

WINTER 2015

# LMR news

## Welcome!

Welcome to the winter 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 the occurrence, exposure, response, and consequences of marine mammals near Navy at-sea training and testing activities.

Pilot whales.  
[istockphoto.com](http://istockphoto.com)



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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

It has been another busy quarter for the LMR program.

We held our annual In-Progress Review (IPR) in November, during which our Principal Investigators presented the most recent results of their LMR-funded efforts. More details are provided later in this issue.

Program Manager Anu Kumar presented his 2014 programmatic brief to receptive audiences in Washington, D.C. He gave presentations to senior leaders and staff in the Deputy Assistant Secretary of the Navy Environment (DASN(E)) and OPNAV N45 offices as well as at NAVFAC headquarters. These meetings provided for a healthy exchange of information about the program, receiving positive feedback on the work being done by the program, appreciation for the efforts of the LMR Advisory Committee (LMRAC), and the new "public face" and transparency of the program.

We have also been preparing the first-ever LMR Program Report. We believe this report will become an important resource for all program participants and our resource sponsor. The report will provide 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. When completed, the report will be made available on the LMR web site at [www.lmr.navy.mil](http://www.lmr.navy.mil).



Anu Kumar, Program Manager

## PROGRAM INVESTMENT AREAS

The LMR program's Standard Operating Procedures lay out the following five key investment areas.

### 1. Data to Support Risk Threshold Criteria

Conduct applied research to establish risks to marine mammals, birds, fish, turtles and invertebrates from effects of naval training, exercise and R&D activities on Navy maritime ranges and operating areas, primarily risks from sound, vessel collisions and habitat degradation.

### 2. Improved Data Collection on Protected Species and Critical Habitat within Navy Ranges

Develop means to improve the quality, quantity and cost-effectiveness of protected species information and habitat monitoring capabilities on Navy at-sea ranges. Work should not include operational data collection that is part of required mitigation monitoring, but should offer proof-of-concept demonstrations of improved means for obtaining such data.

### 3. New Monitoring and Mitigation Technology Demonstrations

Demonstrate new technologies that offer to improve the effectiveness or endurance of monitoring and mitigation or reduce costs of required mitigation. Demonstrations should be undertaken with the cooperation and coordination of the Fleet or SYSCOM sponsor that would be accepting the technology if successfully demonstrated.

### 4. Database and Model Development

Address issues pertaining to data needs of Navy environmental documents and ongoing adaptive management evaluations of Navy activities on range marine life.

### 5. Education and Outreach, Emergent Opportunities

Provide information and capabilities developed under this or other programs both to potential users and experts in the field to facilitate application of new information and capabilities and to the concerned public and regulatory community to facilitate acceptance of new Navy science and technology applications. This investment area also covers emergent needs or opportunities that present a requirement for quick response on a topic of high Navy interest with a relatively quick and straightforward solution, but which is not covered by the preceding four Priority Areas of Investment.



Sperm whales.  
Suzanne E. Yin, HDR, NMFS Permit 14451

## LMR PROJECT SPOTLIGHT

Wondering about some of the new LMR projects? This section provides a brief overview of some of the new start projects launched this year. This quarter's project spotlight presents Principal Investigator Haru Matsumoto's project, "Demonstration of High-performance PAM Glider and Profiler Float."

