

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>2008</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2008 to 00-00-2008</b>	
4. TITLE AND SUBTITLE <b>Remote Monitoring of Dolphins and Whales in the High Naval Activity Areas in Hawaiian Waters</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Hawaii Institute of Marine Biology, Marine Mammal Research Program, P.O. Box 1346, Kaneohe, HI, 96744</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>3</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

# **Remote Monitoring of Dolphins and Whales in the High Naval Activity Areas in Hawaiian Waters**

Whitlow W. L. Au  
Marine Mammal Research Program  
Hawaii Institute of Marine Biology  
phone: (808) 247-5026 fax: (808) 247-5831 email: [wau@hawaii.edu](mailto:wau@hawaii.edu)

Award Number: N000140810903

## **LONG-TERM GOALS**

The axiom that knowledge is power applies directly to the problems experienced by the U.S. Navy in encountering dolphins and whales. These encounters can be avoided if more knowledge and understanding of the behavior, distribution, and movements of these animals. Simply stated, if the Navy had more knowledge of the **what, where, when** and **why** of marine mammals in a given body of water, encounters between Naval vessels and marine mammals could be reduced or avoided all together. The ocean is large and the chances of avoiding any interaction with any sizable group of marine mammals are probably much greater than the probability of encountering marine mammals. However, the cost of negative encounters is disproportionately high in terms of negative publicity and law suits so it would be prudent to take steps to increase the odds against any encounters. Therefore, basic information on the biology, natural history, and behavior of cetaceans that frequent waters of high Navy activity are needed to understand ways to avoid encounters. A robust database of this information currently does not exist. There is a higher probability of Naval encounters with marine mammals in Hawaiian waters than in most other regions of the world because of the large number of cetacean species that inhabit or frequent these waters. Approximately 16-20 species of cetaceans can be found in Hawaiian waters. This is a large number of species for such a small geographic area. Knowing **what** animals are present in a given body of water is important because different species utilize their habitat in different ways. Therefore, it is important to understand the distribution, abundance and movement of dolphins and whales over the day-night cycles and seasonal periods.

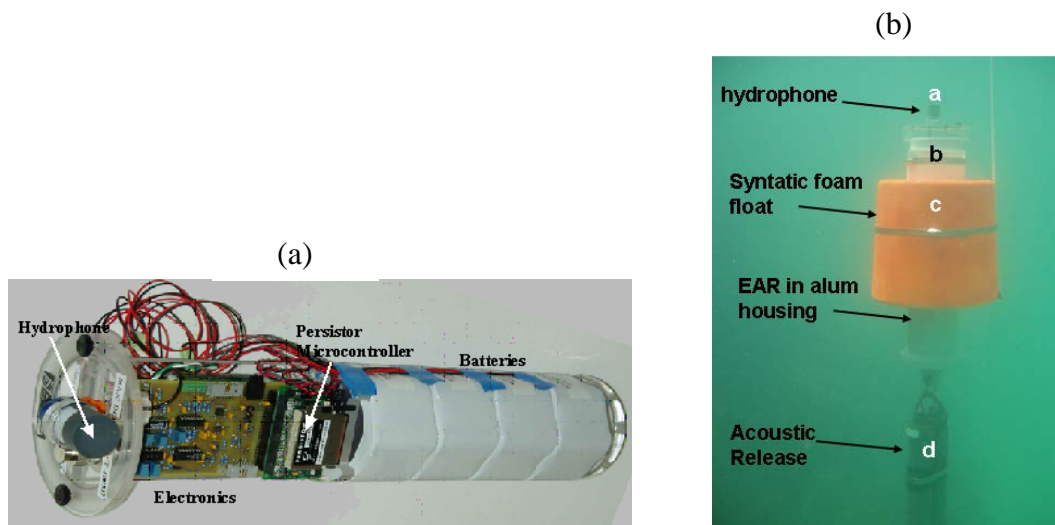
## **OBJECTIVES**

The objective of this study is to map the distribution and abundance of whales and dolphins in selected regions of Hawaiian waters. The waters surrounding the islands of Kauai and Oahu, where most Naval activities occur, will be the focus of this study. The Pacific Missile Range is in the waters of Kauai and the Pearl Harbor Naval Base is the home of the U.S. Pacific Fleet.

