



LIVING MARINE RESOURCES PROJECT 19

DECAF-TEA: Density Estimation for Cetaceans from Acoustic Fixed Sensors in Testing and Evaluation Areas

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. As part of the compliance process associated with these regulations, 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.

Passive Acoustic Monitoring (PAM) is a proven means of detecting and classifying vocally active marine mammals, as well as a number of fish species. While the Navy uses PAM data for many environmental monitoring purposes, perhaps its most powerful and beneficial application is to obtain density estimates for species of concern in situations where other methods (e.g., visual) are infeasible or prohibitively costly. Much of the PAM-based density estimation work is now taking place on Navy testing ranges where there are pre-existing arrays of cabled hydrophones. Much Navy activity takes place away from these instrumented ranges, but methods applicable to such areas have yet to be fully developed, demonstrated and validated.

THE SOLUTION

Cetaceans, which rely on sound for both communication and (in many cases) foraging, are especially well suited for density estimation using passive acoustic monitoring. The goal of this project is to demonstrate and validate a method for passive acoustic density estimation for cetaceans applicable to Navy operating areas.



Cuvier's beaked whale.

*Gregory S. Schorr,
Permit 16111*

THE METHODOLOGY

This research team, led by Len Thomas of the University of St Andrews, will deploy retrievable, bottom-mounted passive acoustic sensors adjacent to or overlapping the Southern California Anti-Submarine Warfare Range (SOAR). This allows the team to demonstrate how information from instrumented and non-instrumented areas can be combined. Data from these sensors, in conjunction with estimates of

vocalization rates from existing and ongoing studies, will be used to estimate density values and create animal distribution maps for two case-study species: the Cuvier's beaked whale and fin whale. This work will build on previous studies with other species which have taken place at the Navy's instrumented ranges. The project team will leverage fin whale vocalization data obtained in the ongoing SOCAL Behavioral Response Study (LMR project 2). The project is heavily reliant on the M3R passive acoustic monitoring system developed for the instrumented Navy ranges by the Navy Undersea Warfare Center, who are partners on this project.

THE SCHEDULE

In fiscal year 2016 (FY16) the team will hold a planning meeting and undertake a desk-based review of available acoustic recording hardware. In FY17, the team will undertake a test deployment adjacent to SOAR. This will allow them to use the existing hydrophone array at SOAR to validate the ability of their approach for estimating acoustic detection probability, and test other aspects of the method. The main deployment will occur in FY18; this will last as long as is practical given budgetary constraints, but will be a minimum of one month. Data processing and analysis will take place in FY19, with the project completing in September 2019.

The end products will be density estimates and associated animal distribution maps that combine data from both instrumented and non-instrumented ranges.

NAVY BENEFITS

This technology will, for the first time, extend passive acoustic density estimation capability to areas of sonar use outside the boundaries of instrumented ranges

and greatly contribute to the knowledge of species density. These data are critically important for the ongoing sonar effects modelling which is required with each Navy Environmental Impact Statement (EIS). Currently, many of the areas covered under the requisite EISs use data from sparse visual surveys or habitat models, which leads to large uncertainties in the models' take estimates.

TRANSITION

The project goal is to demonstrate a system that can readily be transferred to operational Navy. This will be described in detail in a written report, together with concrete suggestions for transfer to other sites and species of high Navy relevance. Members of the project team are already engaged in training Navy personnel in the appropriate statistical approaches via the LMR-funded project, Training Workshops on Density Estimation from Passive Acoustic Data (also known as the IDEA project).

ABOUT THE PRINCIPAL INVESTIGATOR

Len Thomas has worked as a statistician at the University of St Andrews, Scotland, since 1997, where he is Director of the Centre for Research into Ecological and Environmental Modelling. Len's research focuses on applied ecological statistics. Of particular relevance to this project, Len was principal investigator on the project (DECAF) that developed the first methods for cetacean passive acoustic density estimation. He has a Ph.D. in Forestry from the University of British Columbia.



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.

