LMR news

SUMMER 2015

Welcome!

Welcome to the summer 2015 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.

Sperm whale.
Robert K. Uyeyama, NMFS Permit 14451

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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

One particular topic of note from this quarter includes the LMR call for pre-proposals for 2016 projects, which went out on September 4, 2015. The need topics include: 1) behavioral response research to study the effects of sound on marine mammals, and 2) marine species hearing research related to the acoustic effects criteria.

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. Additional details on 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, Pacific Daylight Time on 23 October, 2015 (see website or BAA for official dates and other guidance).

Anu Kumar, Program Manager

In addition, LMR researchers continued field work and analysis for ongoing projects. The "Southern California Behavioral Response Study (SOCAL BRS)" and the "Development of Automated Whistle and Click Detectors and Classifiers for Odontocete Species in the Pacific and Atlantic Oceans" are both featured in our Project Spotlights for this quarter.

And we had the opportunity for several LMR participants to share their work and learn from others at the 2015 Detection, Classification, Localization, and Density Estimation (DCLDE) workshop in La Jolla, California. More on that on the following pages.

LMR PARTNERSHIPS

4th International Conference on the Effects of Noise on Aquatic Life, Dublin 2016

The LMR program is a sponsor for this conference which brings together scientists, regulators, environmentalists, and people from industry to learn about and discuss issues related to the effects that man-made noise has on aquatic organisms. For more information, please visit the conference website at http://www.an2016.org/index.html.

Survey Software Toolkit for Data Collection, Data Workflow, and Data Delivery

OPNAV N45 has funded the project "Survey Software Toolkit for Data Collection, Data Workflow, and Data Delivery," guided by Principal Investigator (PI) Michael Richlen from HDR Environmental. The intent of the data collection toolkit is to streamline survey data collection so that all aspects of the workflow become more efficient. The Navy's marine species monitoring program and the LMR program will work collaboratively to provide guidance during development and testing of the toolkit in order to make sure that the product is meeting the Navy's needs.

False killer whale.
Robert K. Uyeyama

IN-PROGRESS REVIEW 2015—COMING SOON

All LMR PIs and LMRAC members are reminded that 2015 IPR is fast approaching. The IPR provides a forum in which LMRAC members, LMR staff and PIs discuss project progress, accomplishments and potential issues. The 2015 IPR will be held at the Naval Facilities Engineering and Expeditionary Warfare Center in Port Hueneme, California the week of 19–23 October 2015. For more information, contact Anu Kumar, Program Manager, exwc_lmr_program@navy.mil, 805-982-4853.

We look forward to seeing you there.

LMR PROJECT SPOTLIGHTS

Wondering about some of the LMR projects? This section provides a brief overview of some of the projects currently underway. This quarter we share two projects, the "Southern California Behavioral Response Study (SOCAL BRS)" and the "Development of Automated Whistle and Click Detectors and Classifiers for Odontocete Species in the Pacific and Atlantic Oceans."

Southern California Behavioral Response Study (SOCAL BRS)

Principal Investigators Brandon Southall from Southall Environmental Associates (SEA), Inc. and John Calambokidis from Cascadia Research Collective

To meet regulatory requirements, the Navy needs direct, empirical information about how protected marine species respond to sound exposures. The SOCAL BRS results contribute baseline data on movement and acoustic behavior of poorly known or unknown species as well as individual high-resolution measurements of behavioral changes during experimentally controlled sound exposure. To understand and predict the type and probability of behavioral changes, it is important to understand details about species differences in general responsiveness and how individual response probability is affected by the exposure context, including animal behavioral state (e.g., foraging, mating, etc.), source type, received exposure level and other features, source-animal distance and relative orientation, and prey distribution.

The project is designed to increase understanding of marine mammal reactions to sound and provide a more robust scientific basis for estimating the effect of Navy mid-frequency active sonar (MFA sonar) on marine mammal behavior. It incorporates controlled exposure experiments (CEE) that can include playback of pre-recorded, simulated military sonar sounds, as well as the limited use of real MFA sonar from operational Navy vessels in a controlled, experimental context.

Research teams employ a wide range of expertise and tools in field measurements of behavior and CEEs. These include visual observers, tagging teams, sound source engineers, and fisheries acoustics biologists who use photo identification, passive acoustic monitoring (PAM), and geographical information system (GIS) tools.

Prior to CEEs, tags are applied on focal animals and underwater acoustic monitoring is conducted with towed hydrophones, fixed range hydrophones when available, and/or sonobuoys. Visual observers monitor the area to assess focal and other animals and determine if particularly vulnerable animals (e.g., neonate calves) are present. During exposure experiments, the teams follow explicit start-up, exposure, and shutdown protocols. These include visual surveys and focal follows maintained before, during, and after sound exposure.

