LMR news

SUMMER 2016

SCIENCE • STEWARDSHIP • NAVY READINESS

Welcome!

Welcome to the summer 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.

INSIDE THIS ISSUE

Fin whale.
Brenda K. Rone, NMFS Permit 15330

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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

We saw a lot of programmatic progress this quarter. Three particular highlights of note include completing proposal review for Fiscal Year 2016 (FY16) projects, issuing the FY17 Broad Agency Announcement (BAA) and issuing our FY15 Program Report.

Anu Kumar, Program Manager

FY16 Proposal Review

The LMR Advisory Committee (LMRAC) members and program staff completed the proposal review process for FY16. Of the 48 pre-proposals received in response to our FY16 BAA, we requested 20 full proposals—ten within the Behavioral Response Research need (N-0**102**-16) and ten with Marine Species Hearing Research (N-0**103**-16). In the final review, eight projects were found to best fit the defined needs within the program budget. The selected projects, currently in contract negotiation and contingent on final funding and contract agreements, are listed below.

Need	Title	Principal Investigator
102	Developing tools for acoustic-only BRS studies at Navy instrumented ranges	Tyler Helble
102	A Blainville's beaked whale (*Mesoplodon densirostris*) behavioral risk function for Hawaiian populations	Dave Moretti
102	Extended duration acoustic tagging of right whales	Susan Parks
102	Cuvier's beaked whale and fin whale behavior during military sonar operations: Using medium-term tag technology to develop empirical risk functions	Greg Schorr
102	High fidelity acoustic and fine-scale movement tags to enable behavioral response research on deep diving whales	Alex Shorter
103	The effects of underwater explosions on fish	Peter Dahl
103	Frequency-dependent growth and recovery of TTS in bottlenose dolphins	Jim Finneran
103	Hearing and estimated noise impacts in three species of Auk: implications for the marbled murrelet	Aran Mooney

FY17 BAA Issued

As we complete the contract process for the FY16 projects, our FY17 process is getting underway. The BAA has just been issued, opening the window for interested parties to submit pre-proposals. The FY17 BAA defines three needs that the program wants to address under the FY17 funding. The needs to be addressed within the FY17 funding are:

- **Need Topic 1 (N-0134-17): Measuring Explosive Effects to Marine Mammals**
  There is little information about the potential direct effects to marine mammals from exposure to blasts from underwater explosions. The criteria for safe standoff ranges, slight lung injury, and severe injury/mortality for marine mammals are based on limited datasets originally derived from experiments using historic studies using small submerged terrestrial animals subjected to underwater explosions.

- **Need Topic 2 (N-0135-17): Understanding the Range to Effect to the Behavioral Response of Marine Mammals from Sonar Exposure**
  It has been noted from previous behavioral response studies that the context of when the exposures are experienced by marine mammals may affect their responses. It was noted that marine mammals may have the ability to assess range (distance) to the sound source and received sound pressure level may not be the only factor to consider when assessing behavioral responses.

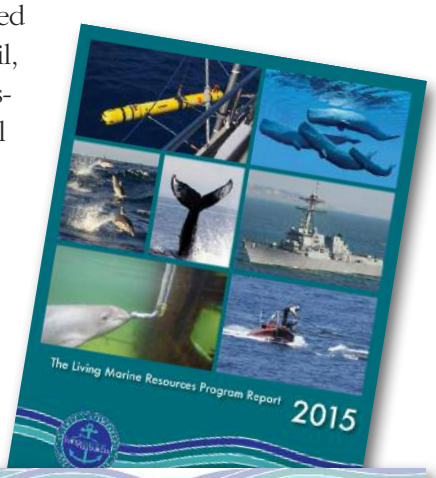
  More details on Navy interests on the topic can be found in the recent workshop report 'Report on the Status and Future of Behavioral Response Research' by Catriona Harris and Len Thomas at the University of St. Andrews and jointly sponsored by the Office of Naval Research, the Living Marine Resources Program, and NOAA. https://research-repository.st-andrews.ac.uk/handle/10023/7741.

- **Need Topic 3 (N-0136-17): Coordination for the Advancement of Density Spatial Modeling Methods Using Visual and Acoustic Survey Data**
  This need involves a lead individual/team to coordinate a working group consisting of relevant scientists (government and non-government) to coordinate the advancement of density spatial modeling methods using visual and acoustic survey data. This effort is intended to lead the advancement of density spatial modeling methods and coordinate with stakeholders to address priority issues identified by the working group. The key objectives of this need involve:

  1. Bring together scientific leaders in density spatial modeling
  2. Sharing information about best practices, without being prescriptive
  3. Developing and implementing innovative approaches for advancing spatial modeling methods to best characterize marine species seasonal abundance and distribution within Navy training and testing areas
  4. Highlight priority areas for continued research.

