LIVING MARINE RESOURCES PROJECT 60

# Historic ARP and HARP Passive Acoustic Recording Archiving with NCEI

## NEED

The Navy is interested in developing methods to improve the efficiency of processing and analyzing marine species data and providing cost effective solutions to enhance marine species monitoring capabilities (e.g., detection and classification algorithms, passive acoustic monitoring automated processing tools, statistical methods).

## SOLUTION

With prior Navy funding, the Scripps Whale Acoustic Laboratory has collected an extensive set of passive acoustic data using Acoustic Recording Packages (ARPs) and High Frequency Acoustic Recording Packages (HARPs). These data are at risk of deteriorating or being lost without proper means of archiving the data. National Centers for Environmental Information (NCEI) has been leading an effort to create a national infrastructure to preserve passive acoustic monitoring data and make them publicly accessible for future analysis. This project will focus on preserving the oldest sets of data, collected between 1999 and 2009, which total approximately 100 terabytes (TB) of recorded data. Archiving these datasets includes consolidating the datasets, ensuring metadata integrity and physically transferring these datasets to NCEI. The project team will collaborate with Navy entities and NCEI staff to develop and streamline archiving processes to improve the feasibility of future archiving efforts.

## METHODOLOGY

The project is focused on two core tasks: archiving data and participating in the Passive Acoustic Monitoring National Cyberinfrastructure Center Case Study Project.

1. **Data Archiving**

   The project team will archive approximately 100 terabytes (TB) of passive acoustic recordings from a 10-year time series recorded across up to ten simultaneous stations in the Southern California bight from 1999–2009. The dataset also includes extended-duration recordings from Arctic, Antarctic and Gulf of California monitoring sites. A 15-year time series of short-duration sonobuoy recordings associated with quarterly CalCOFI (California Cooperative Oceanic Fisheries Investigations) cruises also will be archived. The sonobuoy dataset, collected quarterly at approximately 60 stations from 2004–2019, includes an estimated TB of additional compressed data.

   Efforts will include coordinating with Navy entities to ensure that the datasets are publicly releasable and coordinating with NCEI staff to ensure that the data are correctly formatted. The team will also

   - Aggregate documentation that describes the equipment used, calibration information, deployment and recovery details, data quality and associated project details where appropriate.
   - Convert audio files from wave (WAV) and extended wave (XWAV) format to FLAC format, which achieves lossless 2x compression.
   - Generate Long-Term Spectral Averages, used to summarize the data visually at a high level.

2. **Case Study Project**

   The project team will participate in the Navy-led PAMNaCC (Passive Acoustic Monitoring National Cyberinfrastructure Center) Case Study Project to conduct a temporal analysis examining change of sound levels in the Pacific and Arctic Oceans.

NAVFAC Naval Facilities Engineering Systems Command
EXWC Engineering & Expeditionary Warfare Center

The case study will use HARP and ARP datasets in conjunction with Noise Reference Station and Alaska Fisheries Science Center data.