In 2013, SOCAL BRS researchers conducted groundbreaking research using real MFA sonar sources by working in coordination with Navy ships USS Dewey (DDG 105) and USS Cape St. George (CG 71). This was the first-ever use of full-scale operational Navy MFA sonar systems (SQS-53C) in the context of a controlled exposure experiment.

SOCAL BRS has produced significant new data for a range of species on diving, foraging, social, and vocal behavior of focal marine mammal species, including CEE measurements in targeted behavioral contexts. Over 150 tags have been deployed on nine species and over 65 CEEs using simulated and real MFA sonar sources have been conducted, comprising by far the largest data set for any BRS conducted to date.

Initial results from the operational Navy MFA sonar experiments suggest that responses to distant MFA sonar from actual sources appeared less evident than closer scaled sources in some conditions. However, additional data will be acquired to further test this observation, which may have significant implications for Navy environmental assessments.

Group of Risso's dolphins including an individual with a DTAG used in the study

J. Calambokidis, NMFS permit 14534

The 2015 field season is ongoing and in March 2015, field teams were able to deploy a tag on a blue whale and completed a CEE with the USS William P. Lawrence (DDG 110). During the remaining 2015–16 fieldwork, efforts will primarily focus on Navy sources realistic scenarios using full-scale Navy sources, as available, while maintaining a secondary scaled-source option. That will be followed during 2016–2017 by data analysis with an emphasis on comparing data from real versus scaled MFAS, and transitioning results into use in Navy environmental assessments.

The direct data on actual behavioral responses in known, controlled conditions are already being applied within, and will continue to support the environmental impact assessments the Navy prepares for training and testing permit applications and other legal requirements. The outcomes will not only inform legal requirements but also broaden the scientific and public understanding of marine mammal behavior.

LMR PROJECT SPOTLIGHTS

Development of Automated Whistle and Click Detectors and Classifiers for Odontocete Species in the Pacific and Atlantic Oceans

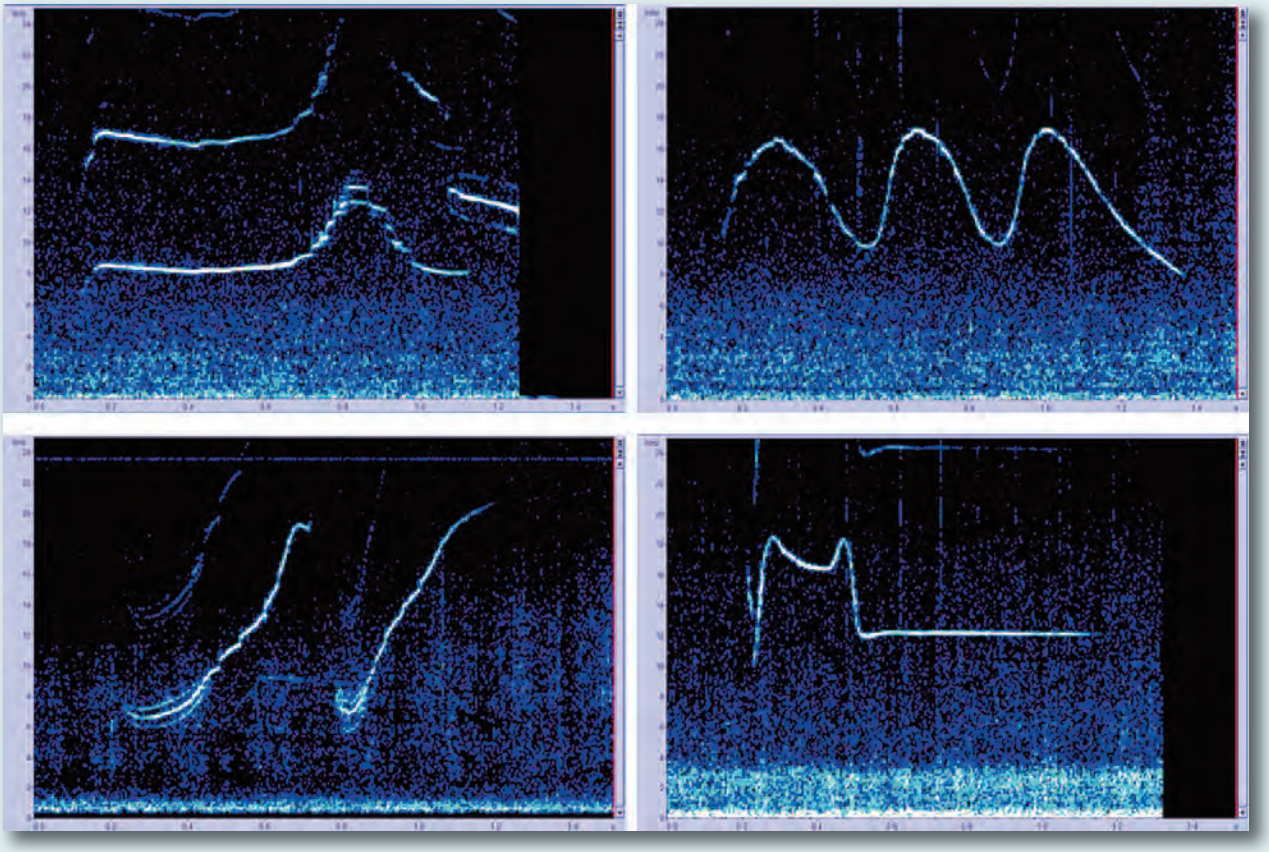
Principal Investigators Julie Oswald and Tina Yak from Bio-waves, Inc.