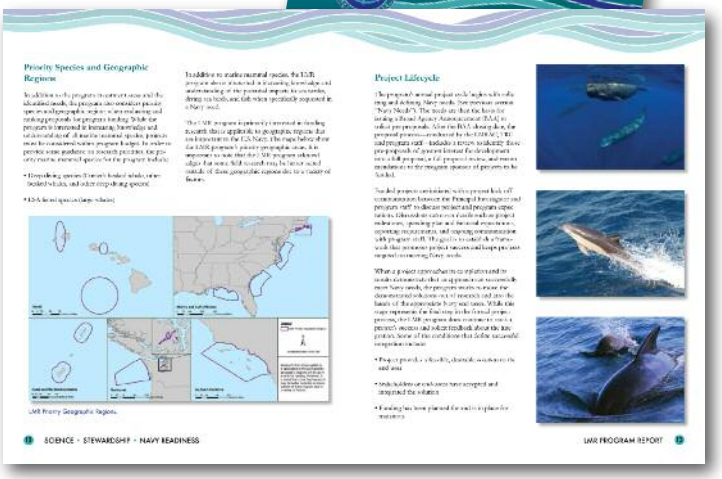
For complete Needs Statements, please go to
www.lmr.navy.mil/Preproposals.aspx and click on N39430-16-R-7201.

Potential applicants are encouraged to visit the LMR website, www.lmr.navy.mil/Preproposals.aspx, for more information about the LMR program and the solicitation. Federal government applicants are not eligible to submit pre-proposals under the Broad Agency Announcement (BAA), but will be able to submit pre-proposals directly to the relevant Navy statement of need by selecting Federal Government when submitting. Academic, non-federal government, nonprofit, and private sector submitters should select Private/Academia, when submitting their pre-proposal. The need topics can be viewed within the BAA at www.neco.navy.mil, www.fbo.gov, or at www.lmr.navy.mil/Preproposals.aspx. All submissions must be made via the LMR website. The solicitation period will close at 5:00 pm Eastern Time on 19 October, 2016 (see website or BAA for official dates and other guidance).



Annual Program Report

Our FY15 program report is now available. You can download the report from our website at www.lmr.navy.mil/AnnualReports.htm. The 50-page document details FY15 accomplishments and plans for FY16 and beyond.



LMR PARTNERSHIPS

The 4th International Conference on the Effects of Noise on Aquatic Life was held in Dublin, Ireland 10–16 July, 2016. The LMR program contributed funding to the conference. These conferences—attended by scientists, regulators, environmentalists, and industry representatives—offer participants opportunities to keep up with and discuss recent research data and regulatory issues related to the effects of man-made noise. The information presented and the exchanges during conference sessions are of significant benefit to the LMR program, both in terms of what is learned and what is shared by the program. The conference agenda and presentation abstracts can be downloaded at http://an2016.org/programme.html.

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).

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).

Orca whales.
Brandon Southall, NMFS/OPR

LMR PROJECT SPOTLIGHT

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

This quarter we introduce a recently funded project for FY15, Jawphone Simulations to Maximize the Utility of Psychoacoustic and Auditory Evoked Potential Experiments, Principal Investigators Ted Cranford, San Diego State University and Petr Krysl, University of California, San Diego.

Ted Cranford

Understanding baseline hearing in marine mammals—how and what marine mammals hear—is an important component of the Navy's marine species monitoring and compliance efforts.

