Environmental Studies Program: Ongoing Study

Title	ADRIFT: Spatial and Temporal Distribution of Cetaceans in the California Current Ecosystem Using Drifting Archival Passive Acoustic Monitoring (PC-20-04)
Administered by	Pacific OCS Region
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Procurement Type(s)	Inter-agency Agreement
Conducting Organization(s)	National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southwest Fisheries Science Center
Total BOEM Cost	$1,915,410 Note: BOEM funding is from the Environmental Studies Program ($800,000) and the Pacific OCS Office ($1,115,410).
Performance Period	FY 2020–2023
Final Report Due	June 4, 2023
Date Revised	August 26, 2021
PICOC Summary	
Problem	BOEM's ability to accurately assess the potential impacts from offshore renewable energy development on protected species, as required by the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA), is restricted by a lack of ambient soundscape and seasonal cetacean habitat use data.
Intervention	Collect and analyze passive acoustic data in the California Current Ecosystem to gain comprehensive spatial and temporal insight into the occurrence and distribution of protected cetacean species, while simultaneously collecting ambient soundscape data.
Comparison	This data would complement and advance our existing knowledge and provide the foundation for any effects analysis of future operational monitoring data. This data can also be compared to data collected by the National Oceanic and Atmospheric Administration's (NOAA's) Ocean Noise Reference stations in the Olympic Coast and Channel Islands National Marine Sanctuaries.
Outcome	Description of the spatial and temporal occurrence of cetacean species and ambient soundscapes in the California Current Ecosystem.
Context	California

BOEM Information Need(s): BOEM needs to understand the occurrence and distribution of protected cetacean (whale, dolphin, and porpoise) species within the California Current Ecosystem (CCE). In addition, BOEM needs to understand the ambient soundscapes in these areas. These data will assist BOEM in more accurately assessing the potential impacts and overall acoustic contribution of BOEM-related activities. This information will allow for compliance with BOEM's regulatory responsibilities under the MMPA, ESA and National Environmental Policy Act. This information is applicable to all BOEM Programs and is especially applicable to current efforts directed towards the identification of wind energy areas and the general types of mitigation strategies required to minimize potential impacts to these marine mammals from any of BOEM's future offshore energy related activities.

Background: Cetacean distribution and abundance data are traditionally collected by large vessels and aircraft conducting surveys in offshore areas. These surveys (e.g., Pacific Marine Assessment Partnership for Protected Species [PacMAPPS] California (BOEM, 2020a) provide important data; but due to the expense and difficulty in collecting data during bad weather or during times of low visibility, the surveys are generally conducted intermittently during the summer and fall seasons. As such, these data suffer from spatial and temporal (e.g., seasonal) gaps.

Passive acoustic monitoring (PAM) techniques are well established in the scientific community (Sousa-Lima et al., 2013; Booth et al., 2017) as a data collection technique that complements past and current visual survey efforts. This study will employ a novel sampling method of using drifting autonomous spar buoys (DASBRs; Griffiths and Barlow, 2015; 2016) as opposed to using traditional bottom-mounted systems. This validated methodology supported other BOEM-funded study efforts (BOEM, 2020b; BOEM, 2020a). This study will transition this technology into operations to fulfill critical gaps in monitoring for both cetacean species and contiguous baseline soundscape data in the CCE.

DASBRs are low-cost drifting buoys that can record for 30+ days. Their low cost allows deployment of more instruments, providing improved geographic and temporal data collection. While drifting, the acoustic recorders will record the sounds of the ocean, including: whales, dolphins, fish, and ships. The hydrophones are neither at the surface nor at the seafloor: their positioning in the water column where the animals are vocalizing allows them to collect data of the highest quality without affecting their behavior. These data can then be used to study animal populations and the potential impact of human activities and environmental change on these protected species, in the present and as a reference for the future.

In addition, it is anticipated that this study will be a highly collaborative effort between federal and state agencies that will emphasize partnerships with local communities as well as public engagement in science.

Objectives: The primary objective of this study is to gain a better understanding of the seasonal occurrence and distribution of cetacean species in the California Current Ecosystem, and within BOEM's renewable energy Call Areas. Abundance estimates of cetacean species will also be explored. The ambient soundscape will be described and the major contributors to the soundscape will be identified wherever possible.

Methods:

- Deploy DASBR acoustic recorders in pre-determined locations in the CCE, with array clusters focused in the Northern and Central California Renewable Energy Call Areas.
- Collect ambient and biological acoustic data from cetacean species, including but not limited to blue, humpback, fin, minke, killer and beaked whales, dolphins and porpoises.
- Analyze recorded data to describe the spatial and temporal distribution of cetacean species and ambient soundscapes in the CCE as a whole, with additional quantitative analyses in the Northern and Central California Renewable Energy Call Areas.

