



U.S. Navy Living Marine Resources Program FY21 Need Topics

The U.S. Navy Living Marine Resources (LMR) program issued a call for pre-proposals pertaining to five FY21 need topics.

SOLICITATION OPEN PERIOD: 4 September – 12 November 2020.

SOLICITATION ADVERTISEMENT:

- BAA Solicitation N39430-20-S-2256 posted under Contract Opportunities on Beta.SAM.gov <https://beta.sam.gov> on 04 September 2020.
- Announcement posted on LMR Program website at <https://www.navfac.navy.mil/lmr> on 04 September 2020.
- Announcement posted to MARMAM and bioacoustics-l listservs on 04 September 2020.

NEED TOPIC N-0226-21: SHIP SHOCK TRIAL ACOUSTIC MEASUREMENT

Each new class (or major upgrade) of surface ships constructed for the Navy may undergo an at-sea shock trial. A shock trial is a series of underwater detonations that sends a shock wave through the ship's hull to simulate near misses during combat. A series of up to four underwater detonations per event will be conducted at various distances from the ship (with charges set closer to the ship as the trial progresses). While the Navy collects data on the acoustic shock waves effects on the ship and equipment and has estimated the impact to the environment through acoustic models, few *in situ* measurements on the extent of the acoustic propagation have been undertaken. There is a research need to collect *in situ* data on propagation in the marine environment to enhance the Navy's predictive acoustic modeling methods.

The LMR program is seeking pre-proposals on measuring the sound produced from a ship shock trial involving explosives from 10,000 -58,000 lbs. net explosive weight (NEW). Pre-proposals should include an approach to measure the sound from several locations, distances, and depths to get a representation of the ocean's physical environment and how it affects acoustic propagation. Proposed methods should include remote recording capability with appropriate sensitivity, bandwidth, and hardware survivability to completely capture and measure the signal using the appropriate metrics from a safe standoff distance. This will likely require a minimum of 72-hour recording capacity per device to allow for deployment prior to the test. Additionally, the pre-proposal should include methods to collect data on the physical environment, such as water column structure and depth, wave height, wind speed, etc. The

pre-proposal should seek existing data on bathymetry and sediment properties of the study site. Resulting data collected will be provided to the Navy for further analysis.

The pre-proposal should be structured to include a Phase I base task of developing the test plan, participating in field test planning discussions, and presenting at the annual LMR In-Progress Review. A Phase II optional task would include procuring and/or assembly of any equipment. The Phase III optional task would be everything involved to conduct the field measurements and prepare data for analysis and delivery to the Navy. Assume a planned field date sometime within June 1- November 14 2021. Assume the field location is off the coast of Jacksonville Florida, in water deeper than 600 ft. Also, assume that Navy will provide the vessel to support deployment and recovery of equipment during the field event. A Phase IV optional task can include analysis of the data.

NEED TOPIC N-0237-21: STANDARDIZING AUDITORY EVOKED POTENTIAL HEARING THRESHOLDS WITH BEHAVIORAL HEARING THRESHOLDS

The use of Auditory Evoked Potential (AEP) methods to study hearing capability in marine mammals has expanded the audiogram data available, both for species we have in captivity as well as from stranded animals. AEPs continue to be the primary means by which sample sizes of audiograms will increase due to the ease of implementation and the ability to be used in untrained or stranded animals. However, the use of behavioral methods to study hearing thresholds remains the standard for assessing absolute hearing sensitivity. Due to the uniform, frequency-dependent elevation of AEP thresholds over behavioral hearing thresholds, AEPs are currently only used for defining species' upper-frequency limit of hearing. The ability to study and account for these differences in methods would enable AEP audiograms to be adjusted and comparable to audiograms using behavioral audiogram approaches. This would allow a greater number of AEP audiograms available for use in weighting function development and other Navy environmental compliance efforts.

The LMR program is seeking pre-proposals on investigating the relationship between AEP and behavioral hearing thresholds. The intent would be to develop a standard by which AEP hearing thresholds could be adjusted and compared to behavioral thresholds. This work would potentially broaden the capability and use of AEP results in criteria development for future Navy environmental compliance efforts.

NEED TOPIC N-0238-21: UNDERSTANDING MARINE MAMMAL HEARING AND BEHAVIORAL RESPONSE TO CONTINUOUSLY ACTIVE SONAR

It has been noted from previous behavioral response studies that signal type and duration of Navy sonar signals may play a role in observed responses in marine mammals. In 2017, LMR began investing in studying and collecting behavioral response data to continuously active sonar as part of the third phase of the Sea Mammals and Sonar Safety (3S3) project (LMR Project 29). However, there is an expanded need to further understand the effects of continuously active sonar on marine mammals, particularly with additional marine mammal species.

We are soliciting pre-proposals to study the effects of continuously active sonar on marine mammal hearing and behavioral response. Pre-proposals must include an approach that will investigate exposure

to operational Navy sonar sources or simulated scaled-sources with continuous signals. See Appendix A for LMR priority species and geographic regions. Pre-proposals should include appropriate research approaches including but not limited to controlled exposure experiments on free-ranging animals, observational studies of incidental exposure such as during actual Navy training exercises or testing activities, and studies involving captive animals.