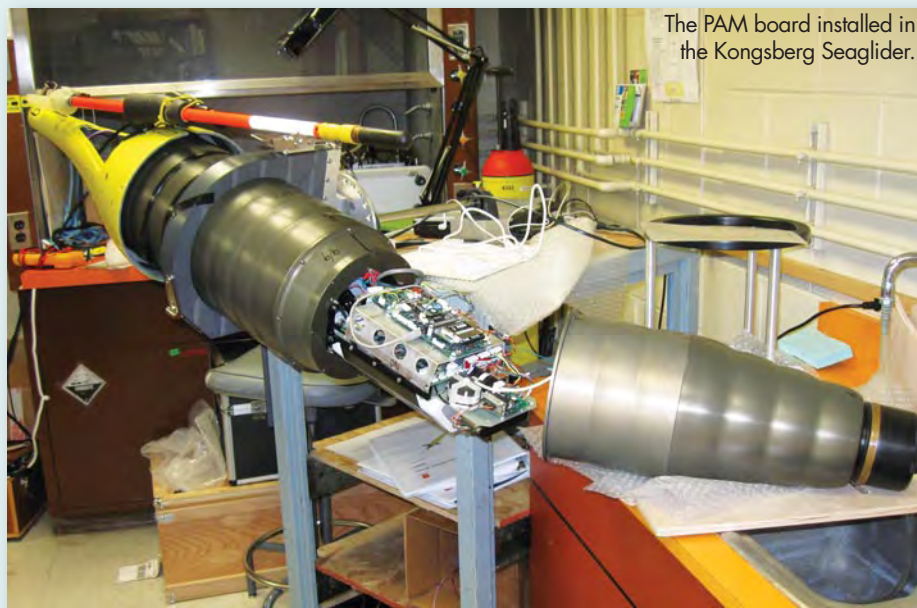
The Passive Acoustic Monitoring (PAM) programs being conducted on Navy ranges employ a variety of platforms, from fixed seafloor hydrophones—which limit the range of detection coverage—to hydrophone arrays that are towed, mounted on platforms, or drifting. In response to the need for improved PAM technology, Dr. Matsumoto's team is demonstrating two autonomous PAM platforms based on commercially available gliders and profiler floats—platforms that will allow the Navy to cost-effectively monitor marine mammals anywhere in the world including remote and non-instrumented training areas.

There are differences in body shape, steering mechanism, water flow, pump and motor activities, and internal electronics noise between the two platforms. These differences likely impact the passive acoustic performance of the systems and need to be examined and evaluated.

Both the float and the glider will include an acoustic system that was developed by Oregon State University (OSU) with funding from the Office of Naval Research (ONR). The OSU PAM board is based on an advanced digital signal processor (DSP) and low noise pre-amplifier that achieve a signal-to-noise ratio higher than 96 decibels, well below the ambient noise level of a typical calm ocean. This system's listening capability covers the frequency range of almost all cetaceans except for porpoises.



An acoustic float descending.



The PAM board installed in the Kongsberg Seaglider.



The first engineering test of a PAM-installed Seaglider took place in October 2014. The test provided valuable data on the system which will be used to enhance its detection capability. In spring of 2015, a two-week test will be conducted to compare the Seaglider's capabilities to those of a bottom-moored High-frequency Acoustic Recording Package (HARP) at the Quinault Training Range (QUTR) in Washington State. Subsequently, both platforms will be demonstrated along with efforts of the Marine Mammal Monitoring on Navy Ranges (M3R) program at Southern California Off-shore Range (SCORE).

At the end of this project, a detailed report will be issued comparing the performance of each system with the HARP and M3R systems. A detailed installation and user's guide will also be developed.



The first engineering test of a PAM-installed Seaglider took place in October 2014. The hydrophone is visible on the orange antenna.

## SUCCESSFUL IN-PROGRESS REVIEW

Nearly forty people from across the Navy gathered at the Space and Naval Warfare Systems Command’s Transducer Evaluation Center (TransDec) facility in San Diego 17-21 November 2014 to hear about the latest accomplishments of various LMR-funded research projects. (TransDec is a controlled environment, low ambient noise, and conveniently accessible transducer calibration and underwater acoustic test facility which also includes a conference room.) Attendees ranged from the program’s own advisory committee—the LMRAC—which consists of a resource sponsor representative, range monitoring program managers, Systems Command representatives, and other R&D program personnel to Principal Investigators who are leading research efforts to increase the capability of the U.S. Navy’s marine species monitoring program—efforts critical to the ongoing operation of the Navy’s testing and training ranges.

“It’s important that we check in with our Principal Investigators at these In-Progress Reviews (IPR) and over the course of the year to ensure that their efforts are properly focused and will achieve the intended results,” said Anu Kumar, LMR program manager. “These annual reviews bring together our end users, resource sponsor representatives, and researchers to strengthen the gap between the research we sponsor and the integration of that research into the Navy’s at-sea environmental compliance and permitting processes. These meetings also give us the chance to make some early course corrections where they are necessary. This year’s meeting was particularly successful in doing all of these things.”

