



Using Passive Acoustic Tracks from a Navy Array to Study Large Whale Behavior in the North Atlantic

NEED

The Navy is interested in developing methods to improve the efficiency of processing and analyzing marine species data and providing cost effective solutions to enhance marine species monitoring capabilities (e.g., detection and classification algorithms, passive acoustic monitoring automated processing tools, statistical methods).

SOLUTION

This project is demonstrating the utility of the Navy's passive acoustic marine mammal monitoring data system, M3. It is building from a project that was funded by the Department of Defense SMART SEED Grant program using M3 data to analyze behavioral responses to seismic surveys. This project will involve two tasks: 1) continue the analysis of behavioral responses to seismic surveys, and 2) analyze fin whale vocalization behavior in the North Atlantic, including defining cue rates for Atlantic fin whales.

METHODOLOGY

The M3 dataset contains 20 years of passive acoustic monitoring and tracking data collected from bottom-mounted sensors.

Task 1: Analyze data for behavioral response to seismic surveys for whale species present (blue, sei, fin, humpback and sperm whales).



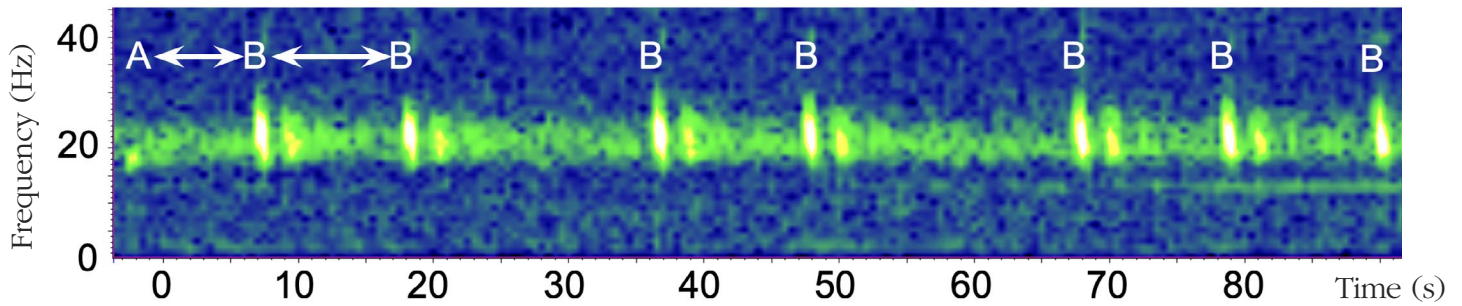
Fin whale.

The analysis focuses on segmenting the passive acoustic tracks into regular intervals and categorizing each interval into a behavioral state based on speed: fast or slow. The behavioral state will be modeled as a function of time of day, relative position of the seismic vessel and airgun status (on or off). These models will be used to test the hypothesis that whale behavior changes based on these covariates, specifically that whales swim faster when airguns are on and when the vessel is closer to them.

Task 2: Previously collected recordings of fin whale tracks will be processed to automatically detect every fin whale note.

The resulting fin whale dataset will be manually validated to identify any missing or false notes. After adapting the tools previously developed for analyzing fin whale tracks at the Navy's Pacific Missile Range Facility, the Atlantic data will then be analyzed for fin

Fin Song Analysis



whale song patterns and to quantify cue rates. (These tools were developed under an LMR partnership project, Developing Tools for Acoustic-only Behavioral Response Studies at Navy Instrumented Ranges.)

SCHEDULE

The project began in late 2022 and will continue into mid-2024.

NAVY BENEFITS

The project will help to refine methods for using the passive acoustic monitoring data housed in the M3 system, making it more available for use by Navy personnel to monitor whale presence and abundance in the North Atlantic. Characterizing fin whale cue rates and song patterns will also contribute to improved analysis of acoustic data needed for environmental compliance assessments.

TRANSITION

Project outcomes will include a process for securely handling and analyzing data from the M3 system. Two manuscripts are also anticipated from this project, one discussing behavioral responses of whales to seismic airguns and the other providing fin whale cue rate results.

ABOUT THE PRINCIPAL INVESTIGATOR

Regina Guazzo works with the Whale Acoustics Reconnaissance Project (WARP) at the Naval Information Warfare Center Pacific (NIWC Pacific). Dr. Guazzo earned her Ph.D. in oceanography from Scripps Institution of Oceanography at University of California San Diego. Her work at WARP focuses on using passive acoustic monitoring data from Navy hydrophone arrays to characterize marine mammal behaviors.

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 exwc.navfac.navy.mil/lmr.