Passive Acoustic Monitoring (PAM) methods have been adopted as a cost-effective approach for collecting data about and monitoring the occurrence and distribution of marine mammals. While effective, PAM generates huge volumes (many terabytes/year) of data. In order for this technology to be efficiently utilized and the data generated to be interpreted effectively, reliable, automated acoustic analysis software programs are needed.

Sounds produced by odontocetes—particularly dolphin species—can be grouped into one of two broad categories: whistles and pulsed sounds (e.g. clicks). The variability inherent in many sounds produced by odontocetes (toothed whales) makes it difficult to automatically detect and classify them to species. While separate whistle and click classifiers have been developed for specific dolphin species, not all species produce whistles, or they may only produce whistles or clicks in specific behavioral contexts. The goal of this project is to create classifiers that use information from whistles and clicks as well as variables related to location and acoustic behavior to classify sounds produced by odontocete species on naval ranges.

Using three different automated tonal detectors, the team has extracted whistles from acoustic recordings of three odontocete species. The output of these automated detectors were compared using a variety of metrics. All three performed well, each having precision scores greater than 75 percent for all species combined. Based on the strengths and weaknesses of each detector, the team decided to integrate PAMGuard's whistle and moan detector with ROCCA (Real-time Odontocete Call Classification Algorithm). Using this tonal detector/ROCCA combination, whistles have been detected, extracted and measured from acoustic recordings made in the northwest Atlantic, Hawaii and the temperate Pacific. Clicks have also been detected and measured from these data using PAMGuard's automated click detector and new click measurement functionality which has been added to send measurements to ROCCA. Preliminary results from a comparison of clicks produced by species recorded in the northwest Atlantic suggest that significant differences exist in multiple click parameters and that the addition of clicks to classifiers will increase classification success.

Three geographic classifiers will be available at the end of the project: one for odontocete species in the waters surrounding the Hawaiian Islands, one for species in the temperate Pacific Ocean and one for species in the northwestern Atlantic Ocean.



Whistles produced by striped dolphins. These whistles illustrate the high within-species variability in whistle structure that exists in most delphinids.

In a companion effort funded by the Office of Naval Research, contextual information such as vocalization rates (number of whistles and/or clicks per second), relative abundance of whistles and clicks, and latitude of acoustic detections will be included in a 'context' feature vector. Combining whistle, click, and context feature vectors to produce a final classification will provide a tool for efficiently and automatically processing the large datasets generated during PAM projects.

