# U.S. Navy East Coast Passive Acoustic Monitoring Efforts from 2009 to Present

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## Introduction

The U.S. Navy's Atlantic Fleet conducts training and testing activities within the Northwest Atlantic Ocean and Gulf of Mexico, including the use of active sonar and explosives. In order to evaluate the impacts of these activities on marine mammals and other protected marine species, the Navy implemented a monitoring program to collect data on baseline animal presence, as well as exposure and response to Navy training and testing activities. Passive acoustic monitoring is an important component of the Navy's monitoring efforts.

**Figure 1. The Atlantic Fleet Training and Testing Study Area and associated range complexes**

The primary objectives of the monitoring program (outlined in the Integrated Comprehensive Monitoring Program Charter, available online) are to:

- Monitor and assess the potential effects of Navy activities on protected marine species;
- Ensure that data collected at multiple locations is collected in a manner that allows comparison between and among different geographic locations;
- Assess the efficacy and practicality of the monitoring and mitigation techniques; and
- Add to the overall knowledge base of protected marine species and the effects of Navy activities on these species.

## Methods

Between 2009 and 2013, the Navy utilized effort-based monitoring metrics and targeted a number of different training and testing events for monitoring. In November 2013, effort-based monitoring metrics were replaced with objective-based monitoring projects. Future work will focus on species classification and animal behavior.

**Figure 2. Platforms include sonobuoys, Marine Autonomous Recording Units (MARUs), High-Frequency Acoustic Recording Packages (HARPs), D-Tags, and Ecological Acoustic Recorders (EARs), towed arrays, and Autonomous Multichannel Acoustic Recorders (AMARs).**

The Navy works with organizations such as Duke University, Cornell University Bioacoustics Research Program, Scripps Institution of Oceanography, Bio-Waves, Inc., and HDR, Inc. in order to collect monitoring data.

## Acknowledgments

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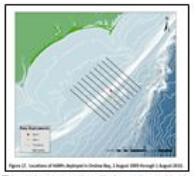
## Project Accomplishments

From 2009 to 2013, the U.S. Navy successfully accomplished the following in Virginia Beach (VB), Cape Hatteras (CH), Onslow Bay (OB), and Jacksonville, FL (JAX):

Deployed four synchronized AMARs off CH as a pilot project for future training event monitoring. 27 days of AMAR data in Sept 2011 during submarine exercises (classified)

Made 28 HARP deployments– over 28,000 hours(hr) of recordings

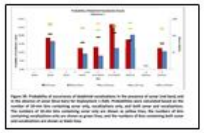


Towed arrays in all three locations: 42 line transect surveys (started in 2007) and two photo-ID surveys in OB; 22 line transect surveys in JAX; 17 hours in CH

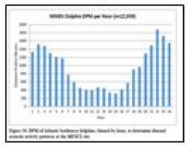
Deployed 7 D-Tags on critically endangered North Atlantic right whales in JAX in order to study movement within their only known calving grounds

Deployed 11 D-Tags and conducted 6 playback-exposures on short-finned pilot whales

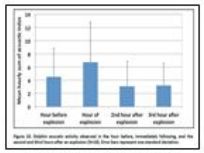
Real-time PAM and localization of MM vocalizations in association with 5 Mine exercise (MINEX) with sonobuoys



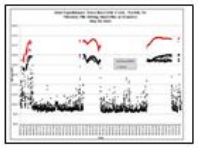
Deployed 4 MARU arrays during training exercises.
20 days in OB in 2008, & two months in JAX in 2009 for 13,077 hrs of data
Data used to determine vocalization changes during/after Navy activity.
Deployed 5 MARUs off CH to learn more about North Atlantic right whale migration patterns.



Four C-PODs deployed beginning in August 2012 in W-50 of the MINEX area and adjacent Chesapeake Bay waters



EARs deployed in 2012 to monitor odontocete occurrence and acoustic activity in VB in relation to MINEX events



Sound source measurement for pile driving at Navy installations along the East Coast

## Lessons Learned & Related Efforts

Sonobuoys are effective for portable short term monitoring. Pre and post-exposure sampling greatly enhances PAM effectiveness during event monitoring. Collection of environmental and anthropogenic data is needed for better interpretation of data. The ability to correctly classify many species still needs to be resolved.

Similar monitoring efforts are undertaken by the Commander, United States Pacific Fleet in the Hawaii, Southern California, Mariana Islands, and the Pacific Northwest. Additionally, the Office of Naval Research (ONR) Marine Mammals and Biology Program, & the Living Marine Resources (LMR) Program support basic and applied research and technology development related to the passive detection, classification, and localization of marine mammals.

**Figure 3. U.S. Navy Marine Species Monitoring Website interactive map of moored passive acoustic monitoring deployments in the Atlantic. For more detailed information, visit the U.S. Navy Marine Species Monitoring Website**