NEED TOPIC N-0239-21: RELATIONSHIP BETWEEN PERCEIVED LOUDNESS OF A SIGNAL AND SIGNAL LENGTH

Unlike physiological impacts (i.e., Temporary Threshold Shift, Permanent Threshold Shift), marine mammal behavioral response to noise is likely mediated by both context and perceived components of the signal rather than physical characteristics alone. One of the perceptual components of sound is the perceived loudness. Loudness is a psychoacoustic measure which does not track linearly with increase in signal amplitude (i.e., in humans loudness is doubled every 10db while signal energy or amplitude is doubled every 6db [Suzuki & Takeshima 2004]). One factor that may lower perceived loudness and therefore reduce the potential for a behavioral response is the length of the signal. Previous research in humans shows a significant decline in perceived loudness with signals shorter than a certain length. In other words, signals were perceived as louder as signal length increased until ~300ms at which no further increase of loudness was reported with increasing signal length (Small et al. 1963 and Ekman et al. 1966). There is a research need to further investigate the potential relationship between perceived loudness and signal length in marine mammals in order to understand the duration of which the signal is no longer perceived. Some related investigations on the topic of perceived loudness include Kastelein et al. 2011, Finneran et al. 2011, and Mulsow et al. 2015.

The LMR program is seeking pre-proposals on investigating the relationship between perceived loudness and signal length for short duration signals, between 25 millisecond and 1 second in length, with the objective of understanding at what duration the subject no longer perceives the signal. Frequency range of the study signals should be within one octave above and one octave below the best hearing frequencies of the proposed species being evaluated. The pre-proposal can include additional frequencies as appropriate to better characterize the relationship. Pre-proposals should consider studies with captive marine mammals with a priority to study 1) delphinids, 2) pinnipeds, and 3) porpoises.

Ekman, Gosta, Berglund, Birgitta, and Berglund, Ulf 1966. Loudness as a function of the duration of auditory stimulation. *Scand. J. Psychol.*, Vol. 7, 1966 201-208

Finneran, James J., and Schlundt, Carolyn E. 2011. Subjective loudness level measurements and equal loudness contours in a bottlenose dolphin (*Tursiops truncatus*) *J. Acoust. Soc. Am.* 130 (5) 3124-3136 doi: 10.1121/1.3641449

Kastelein, Ronald A., Wensveen, Paul J., Terhune, John M., and de Jong, Christ A. F. 2011. Near-threshold equal-loudness contours for harbor seals (*Phoca vitulina*) derived from reaction times during underwater audiometry: A preliminary study. *J. Acoust. Soc. Am.* 129 (1) 488-495 doi: 10.1121/1.3518779

Small, Arnold M., Brandt, John F., and Cox, Phillip G. 1963. Loudness as a function of signal duration. J. Acoust. Soc. Am. 34 (4) 513-514 doi: 10.1121/1.1918157

Suzuki, Yo^oiti, and Takeshima, Hisashi 2004. Equal-loudness-level contours for pure tones. J. Acoust. Soc. Am. 116 (2) 918-933 doi: 10.1121/1.1763601

Mulsow, Jason, Schlundt, Carolyn E., Brandt, Lacey, and Finneran, James J. 2015. Equal latency contours for bottlenose dolphins (*Tursiops truncatus*) and California sea lions (*Zalophus californianus*). J. Acoust. Soc. Am. 138 (5) 2678-2691 doi: 10.1121/1.4932015

NEED TOPIC N-0240-21: STUDYING MARINE MAMMAL BEHAVIORAL RESPONSE TO SURTASS LFA SONAR

The Navy plans to continue to train and test with the Surveillance Towed Array Sensor System (SURTASS) Low Frequency Active (LFA) sonar systems in the western and central North Pacific and eastern Indian oceans. More information about the SURTASS LFA system, where and how it operates, and an assessment of the potential effects to marine species can be found at <http://www.surtass-lfa-eis.com/>.

Since acoustic stimuli from use of SURTASS LFA sonar during training and testing has the potential to cause harassment of marine mammals, there is a need to study and collect new data on these potential effects, with a priority towards understanding behavioral response to the LFA source. The goal of this effort is to update previous studies done with LFA sources circa 1990s based on lessons learned and best practices from controlled and observational behavioral response studies using other sonar sources conducted over the last 10 years.

LMR is seeking pre-proposals on a Phase I feasibility study to develop a plan to study marine mammal behavioral response to LFA sonar. The Phase I feasibility study will investigate the best approach to designing a scientific study to assess behavioral response to LFA sonar. This will involve discussions with the program managers about identifying Navy participation, availability of sources, and developing a final plan to conduct a study to collect data to best characterize behavioral responses to LFA sonar. Initial assumptions to consider in the pre-proposal include:

1. Navy will provide the source
2. Source options potentially include a 3-element scaled source or a 19-element full scale source on a SURTASS LFA vessel
3. Regions of data collection are unknown at this time, assume that it will be in the United States (either contiguous or non-contiguous)
4. Priority species include mysticetes and beaked whales, along with any other priority species within the specific region that data collection will occur.

The Navy's preference is for collection of *in situ* data via field trials, but are open to other approaches. The Phase I final plan will form the basis of the proposed scope of work for a Phase II proposal submission.

This BAA announcement is for the Phase I effort only and awardees will compete for a Phase II award. In the pre-proposal submission, include your approach to developing a Phase I plan, anticipated required information you will need to develop the plan, potential challenges with developing and conducting a study and proposed means of overcoming them, and your team's experience to conduct the study. All offeror's that are awarded Phase I awards originating from this announcement will be eligible to participate in the Phase II competition. The program managers will provide, either in the Phase I award or by subsequent notification, full details on the due date, content, and submission requirements of the Phase II proposal.

Phase I Kick-Off Brief will be required as the first deliverable on the Phase I contract. Phase I period of performance will be 12 months and approximately \$150,000. While the program managers may provide updated information throughout Phase I, awardee's are required to seek information that is necessary to develop the plan from the program managers. The program managers will work to address questions, and share information to all awardees in a consistent and fair manner. Final deliverables for Phase I will be a Final Brief and the Phase II proposal submission. Anticipate Phase II period of performance to be based on proposed study design requirements, not to exceed 5 years, in total, from Phase I award date.