Within its role in the case study, the project team will

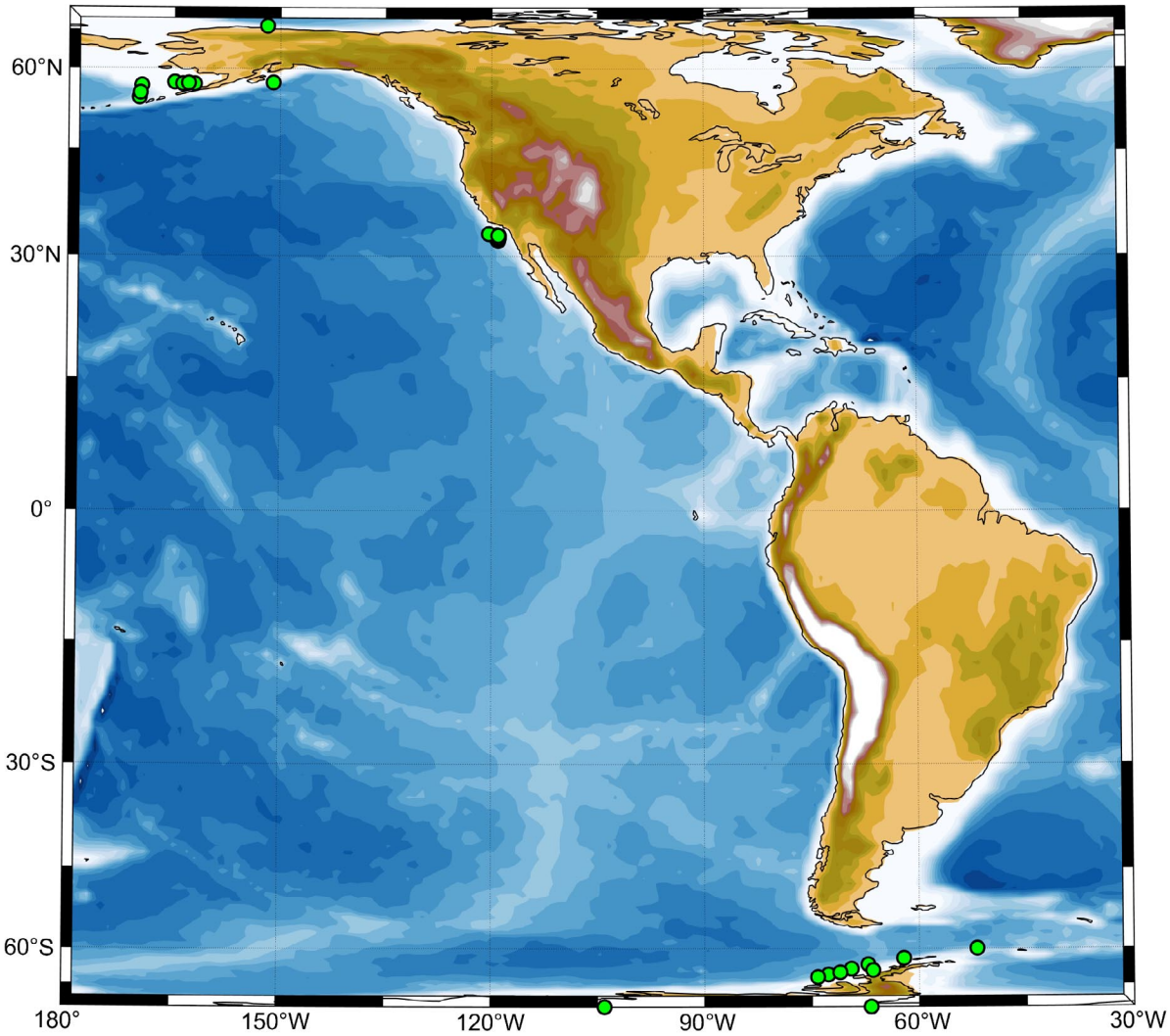
- Identify the best datasets to include in the case study
- Create and share calibrated sound levels for those datasets
- Provide expert insight on the sound level patterns to ensure accurate interpretation
- Participate in an annual one-week workshop in at NCEI in Boulder, Colorado over the course of the project.