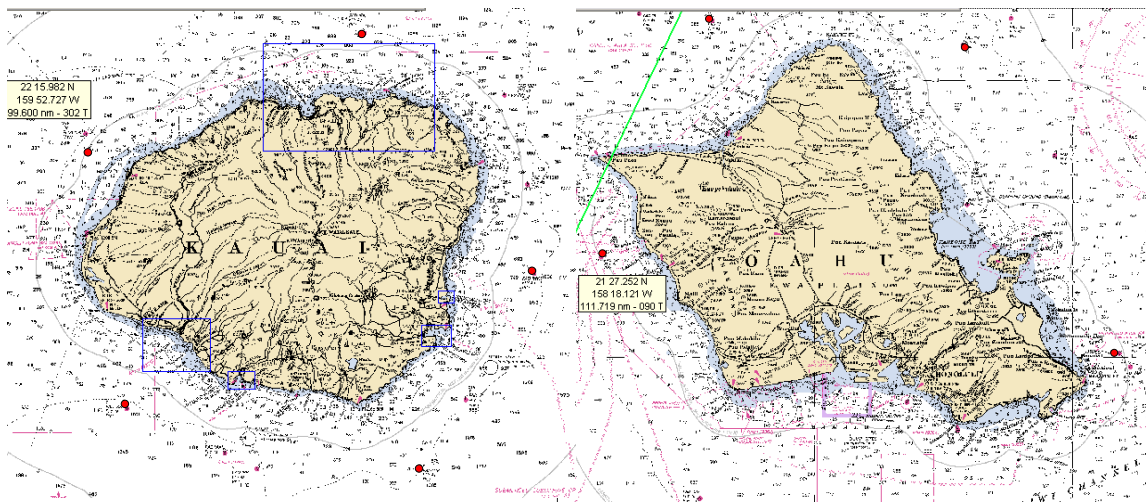
## **APPROACH**

During the first year, five relatively low-cost autonomous, remote acoustic recorder denoted as the **EAR** (Ecological Acoustic Recorder) will be deployed around the island of Kauai and five more EARs will be moored around Oahu, to simultaneously monitor for the presence of dolphins and whales. In the second year, the locations of the EARs will be relocated and deployed in “hot spots” as determined by prior EAR deployment during the first year.

The EAR, jointly developed by the Hawaii Institute of Marine Biology (HIMB) and the Coral Reef Ecological Division of NOAA's Pacific Islands Fisheries Science Center has a maximum sampling rate of 64 kHz with a hydrophone that is functional up to 40 kHz and records data to a 160 Gbyte laptop recorder. It has a recording bandwidth of 30 kHz and can be deployed to depths of up to 500 m. The EAR is controlled with a Persistor Instrument CF2 microcontroller. Its deployment life is determined by the programmable recording duty cycle and the number of battery packs included, but typical deployment durations range between 3-12 months. At its maximum sampling rate, it is capable of recording the calls of all cetacean species found in Hawaiian waters, including beaked whales. A pictorial description of the interior electronics and power supply is shown in Figure 1a along with a picture of a deployed EAR on an acoustic release device in Figure 1b. A map of potential deployment sites around the islands of Kauai



**Figure 1. (a) The internal parts of the EAR with the electronics, Persistor microcontroller and the battery pack, (b) EAR in deep mooring configuration showing an acoustic release, EAR in an aluminum housing and a syntactic foam collar.**



***Figure 2. The potential locations around the islands of Kauai and Oahu where EARs (red dots) operating simultaneously will be deployed during the first year.***

## **WORK COMPLETED**

Funds were made available to this project in July, 2008, however, work on this project did not commence until September because of prior commitments. The parts for all the EARs have been purchased and five EARs have been fabricated and five more are in the process of being fabricated.

## **IMPACT/APPLICATIONS**

Potential future impact for Science and/or Systems Applications is gaining knowledge of how dolphins and whales utilize the waters surrounding Kauai and Oahu, two areas of high Naval activities and from that knowledge, operations can be planned that would maximize the probability of avoiding marine mammals. Successful results and methods used in this project could also be applied to other areas of high Naval activities.

## **RELATED PROJECTS**

None.