LMR PROGRAM PARTICIPANT UPDATES

2015 Detection, Classification, Localization, and Density Estimation (DCLDE) workshop

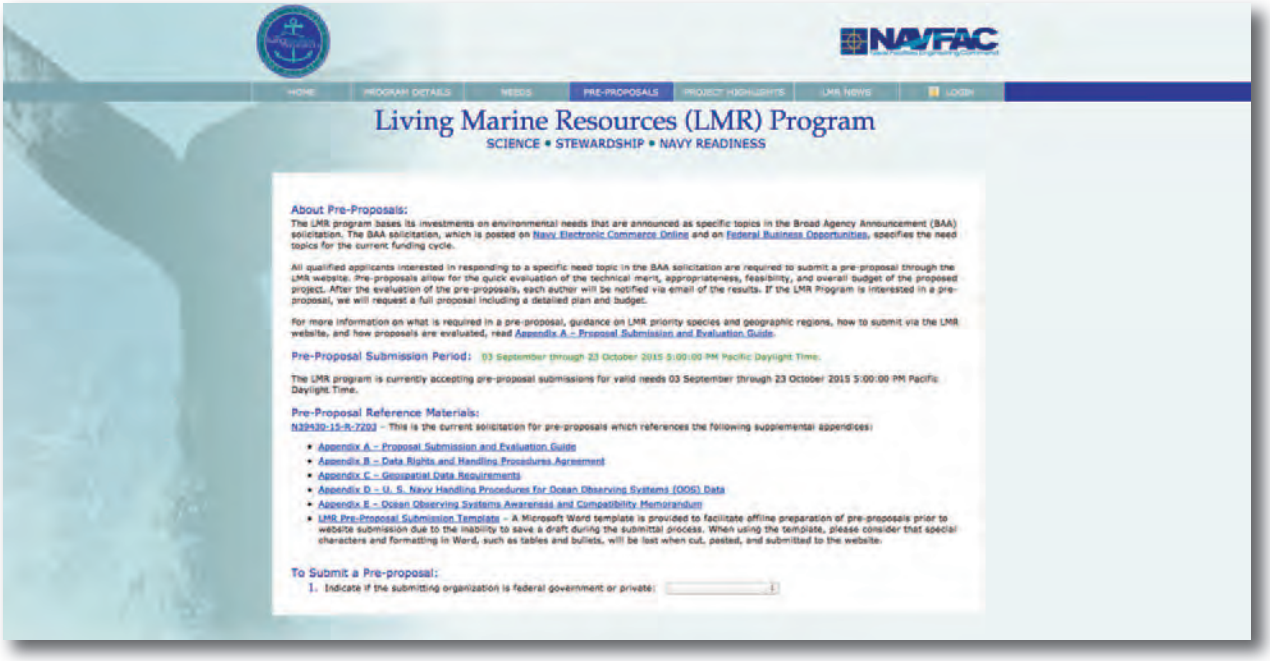
Several LMR program participants—PIs, LMRAC members and staff—participated in the July 2015 DCLDE Workshop in La Jolla, California at the Scripps Institution of Oceanography/University of California San Diego. The biennial workshop provides a structured opportunity to share information on acoustic methods applied to marine mammals. As the workshop title suggests, the focus is on methods to detect, classify, locate, track, count and monitor marine mammals in their environment. Such methods are central to much of the work funded by the LMR program.

Southern right whales.

The LMR program specifically funded Scripps Institution of Oceanography to develop the workshop data set to which participants could apply their algorithms and methodologies for demonstration. This allowed for a more direct comparison of techniques and an assessment of performance. The workshop dataset was well received by participants who appreciated the complexity of the dataset, which included a variety of marine mammal species and acoustic environments within southern California.

OUR WEB SITE—WHAT'S AVAILABLE NOW

Our web site (www.lmr.navy.mil) is a ready source of up-to-date information about the LMR program. Of particular note, the section with requirements for submitting pre-proposals in response to the LMR call for proposals for FY16 has been updated and streamlined. We have also consolidated all of the guidance you will need to submit a pre-proposal. This information can be found at www.lmr.navy.mil/Preproposals.aspx



www.lmr.navy.mil

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).

Pantropical spotted dolphin.
Suzanne E. Yin, 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).

PROGRAM SCHEDULE

No.	What	When
1.	**Proposal Solicitation & Review**	
a.	Issue the BAA and solicit for pre-proposals	Fall 2015
b.	Pre-proposals due	Fall 2015
c.	Request full proposals	Winter 2015/16
d.	Full proposals due	Spring 2016
e.	Announce project new starts	Summer/Fall 2016
2.	**Project & Contracts Management**	
a.	Conduct In-Progress Review	October 19–23, 2015
3.	**Quarterly Status Reports (QSR)**	
a.	Submit fall QSR	October 5, 2015
b.	Submit winter QSR	January 4, 2016
c.	Submit spring QSR	April 4, 2016
d.	Submit summer QSR	July 4, 2016

Check out our web site (www.lmr.navy.mil) for the latest version of our program schedule.

LMR-RELATED PHOTOS—KEEP THEM COMING

We continue to welcome the wonderful high resolution photographs of marine mammals taken during survey work. We encourage others 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.

Short-finned pilot whales.
Jessica M. Aschettino, NMFS Permit 16239

So please, go through those photos and send us a few that you're particularly proud of. Include a caption, photo credit and permit number (as applicable) and be sure that the photos are in high resolution format. And 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

Check out our web site at www.lmr.navy.mil for the latest version of our program schedule.

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 207-384-5249 or 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 include highlights from the 2015 IPR and will announce the new projects selected for 2015 funding.

In case you missed it, the summer 2015 issue of *Currents* magazine, the Navy's energy and environmental magazine, includes an article announcing the LMR Program Report "CNO Environmental Research & Development Programs Release Annual Reports." It provides highlights from both the LMR and the Navy Environmental Sustainability Development to Integration (NESDI) program reports. The summer issue also includes one of Ari Friedlaender's photos from BRS tagging efforts in the "Best Shot" department. You can find these and other articles about the LMR program in issues of *Currents* magazine at http://greenfleet.dodlive.mil/currents-magazine.