Highlights of some of the more notable accomplishments presented during this IPR are provided below:

No.	Project	Recent Accomplishments	Principal Investigator
1.	Behavioral Response Study (BRS)	Published a SOCAL 2013 summary report and developed a SOCAL 2014 test plan. <ul style="list-style-type: none"> <li>• Executed and evaluated the SOCAL 2014 field effort.</li> <li>• Conducting advance planning for SOCAL 2015.</li> <li>• Focus on tagging in coordination with real sonar.</li> </ul>	Brandon Southall
2.	Marine Mammal Monitoring on Navy Ranges (M3R)	Tagged numerous species (Cuvier’s beaked whale, pilot whales, sperm whale and melon-headed whale) on AUTEK, SCORE, PMRF ranges with satellite tags. <ul style="list-style-type: none"> <li>• Developed a statistical tool that models the orientation and size of estimated error ellipses around Argos telemetry locations (important for imprecise beaked whale locations).</li> <li>• Developed a Blainsville’s beaked whale behavioral response curve.</li> <li>• A different curve for helicopter-dipping sonar suggests a range dependency on response.</li> </ul>	Dave Moretti

No. Project	Recent Accomplishments	Principal Investigator
3. Technology Demonstration for Fleet Passive Acoustic Monitoring (LMR project no. 7)	Developed a more efficient design for the upgrades to the High Frequency Acoustic Recording Package (HARP) devices for use in the Pacific and Atlantic ranges. <ul style="list-style-type: none"> <li>Upgrades include additional hard drive storage and bandwidth, multichannel recording, and longer battery life.</li> </ul>	John Hildebrand
4. Electrophysiological Correlates of Subjective Loudness in Marine Mammals (LMR project no. 9)	Collected Auditory Evoked Potential (AEP) data, conducted AEP with exponential modulation envelopes at low frequencies (with bottlenose dolphins). Developed and tested software for AEP correlational analysis. (Correlation method approximates equal latency contour shape only over limited frequency range.) <ul style="list-style-type: none"> <li>Collected frequency-specific data on two dolphins and two sea lions.</li> <li>Incorporating the results of this effort into the Navy's acoustic effects analysis (on Phase III criteria for weighting functions) and to support Navy interactions with regulators.</li> </ul>	Jim Finneran
5. Integrated Real-Time Autonomous Passive Acoustic Monitoring (IRAP) System (LMR project no. 2)	Designed and built the IRAP System payload for the REMUS Autonomous Underwater Vehicle and modified vehicle control computer software.	Phil Abbot Vince Premus
6. Demonstration of Commercially Available High-Performance PAM Glider and Profiler Float (LMR project no. 4)	Incorporated and tested Wideband Intelligent Sound Processor & Recorder (WISPR) electronics into Seaglider (Kongsberg) and profiler (Teledyne Webb) float. <ul style="list-style-type: none"> <li>Completed Seaglider and profiler system integration and conducted engineering test (off Newport, OR coast).</li> </ul>	Haru Matsumoto
7. Improving the Navy's Automated Methods for Passive Underwater Acoustic Monitoring of Marine Mammals (LMR project no. 8)	Running the Generalized Power Law (GPL) detector on PMRF range data (for baleen, humpback, minke and fin whales) and on SOCAL HARP data (for humpback, minke and blue whales). <ul style="list-style-type: none"> <li>Calibrated call counts on HARP data for humpback whales.</li> <li>Published journal article on humpback whale tracking on PMRF.</li> </ul>	Tyler Helble

Save the date for the 2015 IPR where all LMR Principal Investigators will be back to 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](mailto:cynthia.webber@navy.mil) or 760-939-2060.