The first phase, ADRIFT in Northern California, will consist of DASBR deployments between San Francisco and Eureka, California. During this first year, data collection and analysis methods will be streamlined and partnerships critical for incremental expansion of the ADRIFT study to the greater CCE will be

developed. The second phase, ADRIFT in Central California, will consist of DASBR deployments between Point Conception and Monterey Bay and the inclusion of these data in the analyses.

This study benefits from the fact that DASBRs area easily deployed from vessels of opportunity, including research ships, fishing & whale-watching boats. DASBRs are autonomous, meaning that once they are deployed—they do not require oversight. The buoys will drift at sea for 30+ days, with shore side monitoring of their drift via satellite messenger. Coordinating data collection with vessels already in the area provides significant cost savings. These opportunities will also provide valuable partnerships and increased community engagement in this science.

Approximately 50 DASBR units will be assembled for this study, incorporating three clusters of 15 units each. One cluster will be deployed within each Call Area during each seasonal (spring, summer, fall and winter) period.

Researchers at NOAA's Southwest Fisheries Science Center are developing FOSSA, a series of open-source software packages that can be used to efficiently process and analyze passive acoustic data. Built on the open source, multi-platform language, R, these three packages will consist of: (1) functions to extract acoustic metadata, integrate it with ancillary data, and generate summaries and output for downstream analyses (PAMr, in development), (2) a powerful and systematic method for cetacean species classification using passive acoustics (BANTER, complete), and (3) a package for the coordination of acoustic cetacean population assessment tools (PAMde, 2020). These are being designed to work seamlessly with acoustic data collected and analyzed with Pamguard software; however, its utility applies broadly to acoustic data. Ultimately, the analytical advancements provided by BANTER, PAMr, and PAMde will allow for efficient, standardized results that can be quickly produced with minimal human intervention.

Automatic acoustic detectors will be parameterized to identify and quantify the vocalizations of the key marine mammal species (and the methods for this process will be captured using the Tethys metadata system). For soundscape-level analyses, the data will be processed using the Atlantic Deepwater Ecosystem Observatory Network (ADEON) data standards in order to ensure that the information is comparable to similar data collected in other areas (e.g., the Atlantic). In order to inform the design of the array(s), a basic propagation model will be run inputting species parameters of certain species (e.g., fin whales) to get a sense about the characteristics of the whale calls and what will be detected and at what distances.

Specific Research Question(s):

1. What is the seasonal occurrence/distribution of marine mammal species in the CCE and Call Area(s)?
2. If localization is possible, what can be said about the abundance of the various marine mammal species?
3. What is the ambient noise level in the CCE and Call Area(s)?
    a. What are the major contributors to the soundscape?

Current Status: Due to renewed interest in the potential development of wind energy offshore Central California, phase 2 of ADRIFT will expand the data-collection and analysis efforts to include Central California, from Monterey Bay to Point Conception.

Progress since Spring 2020 has been delayed by the COVID-19 pandemic due to closure of Federal facilities and cancellation of cruises. Field work that was scheduled for summer 2020 resumed in June 2021. Data analysis and development of deliverables will likely be delayed.

- The primary focus for analyzing archived data has been on soundscape analysis, fin whales, and detection of odontocetes (starting with Pacific white-sided dolphins and Risso's dolphins).
- 3 buoys were deployed in June 2021 offshore Northern California (between Half Moon Bay and Bodega Bay), with retrieval attempts 1-4 weeks later (TBD). NOAA Sanctuaries is keenly interested in seasonal deployment of ADRIFT buoys to monitor their regions and inform decisions to minimize risk of ship strikes.
- Trinidad Head Line: Buoys were delivered in June 2021 to allow for deployment when THL surveys continue later this summer. We hope these will evolve into monthly sampling along the THL.
- Dungeness Crab Fishery: We are working with industry partners to improve ease of use (for citizen science data collection) as well as minimize risk of ship strike in high-risk areas. Some of this development will be tested with crab fishermen through a project funded by NOAA's Cooperative Research Program ($33,800 NOAA Coop Funding).
- Expansion to Central California: A field technician will begin work in September 2021 to facilitate deployment of an initial set of 4-5 drifting buoys in late summer 2021. Additional buoys are being built and are expected to be available in October 2021.

Publications Completed: None

Affiliated WWW Sites: https://marinecadastre.gov/espis/#/search/study/100287

References:

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