

LMR news

SPRING 2015

Welcome!

Welcome to the spring 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.

Humpback whale.



SCIENCE • STEWARDSHIP • NAVY READINESS

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 are pleased to announce the availability of the first-ever LMR Program Report. We believe this report offers an important resource for all program participants and our resource sponsor. The report provides summaries of ongoing and recently completed projects, an overview of the program's structure and process, summaries of accomplishments and some insights into what is ahead in FY15. The report is available on the LMR web site at www.lmr.navy.mil.

Rear Admiral Kate Gregory (Commander, Naval Facilities Engineering Command) and Rear Admiral Kevin Slates (OPNAV N45) visited NAVFAC EXWC on April 30th and May 7th, respectively. The LMR program manager, Anu Kumar, briefed each Admiral with an overview of the program's research investments and discussed Navy needs and priorities. Both briefings were successful and the Admirals appreciated the hard work of the LMR program.

The Behavioral Response Research Evaluation Workshop (BRREW), co-sponsored by Office of Naval Research and LMR and led by Len Thomas and Catriona Harris from the University of St. Andrews, was recently held in Monterey, CA from 21–23 April. In advance of the workshop, a questionnaire was sent out to researchers to elicit an assessment of the current state of knowledge in key areas of behavioral response research, the research gaps, and suggested pathways to fill those gaps. The results of the questionnaire were then synthesized and discussed as a group during the workshop. A review manuscript summarizing the participants' discussion and recommendations will be coming out later this year.



Anu Kumar, Program Manager

LMR PARTNERSHIPS

Working with other organizations on related projects helps to leverage funding, expand investigation options and draw on additional expertise. One such effort—*Autonomous Real-Time Passive Acoustic Monitoring of Baleen Whales*—is a collaboration between the LMR program and the Environmental Security Technology Certification Program (ESTCP).

While most passive acoustic monitoring activities involve archival data collection, recent advances in technology have made near real-time audio processing, sound detection, classification, and reporting possible. Availability of vocalization detections in near real-time (hours after vocalization is made) can allow biologists to quickly evaluate changes in animal distribution and coordinate passive acoustic and aerial surveys to increase the effectiveness of visual survey techniques.

Led by researchers at NAVFAC Atlantic, Woods Hole Oceanographic Institution, and NOAA's Northeast Fisheries Science Center, this project demonstrates the utility and operational capability of three types of autonomous platforms (Liquid Robotics Wave Glider, Slocum Glider, and a moored buoy) equipped with the Digital Acoustic Monitoring Instrument (DMON) and the Low-Frequency Detection and Classification System (LFDCS). The system is capable of classifying vocalizations from four species of endangered baleen whales, all of which are found in the Gulf of Maine.

The LFDCS classifies vocalizations to species using a dynamic programming to create a pitch track, which is a compact representation of a sound (analogous to a series of notes on a page of sheet music) derived from an audio spectrogram. It consists of a time series of frequency-amplitude pairs that describe the frequency and amplitude modulation of a sound. Pitch tracks are then statistically compared to known call examples from each species.

The first deployments of the autonomous platforms began in May 2015, with the Slocum and Wave gliders. All three platforms report detections to a publicly-available website (dcs.who.edu), where platform tracks, detection information, and pitch tracks are examined and analyzed by scientists. All four species of whales were detected within the first few days of the deployment period. Over the course of the next two years, co-located visual monitoring from ships, aerial surveys, and land-based observation platforms will provide data on the visual and acoustic detection rates for these endangered species.

At the end of this project, a detailed report on the technology and survey results will be issued.



LMR PROJECT SPOTLIGHT

Wondering about some of the LMR projects? This section provides a brief overview of some of the new start projects launched in 2014. This quarter's project spotlight presents two related projects, "Automated Signal Processing for Passive Acoustic Monitoring (PAM)," and "Technology Demonstration for Fleet Passive Acoustic Monitoring."

Automated Signal Processing for Passive Acoustic Monitoring

As PAM technology has advanced, long-term continuous monitoring systems have created large volumes of data and the need for concomitant advances in data curation, search, analysis, and visualization.

One of these continuous monitoring devices, the High-frequency Acoustic Recording Package (HARP), was developed by Sean Wiggins, John Hildebrand and their colleagues at the Scripps Institution of Oceanography. The HARP system, currently used on several Navy ranges, stores up to 10 terabytes (compressed storage) of data. (This capacity will increase in the near future. See the following project for details.)

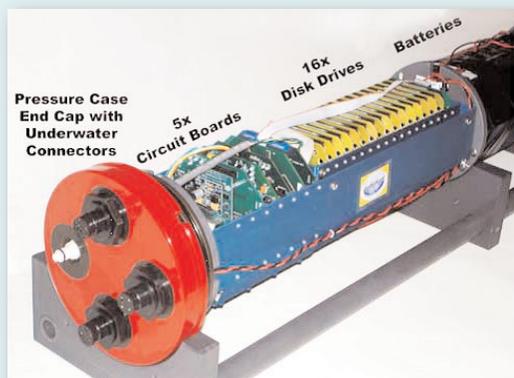
Processing such a massive amount of data is a difficult and time-consuming task and requires trained users. This project intends to simplify the data management process so that non-expert users can access and process the data gathered by monitoring systems.

