section includes recent publications (as available) 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.

The following articles were published in The Journal of the Acoustical Society of America during the fall quarter:

Finneran, J. J., J. Mulsow, D. S. Houser, R. F. Burkard (2016). Place specificity of the click-evoked auditory brainstem response in the bottlenose dolphin (*Tursiops truncatus*). The Journal of the Acoustical Society of America, 140 (4), October 2016.

Mulsow, J., J. J. Finneran, D. S. Houser, R. F. Burkard (2016). The effects of click and masker spectrum on the auditory brainstem response of bottlenose dolphins (*Tursiops truncatus*). The Journal of the Acoustical Society of America, 140 (4), October 2016.

Several additional publications are currently in preparation or in review. For lists of other publications, please see our FY15 and FY14 program reports and recent issues of *LMR News*.

OUR WEBSITE—WHAT'S AVAILABLE NOW

Our website (www.lmr.navy.mil) is a ready source of up-to-date information about the LMR program. Keep a watch on the Project Highlights section where we soon will have summaries of eight new start projects.

PROGRAM SCHEDULE

No.	What	When
1.	Proposal Solicitation & Review	
a.	Pre-proposal review	October 26–December 30, 2016
b.	Notify Submitters of Pre-Proposal Evaluation Results	January 6, 2017
2.	Project & Contracts Management	
a.	FY17 New Start Contracts	September 30, 2017
3.	Quarterly Status Reports (QSR)	
a.	Submit winter QSR	January 3, 2017
b.	Submit spring QSR	April 3, 2017
c.	Submit summer QSR	July 3, 2017
d.	Submit fall QSR	October 2, 2017

Check out our website for possible changes and new dates.

www.lmr.navy.mil

LMR-RELATED PHOTOS—KEEP THEM COMING

We encourage all LMR participants to share photos of marine mammals, survey efforts, personnel who were involved and the equipment used. We'd like to include some of those images in a future issue of the LMR newsletter and give you credit—right there with your photo.

Surely among all of those photos from field work you have a few that you're particularly proud of. Please send them along, accompanied by a caption, photo credit and permit number (as applicable) and be sure that the photos are in high resolution format. Who knows, you may see one of those photos in a future issue of the LMR newsletter. Submit your photos via email to exwc_lmr_program@navy.mil.

Spinner dolphins.
Morgan Richie

HELP WITH OUR MAILING LIST

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, exwc_lmr_program@navy.mil, 805-982-4853.

IN THE NEXT ISSUE OF *LMR NEWS*

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

Watch for a new article about the LMR program's FY16 new start projects in an upcoming issue of *Currents* magazine at http://greenfleet.dodlive.mil/currents-magazine.