

## **ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** National

**Planning Area(s):** All Planning Areas

**Title:** Development of Software and Hardware to Acoustically Detect, Classify, and Locate Marine Mammals --- NOPP co-sponsorship

**BOEM Cost:** \$250,000

**Period of Performance:** FY 2011-2015

**Conducting Organization(s):** Office of Naval Research (M11PG00012) lead agency in NOPP; contract recipient San Diego State University, San Diego, California, principal investigator: Dr. Marie Roch, Associate Professor

**BOEM Contact:** [Dr. Jim Price](#)

### **Description:**

**Background:** Governmental agencies and industries that focus on marine environments need to optimally detect, locate and identify marine mammals during a variety of activities including marine geophysical surveys, naval exercises, and population assessment surveys. Of particular interest is achieving a capability for the detection, classification and localization (DCL) of marine mammals under circumstances where standard visual observation from ship-based marine mammal observers (MMOs) is ineffective, such as during night-time operations, periods of bad weather, with animals below the sea surface and/or beyond visual range. The 2009 report of the Joint Subcommittee on Ocean Science & Technology (JSOST) titled, "Addressing the effects of human-generated sound on marine life: An integrated research plan for U. S. Federal Agencies" identified the development of new methods to detect, identify, locate and track marine mammals in order to increase the effectiveness of detection and mitigation as an item of highest research priority.

Mitigation requirements under Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) provisions require the development of real-time (or near real-time) monitoring capability of marine mammals. Multiple agencies and groups have interest in the improvement of passive and active acoustic monitoring capability as a complement to standard visual observations from ship-based platforms. Ideally, a ship operator would have a single tool to detect, classify and locate marine mammals within a certain operational area such as an exclusion zone. Unfortunately, operational areas within the marine environment are often complex and unique, especially when operations are not conducted in a standard or fixed location. For example, some marine geophysical surveys, which use towed seismic equipment to collect data for research on Earth systems, are driven by scientific questions and therefore are conducted in various locations around the world from deep-ocean to more shallow coastal environments. Some methods may be more appropriate than others under certain environmental conditions, such as deep ocean water versus shallow coastal environments. Therefore,

while a single method for DCL would be ideal, due to the complexities of the marine environment and unique operations, different methods, or combinations of methods forming a DCL “system” for different environments may be necessary. Ultimately, any method developed needs to demonstrate, with a high level of confidence, the detection, localization, and range to marine mammals within a specified area.

The research project BOEM funded will result in an interactive system that permits the archival and sharing of metadata in a format that is flexible enough to meet future needs as methods and equipment evolve. It will enable the team and other users to ask questions about acoustic detections and physical or biological oceanographic phenomena in minutes that formerly would have taken days or weeks of staff effort to pose. Queryable records will aid in preserving institutional memory, and the ability to share between institutions will enable the analysis of broad, long-term data sets. Publishing protocols will allow the metadata to be published to a central repository maintained by OBIS-SEAMAP. A well designed and implemented acoustic metadata database has the potential to serve as a transformational technology for passive acoustic monitoring research.

The details of the work to be described are presented in the proposal submitted under the BAA. A brief listing of the research tasks to be performed, broken-down by U. S. governmental fiscal years, are as follows.

#### Fiscal Year 1

1. Distribute resource materials to partners

#### Fiscal Year 2

1. Develop data security model
2. Write a research paper to be submitted for publication to a peer-reviewed journal using/describing prototype
3. Develop the XML schema design
4. Develop the Mediator Module
5. Develop the Java and Matlab interfaces
6. Make the interfaces publicly available
7. Write a research paper to be submitted for publication to a peer-reviewed journal linking detections and physical phenomena
8. Start geotemporal index design

#### Fiscal Year 3

1. Produce the Geotemporal index and operator design & benchmarking
2. Update publicly available software
3. Start mapping capability and Mediator Module number 2
4. Export the metadata system to OBIS/SEAMAP

#### Fiscal Year 4

1. Complete mapping, visualization, and second mediator capability
2. Write the R-language programmer’s interface

3. Update publicly available software
9. Write the XML Schema for enforcing standard fields
10. Write articles showcasing ability to examine physical and oceanographic variables, and new database article showing spatiotemporal capacity.

**Importance to BOEM:** This study will inform BOEM's rulemaking for the purpose of offshore operator compliance with the mitigation requirements under the Marine Mammal Protection Act and the Endangered Species Act.

**Current Status:** This study was awarded on May 16, 2011; fiscal year 2 activities mostly completed; fiscal year 3 activities spinning-up

**Final Report Due:** September 30, 2015

**Publications:** none

**Affiliated Web Sites:** <http://roch.sdsu.edu/Research.shtml>

**Revised Date:** May 17, 2012

**ESPIS: Environmental Studies Program Information System**

**All *completed* ESP studies can be found here:**

[http://www.data.boem.gov/homepg/data\\_center/other/espis/espisfront.asp](http://www.data.boem.gov/homepg/data_center/other/espis/espisfront.asp)