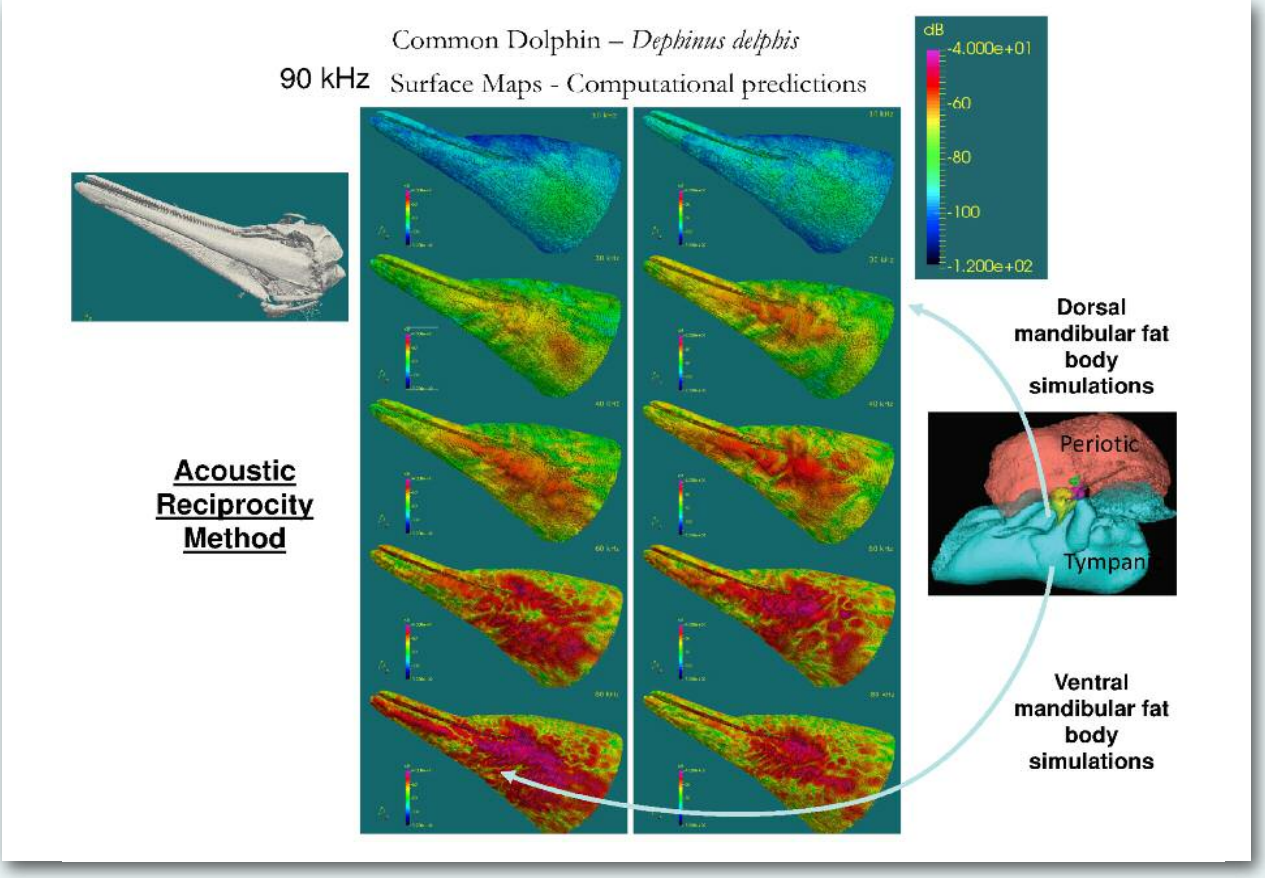
To understand the baseline hearing in marine mammals, researchers have measured hearing thresholds either by studying behavioral response to sound or by taking an electrophysiological approach. In the latter, they measure voltages produced by the brain in response to an acoustic stimulus. These voltages, auditory evoked potentials (AEPs), can be quickly measured in subjects and do not rely on the extensive marine mammal behavioral training needed for behavioral response threshold measurements.

Peter Krysl

To deliver sound directly to an animal for AEP measurements, researchers use a device known as a jawphone (suction cup containing a transducer). However, the placement of the jawphone as well as the frequency selection and other parameters of the device can affect the AEP testing results. In preliminary simulation studies, it appears that jawphones can selectively excite hearing pathways that may be different from those used naturally by the animals. Simulations indicate that small changes in the placement of a jawphone can cause large amplitude differences (several decibels) by the time the sounds reach the ears.

This project is using a computational approach to identify the mechanism(s) by which jawphones stimulate hearing when they are used to gather data on marine mammal auditory capabilities. The methodology is based on finite element modeling techniques, where high-resolution computerized tomography (CT) scan data are combined with measurements of tissue properties and custom-built computer programs to simulate sound propagation into and out of the anatomic complexity of specimens. Model outputs will quantify the acoustic pathways between the jawphone and the ear, which will enable researchers to develop sensitivity maps that identify the optimal locations for jawphone placement in three marine mammal species. These sensitivity maps can be used to design and evaluate AEP-based hearing tests, taking into account potential variable response sensitivity to the location of the transducer on the animal's skin. The maps can help to guide jawphone placement in order to achieve more accurate and consistent results.