To achieve this goal, the team will construct marine mammal sound datasets specific to each naval training area, then compose a standardized set of metrics to assess the performance of both existing algorithms and potential new algorithms.

The project team, consisting of co-Principal Investigators John Hildebrand, Simone Baumann-Pickering and Ana Širović of Scripps Institution of Oceanography and Marie Roch of San Diego State University, is currently compiling an extensive set of training and test data based on acoustic recordings already collected at naval training areas.

These data will be shared with the marine mammal research community for use in developing automatic algorithms related to call detection and classification. This protocol follows the well-developed path of the Advanced Processor Build program utilized in the Anti-Submarine Warfare community.

A parallel effort will engage the marine mammal detection and classification community to develop a standardized set of metrics for evaluating automatic detector and classification outputs. The first year will focus on metrics for



The current HARP data logger electronics are attached to a pressure housing endcap with electrical feed-thru connectors. The modular data logger consists of five removable circuit boards to allow for ease in upgrading and repair, and an array of 16 hard disk drives for long-term high-bandwidth data storage. There is also a battery pack for autonomous power using either alkaline or lithium primary cells.

baleen whale calls. Later years will consider odontocete (toothed whale) signals. These metrics will then be universally applicable to both existing and potential new automatic detection algorithms for specific baleen whale calls and odontocete signals.

New algorithms can be shared with all Fleet PAM operators once they have been demonstrated to provide the necessary recall and precision for a particular species call.

The ultimate goal is to develop an automated method to detect and classify marine mammal sounds, thereby simplifying data analysis and reducing data processing costs.

This project 6 team will focus on species, such as humpback whales, that are found across multiple Naval training sites and have well-characterized signals.



Technology Demonstration for Fleet Passive Acoustic Monitoring

The PAM programs being conducted on Navy ranges employ a variety of platforms, from single hydrophones to hydrophone arrays that are towed, mounted on platforms, or drifting.

The HARP system, currently used on several Navy ranges, is a state-of-the-art recording system that features high bandwidth (up to 160 kilohertz) and large data storage (5 terabytes (TB)) combined with low power requirements. However, evolving mass storage capabilities have rendered the current HARP storage media obsolete. This project team will modify the HARP for new storage media and thereby increase the storage capacity of the Navy's HARP systems.

Current HARP data storage is based on a standard electronic interface for disk storage devices known as Advanced Technology Attachment (ATA). More recently the Serial ATA (SATA) interface has become the industry standard. Serial ATA offers several advantages over the parallel ATA interface—reduced cable size and cost, faster and more efficient data transfer. The current HARP system has a maximum storage capacity of 5 TB or 10 TB compressed storage. Once the SATA interface is installed, storage capacity will be increased to 16 TB (32 TB compressed) based on currently available hard disk drives. It is anticipated that this capacity will increase as disks with larger capacities become available, as has been the case for this technology throughout the years.

The project team, headed by John Hildebrand, has designed the HARP electronic disk interface. Next, it will be installed on a HARP system and tested, first at sea, and then on a Navy range. After a deployment of several months, data from the new system will be analyzed. Assuming acceptable performance, the SATA drives will be installed on all 13 existing Navy HARP systems.

Upgrade of currently deployed HARPs for SATA disk storage capacity will yield reduced costs per deployment and potentially fewer service trips for sites that are difficult or expensive to access. The project is expected to be completed in the spring of 2016.

IN-PROGRESS REVIEW 2015—SAVE THE DATE

All LMR Principal Investigators and LMRAC members should save the date for the 2015 IPR where the Principal Investigators will tell us about their most recent accomplishments. 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 Cindy Webber at cynthia.webber@navy.mil or 760-939-2060.

LMR PROGRAM PARTICIPANT UPDATES

Animal Telemetry Network: Coordinating Wide-ranging Data to Advance Knowledge of Aquatic Species

Mike Weise, team leader of the Office of Naval Research's (ONR) Marine Mammals and Biology Program and ONR's member on the LMR Advisory Committee, is also co-chair of the Interagency Ocean Observation Committee's (IOOC) task team on the Animal Telemetry Network (ATN).

The ATN, through the U.S. Integrated Ocean Observing System (IOOS), will facilitate collaborations among all federal and non-federal entities conducting animal telemetry research and simplify access to animal telemetry data and information products. Not only will the ATN provide long-term archived to real-time data on animal movement and behavior, but will integrate this with multiple sources of data on the environment to better assess the drivers for animal behavior and distribution, including marine mammals. These integrated bio-physical observations provide critical scientific information to support the management of marine fisheries and endangered and protected species, assess the potential effects of anthropogenic disturbances, and improve ocean modeling and forecasting.