## LMR PROGRAM PARTICIPANT UPDATES

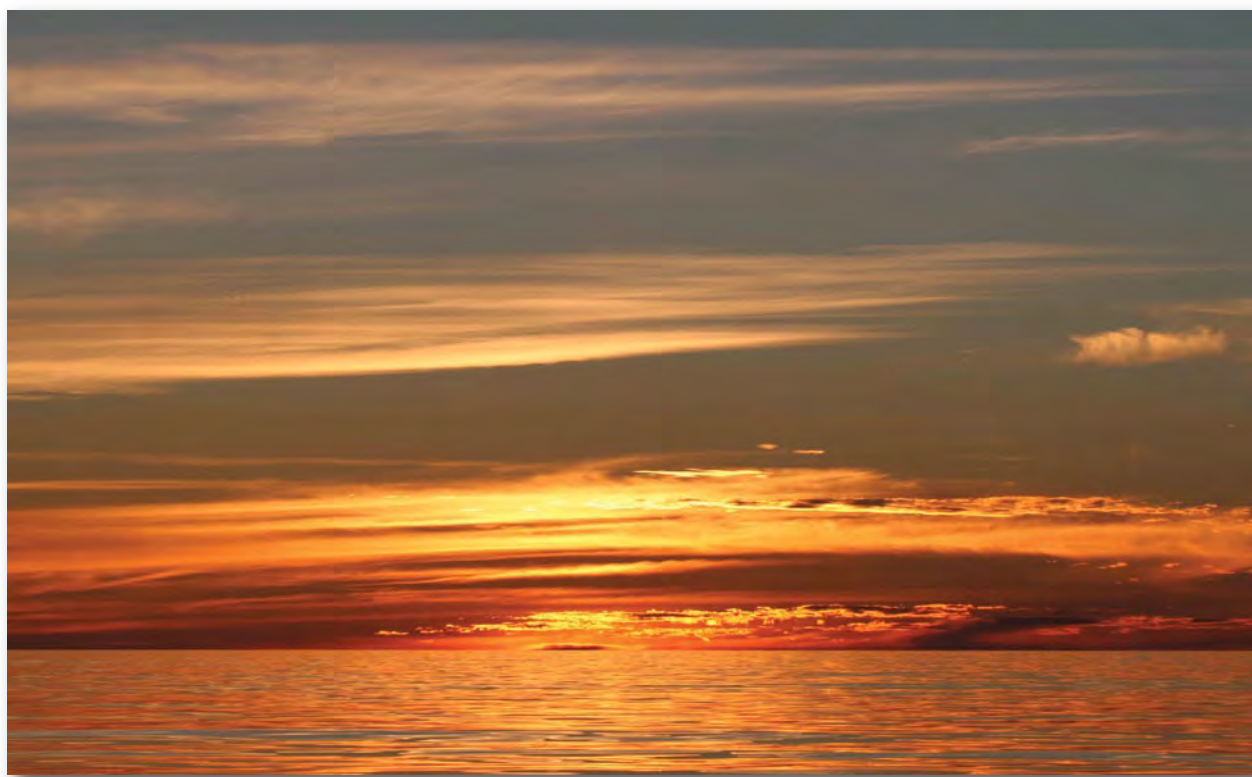
### Baleen Whale Hearing

Ted Cranford and Petr Krysl recently published results of their research on baleen whale hearing, specifically how baleen whales sense very low-frequency sounds. Cranford and Krysl used an exceptionally large X-ray CT scanner (designed for rocket motors) to scan the head of a young fin whale that died after a beach stranding. This allowed them to develop a computer model of the head and analyze how sound would travel through the tissue and bone of the head.

Their paper detailing the work, “Fin Whale Sound Reception Mechanisms: Skull Vibration Enables Low-Frequency Hearing,” is available online at <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0116222>. This work received funding from the LMR program and from the Office of Naval Research.

### SOCAL Field Work

Cascadia researchers Erin Falcone and Greg Schorr shared information from their January 2015 field efforts on the Southern California Anti-submarine warfare Range (SOAR), part of the Southern California Offshore Range (SCORE).



Researchers studying the distribution and demographics of marine mammals on a active Navy training range were treated to a gorgeous sunrise over calm waters during a survey in January 2015.

©Erin A. Falcone/Cascadia Research



A stretch of largely good weather with calm seas enabled the team to have several sightings of Curvier's beaked whales, including their first sighting of a neonate (newborn) whale. They successfully deployed four dive-depth tags on beaked whale adults, as well as deploying three tags on fin whales. Data from the tags will help to build the sample size on beaked whale behavior and provide insights into fin whale movement and habitat use in the SOAR region.

