



LIVING MARINE RESOURCES PROJECT 18

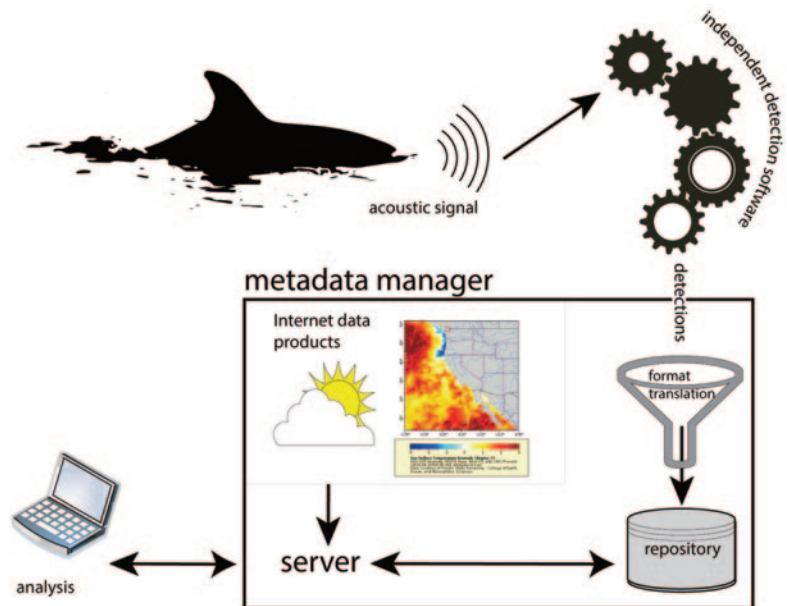
Acoustic Metadata Management for Navy Fleet Operations

THE NEED

The Navy is responsible for compliance with a suite of Federal environmental laws and regulations that apply to marine mammals and other marine protected species, including the Endangered Species Act and the Marine Mammal Protection Act. As part of the regulatory compliance process associated with these Acts, the Navy is responsible for implementing a marine species monitoring program to assess potential impacts from Fleet and System Command military readiness activities involving active sonar and underwater detonations from explosives and explosive munitions. Current Navy-funded marine biological resource surveys span a variety of survey protocols and produce geo-referenced data products that are not necessarily consistent with one another, nor are they consistent with developing inter-agency marine bio-data standards or other established international standards for biogeographic data. The Navy has an immediate need for improved data collection platform technology to meet monitoring requirements.

THE SOLUTION

This project team, led by Professor Marie Roch of San Diego State University, will focus on Tethys, a Passive Acoustic Monitoring (PAM) metadata database system sponsored by National Oceanographic Partnership Program. Tethys incorporates the expertise of PAM personnel at National Oceanic and Atmospheric Administration (NOAA) Alaska, Northeast, Pacific Islands, Southeast, and Southwest Fisheries Science Centers as well as PAM experts at



Overview of workflow. Raw acoustic signals are processed by other software to produce metadata describing animal calls. The system can process output from a wide variety of formats. These metadata are stored in a data repository along with details about the instrument that recorded the calls. Scientists request data through interfaces available for several programming languages, and the interface provides access to other Internet available data products. (Sea surface height anomaly image courtesy NOAA Southwest Fisheries Science Center Environmental Research Division.)

Scripps Institution of Oceanography and San Diego State University.

Standardized data representations (schemata) have been developed in Tethys for describing instrumentation, effort, detections and localizations. In addition to the standard reporting fields, user-defined information may be added. The unique feature of Tethys is that it provides a standard that can be implemented on any system, and there is broad interest in transitioning what is becoming a community standard into an official one. This project involves collaboration between Navy, NOAA, and the Bureau of Ocean and Energy Management (BOEM). This project builds off of work

previously funded by the Office of Naval Research (ONR), and portions of the project are currently being funded by the LMR program while others are being funded by BOEM.

THE METHODOLOGY

This research team will strengthen the capabilities of Tethys to make it more usable by the U.S. Navy. Specific tasks include providing additional data analysis and reporting facilities, identifying bottlenecks in performance as the existing databases continue to grow in size, and further development of the program's schemata for localization.

THE SCHEDULE

Technology will be demonstrated on either San Diego State University or naval hardware. First, client libraries will be enhanced to provide additional data analysis and reporting facilities, then performance will be tested as the volume of Tethys data increases. Next steps will focus on localization data, refining current representations, and developing the capability to export these into the integrated ocean observing system. Role-based security administration will then be performed.

The last and lengthiest task will be to begin the standardization process by inviting input from broader community stakeholders such as the Navy, NOAA, BOEM, the National Geographic Data Center, academia, and private industry.

NAVY BENEFITS

Without a mechanism to effectively organize information derived from PAM, it is impossible to monitor long-term impacts of naval activities. Long-

term data retention that permits comparisons over multi-year time periods enables work in a variety of areas that are of interest to the Naval mitigation efforts in all Navy testing ranges, such as developing sonar dose-response curves, habitat modeling, and density estimation.

TRANSITION

Potential users of this offering include any branch employing PAM for marine mammals. Requirements for organizations leveraging the acoustic metadata and environmental data are the ability to program in one of the client languages (Matlab, R, Java, or Python). The effort to leverage the data is highly dependent on the complexity of the question being asked, but once code is developed, repeated usage can be highly cost-effective. Server hardware requirements are modest—a recent generation server or high-end workstation running a 64 bit Windows operating system with network connections and adequate disk space.

ABOUT THE PRINCIPAL INVESTIGATOR

Marie Roch is an interdisciplinary computer scientist whose work on the bioacoustics of marine mammals is internationally recognized. She has authored over 30 refereed publications, organized conferences and panels in the area of bioacoustics, and presented extensively in academic and community outreach venues. Dr. Roch holds a Ph.D. in computer science from The University of Iowa.



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 www.lmr.navy.mil.