Research team preparing to dual deploy tags on a blue whale.
A. Allen, NMFS Permit 14534

Many of the ONR and LMR-funded projects studying marine mammals include “tagging” species of interest to collect data on occurrence, behavior and response to stimuli. The more that the data from these tags and other monitoring efforts are analyzed along side other environmental data, the clearer our understanding of baseline marine mammal behavior and response to things like Navy sonar will be. Navy efforts to understand, monitor and protect marine mammals will be improved by including data in the ATN and integrating it with other environmental observations

The ATN task team has published its strategic plan and recommendations (*Meeting Our Nation’s Needs for Biological and Environmental Monitoring: Strategic Plan and Recommendations for a National Animal Telemetry Network (ATN) Through U.S. IOOS*) and is now finalizing an ATN Implementation

Plan to become operational in 2016 and beyond. More information on this effort is available at http://www.ioos.noaa.gov/observing/animal_telemetry/.

In addition, the U.S. IOOS and ONR, working with Stanford University, UC Santa Cruz and the NOAA Southwest Fisheries Science Center, have launched the national Animal Telemetry Network Data Assembly Center (DAC) <<http://oceanview.pfeg.noaa.gov/ATN>> . The ATN DAC will be the web portal and access point for data and data products in the future. Currently, the DAC provides access to 48 different species such as sharks, sea turtles, seals, whales, tuna and squid, with deployment dates ranging from 2000–2014.

The ATN is one component of the U.S. IOOS, a national partnership working to identify and provide new tools to integrate wide-ranging information on ocean conditions. The effort is overseen by the IOOC, created by *The Integrated Coastal and Ocean Observation System Act of 2009*.

For more information, email Mike Weiss at michael.j.weise@navy.mil.



Tagged Risso's dolphin.
A. Friedlaender, NMFS Permit 14534

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

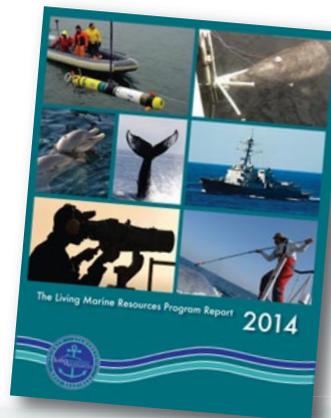
available to the broader scientific community. Emergent research topics of priority interest to the Navy (e.g., LMR website and program outreach on investments, Introduction to Density Estimation from Acoustics (IDEA) training, other study topics needed by the Navy).



Cuvier's beaked whales.
A. Friedlaender, NMFS Permit 14534

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. As noted above, our first-ever program report is now available at the web site. Fact sheets on LMR-funded projects can be downloaded from the “Project Highlights” tab. The web site also continues to provide links to this and past issues of *LMR News*, as well as information on submitting needs, pre-proposals and proposals. For questions on these or any other function of our web site, contact our webmaster Eric Rasmussen at 732-323-7481 or eric.rasmussen@navy.mil.



Living Marine Resources (LMR) Program
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LMR Annual Reports
The LMR program released its first annual report entitled *The Living Marine Resources Program Report 2014*. The 50 page document details FY 2014 accomplishments and plans for FY 2015 and beyond.

To view or download annual reports in PDF format, click on the links below.

FY	Title
2014	The Living Marine Resources Program Report 2014

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PROGRAM SCHEDULE

No.	What	When
1.	Proposal Solicitation & Review	
a.	Issue the BAA and solicit for pre-proposals	Summer 2015
b.	Pre-proposals due	Fall 2015
c.	Request full proposals	Winter 2015/16
2.	Project & Contracts Management	
a.	Conduct In-Progress Review	October 19–23, 2015
3.	Quarterly Status Reports (QSR)	
a.	Submit summer QSR	July 6, 2015
b.	Submit fall QSR	October 5, 2015
c.	Submit winter QSR	January 4, 2016
d.	Submit spring QSR	April 4, 2016

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

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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.

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

A THANK YOU AND A CALL FOR LMR-RELATED PHOTOS

Thank you to Brandon Southall and team for sharing some of the photos that are included in this issue. The photos are from recent SOCAL-BRS field work.

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.

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



Group of Risso's dolphins.
J. Calambokidis, NMFS Permit 14534

IN THE NEXT ISSUE OF LMR NEWS

Our next issue will include an announcement of the LMR program 2015 new start projects, an update on the LMR Broad Agency Announcement (BAA), and a brief description of the biennial Detection, Classification, Localization, and Density Estimation (DCLDE) workshop that took place in July in La Jolla, CA.

In case you missed it, the spring 2015 issue of *Currents* magazine, the Navy's energy and environmental magazine, includes as its cover article "LMR Program Launches Efforts to Improve Marine Species Monitoring Techniques, Equipment & Analyses: New Projects Range from Hardware Upgrades to Improved Data Collection & Analysis Methods." You can find that and other articles about the LMR program in issues of *Currents* magazine at <http://greenfleet.dodlive.mil/currents-magazine>. Click on Spring 2015 under the Issue Archive section.