An exciting advancement that helped this and subsequent tagging in the SOAR region is that two new Wildlife Computers Argos receiving stations (aka, motes) have been installed. The first, installed on San Clemente Island, has been recording since October 2014. The second was installed on San Nicolas Island in January 2015. The San Clemente mote, first tested by Greg and Erin in January 2015, allowed them to obtain complete behavioral records from tagged Cuvier's beaked whales for weeks at a time, compared to the usual data gaps when relying on Argos satellites alone (currently overhead for only 18% of the day). In addition to reducing data gaps, the new motes expand the receiving range with messages coming in from 40 to 70km. The new stations could not have happened without the help and support of many people at SCORE, Wildlife Computers and LMRAC member John Ugoretz.



Researchers document their first sighting of a neonate Cuvier's beaked whale with its mom on the Southern California Anti-submarine Warfare Range in January 2015 while conducting a survey funded by the Navy's Living Marine Resources program. The presences of fetal folds and a slightly bent dorsal fin indicate this calf is likely very young. Photographs of the mother will be compared to Cascadia Research's photo-identification catalog to ascertain sighting history for this individual. Little is known about the reproductive cycle of this cryptic species, so longitudinal studies such as this provide rare and critical opportunities to gather important information about this species.

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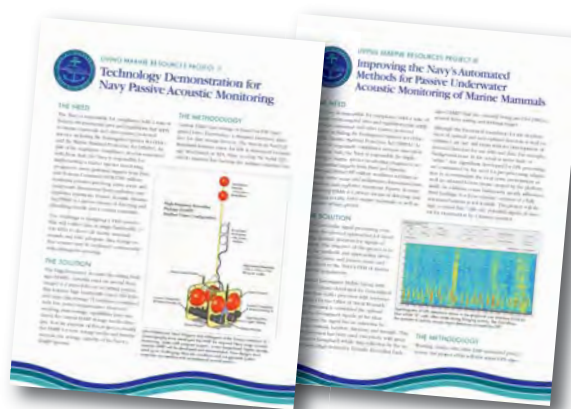
Erin Falcone



Greg Schorr

## OUR WEB SITE—WHAT'S AVAILABLE NOW

Our web site ([www.lmr.navy.mil](http://www.lmr.navy.mil)) is a ready source of up-to-date information about the LMR program. Recent additions include fact sheets on current LMR-funded projects. See the “Project Highlights” tab to find downloadable PDFs of the fact sheets. 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](mailto:eric.rasmussen@navy.mil).



## PROGRAM SCHEDULE

Please check the LMR web site ([www.lmr.navy.mil](http://www.lmr.navy.mil)) for the latest version of our program schedule.



# [www.lmr.navy.mil](http://www.lmr.navy.mil)



## A THANK YOU AND A CALL FOR LMR-RELATED PHOTOS

Thank you to Cascadia researchers Greg Schorr and Erin Falcone for sharing photos from their January 2015 field work, included in this issue.

We know that Greg and Erin are not the only ones who have 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](mailto:exwc_lmr_program@navy.mil).



A adult male Cuvier's beaked whale photographed on the Southern California Anti-submarine Warfare Range during a project to study the distribution, demographics, and behavioral of marine mammals in the area. The white scars are rake marks obtained while fighting with other adult male Cuvier's, and make the individual easier to identify if seen multiple times.

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## CONTACT THE LMR PROGRAM

For more information about the LMR program and its operations, contact Anu Kumar, Program Manager, [exwc\\_lmr\\_program@navy.mil](mailto:exwc_lmr_program@navy.mil), 805-982-4853.

## IN THE NEXT ISSUE OF *LMR NEWS*

Our next issue will include more highlights from ongoing projects, identify new projects due to come online and discuss efforts to make tagging data resulting from improvements in SoCal satellite tagging more accessible to researchers.

Until then, look for the 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” in the spring 2015 issue of *Currents* magazine, the Navy’s energy and environmental magazine. You can find that and other articles about the LMR program in issues of *Currents* magazine at <http://greenfleet.dodlive.mil/currents-magazine>.



An online database of detectors/classifiers will be built for beaked, sperm, and baleen whales.