## SCHEDULE

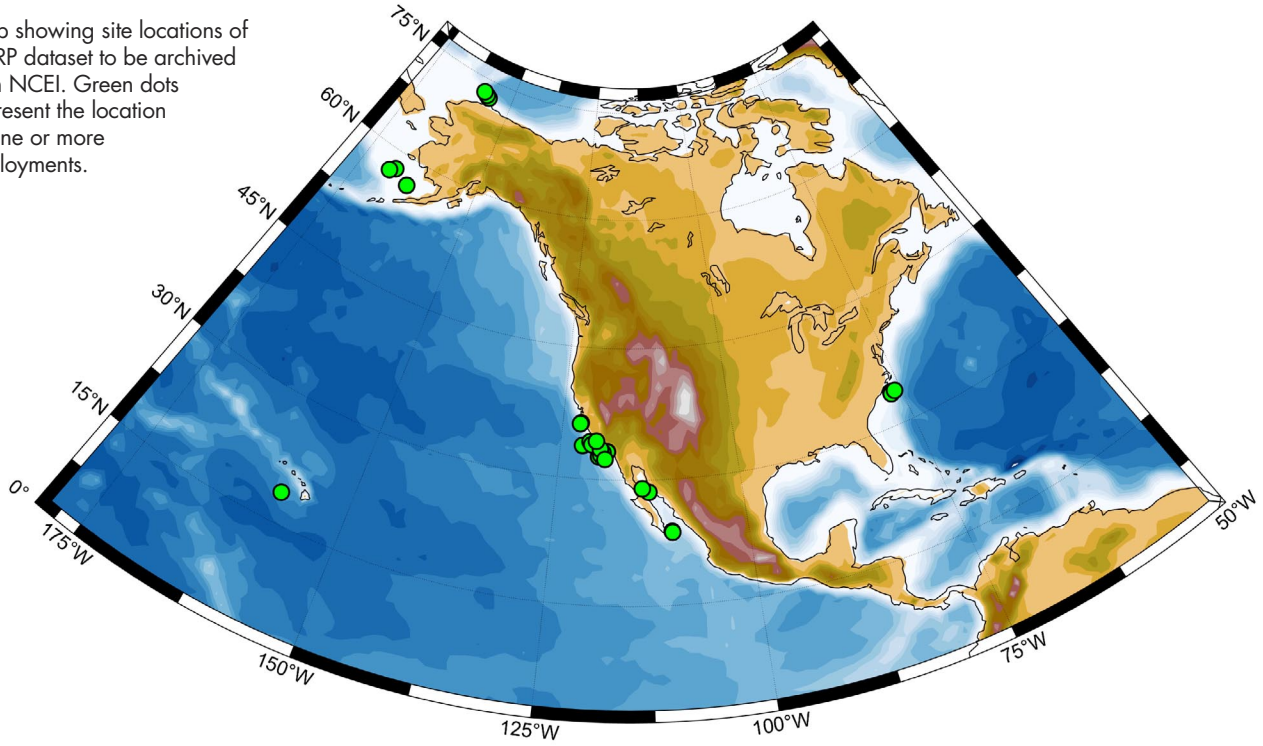
The project will run from mid-2022 through the end of 2024.

## NAVY BENEFITS

Archiving these data will protect past Navy investments in passive acoustic monitoring and will preserve these time series and early recordings.




Map showing site locations of ARP dataset to be archived with NCEI. Green dots represent one or more deployments.




Map showing site locations of HARP dataset to be archived with NCEI. Green dots represent the location of one or more deployments.

Including the data in the NECI archive will enable the data to be used in aggregate to help to quantify long-term changes in marine soundscapes. The effort will also help to evaluate and advance processes for large scale open access passive acoustic data archiving and hosting at a national level.

## TRANSITION

The project will produce compressed (lossless) acoustic recordings organized with all relevant metadata including deployment information (e.g., site locations and depths, sensor design sensitivity and data quality information, and sponsor and project details) to facilitate further use. The project team will provide content and guidance to NCEI, which will develop web-access to the acoustic data and/or metadata records.

## ABOUT THE PRINCIPAL INVESTIGATOR

Kaitlin Frasier, Assistant Researcher with the Scripps Machine Listening Laboratory, has 15 years of experience working with HARP data and specializes in the use of multi-terabyte passive acoustic datasets for marine mammal monitoring. She has initiated an archiving effort in collaboration with NOAA Southeast Fisheries Science Center for passive acoustic data collected in the Gulf of Mexico, and has also assisted with preparation, documentation and archiving of acoustic challenge datasets related to DCLDE, a biennial workshop focused on comparable methods for acoustic analysis on shared datasets. Dr. Frasier earned her Ph.D. in biological oceanography at Scripps Institution of Oceanography, University of California at San Diego.

## About the LMR Program

The Living Marine Resources (LMR) program seeks to develop, demonstrate, and assess data and technology solutions to protect living marine resources by minimizing the environmental risks of Navy at-sea training and testing activities while preserving core Navy readiness capabilities. For more information, contact the LMR program manager at exwc_lmr_program@navy.mil or visit exwc.navfac.navy.mil/lmr.