Thus far, the project has generated preliminary surface sensitivity maps for two species, the common dolphin (*Delphinus capensis*) and the bottlenose dolphin (*Tursiops truncatus*). These surface maps have been generated for six different frequencies at different sound source locations on the left side in both dolphin specimens. The results are still being evaluated but it does appear that the maps do vary between the species across the frequencies tested. The simulations performed for the bottlenose dolphin confirmed previous work that showed the significance that the details of anatomic geometry can have for acoustic function.



Researchers are also evaluating potential differences in the conditions under which jawphones are used for AEP testing. The two primary conditions are in-air or in-water. Work still to be completed includes the final analyses of preliminary results and conducting simulations to produce sensitivity maps for beaked whale specimens.

These results will be helpful in the design and evaluation of past and future AEP hearing tests. They will enhance our ability to determine jawphone placement on stranded animals, and play an important role when measuring the hearing capabilities for new species we have yet to study.

LMR PROGRAM PARTICIPANT UPDATES

Using the U.S. Navy Deep Ocean Lab's computer-controlled pressure chamber at NAVFAC EXWC in Port Hueneme, California, LMR researchers recently pressure-tested dive-recording tags.

Satellite-linked, dive-recording tags have dramatically expanded our knowledge of the diving capabilities of marine mammals. The SPLASH 10-A has a pressure sensor to report dive information back to the researcher via Argos. Though these tags are rigorously tested during development, it is difficult to replicate the kind of conditions they will experience during a prolonged deployment on a beaked whale that dives well beyond 1,000 meter depth many times each day. Infrequent, but apparent, failures in the pressure transducer have been reported, primarily on species that repeatedly dive deeply. Since the tags are not recovered, definitive evidence of these intermittent failures have not been collected.

Researchers simultaneously tested 23 tags in the pressure chamber by simulating repeated deep dives to 2,000 meters over two days. While results of the test are still being analyzed, we wanted to highlight the EXWC's ability to conduct these deep-sea tests on developing technologies to study marine mammals.

Cuvier's beaked whales.
Gregory S. Schorr, NMFS Permit 16111

IN-PROGRESS REVIEW 2016

A reminder for all program Principal Investigators—the 2016 IPR, which includes only those involved in LMR-funded projects, will be held 16, 17, 18 November 2016, back at NAVFAC EXWC in Port Hueneme, California.

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.

One report recently was published in The Journal of Experimental Biology:

Arranz, P., S.L. DeRuiter, A.K. Stimpert, S.Neves, A.S. Friedlaender, J.A. Goldbogen, F. Visser, J. Calambokidis, B.L. Southall, P.L. Tyack. (2016). Discrimination of fast click series produced by tagged Risso's dolphins (*Grampus griseus*) for echolocation or communication. The Journal of Experimental Biology, doi: 10.1242/jeb.144295.

Several additional publications are currently in preparation or in review. For lists of other publications, please see our FY15 and FY14 program reports and the spring 16 issue 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.

In addition to our recently posted FY15 program report, a new fact-sheet has been posted on the Project Highlights page. The project, *Autonomous Real-Time Passive Acoustic Monitoring of Baleen Whales for Mitigating Interactions with Naval Activities*, is a partnership between the LMR program and the Environmental Security Technology Certification Program. Under the direction of Principal Investigators Cara Hotchkin, Mark Baumgartner and Sofie Van Parijs, the project is employing three autonomous platforms to demonstrate a combined passive acoustic detection and classification hardware/software system capable of detecting the calls of four species of endangered baleen whales in near real time.

www.lmr.navy.mil

PROGRAM SCHEDULE

No.	What	When
1.	Proposal Solicitation & Review	
a.	BAA solicitation for FY17 projects opens	24 August 2016
b.	BAA solicitation closes	19 October 2016
2.	Project & Contracts Management	
a.	Award FY16 projects	Fall 2016
3.	Quarterly Status Reports (QSRs)	
a.	Submit fall QSR	3 October 2016
b.	Submit winter QSR	3 January 3 2017
c.	Submit spring QSR	3 April 2017
d.	Submit summer QSR	3 July 2017
4.	In-progress Review	
a.	Port Hueneme, CA	16, 17, 18 November 2016

Check out our website (www.lmr.navy.mil) for possible changes and new dates.

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 on and notes on project field tests, as available.

You also can find articles about the LMR program in issues of *Currents* magazine at http://greenfleet.dodlive.mil/currents-magazine. The summer-16 issue of *Currents* includes an article from Mandy Shoemaker, "LMR Program Launches New Project Initiatives."


LMR Program Launches New Project Initiatives