



LIVING MARINE RESOURCES PROJECT 76

Evaluating Behavioral Responses of Pinnipeds to Mid-frequency Sonar to Support Navy Compliance Permits

NEED

Existing data used in the Navy's Acoustic Effects Model (NAEMO) predict that the Navy has a large number of behavioral impacts on pinniped species from acoustic sources used during training and testing activities. However, the existing data were collected on cetacean species (whales and dolphins). The Navy needs behavioral response data from free ranging pinniped species to improve understanding of how sonar exposure may be affecting their behavior. Such behavioral response data will support compliance analysis modeling and enable Navy readiness.

SOLUTION

This project will investigate if Navy sonar affects the at-sea behavior of California sea lions and quantify the potential population effect on this species. The effort will demonstrate the feasibility of successfully locating, tagging, tracking and measuring detailed aspects of behavior during controlled sonar exposures. It will provide data for both behavioral response analyses and Population Consequences of Disturbance (PCoD) modeling.

METHODOLOGY

The project will monitor the fine-scale movement of individual sea lions using electronic tags and an array of drifting acoustic recorders to characterize source received level characteristics. Combined, these methods will allow the research team to monitor the response of focal individuals in controlled exposure experiments (CEEs). A mid-frequency active sonar (MFAS) source will be presented systematically (with other CEEs, including known no-sonar controls), and the behavioral and acoustic response of focal individuals will be monitored in pre-exposure, exposure and



California sea lion with
SPLASH10 monitoring tag.
Permit 27155

post-exposure phases. Finally, the results of the field-work will be used to identify appropriate parameters for an updated, spatially explicit PCoD model. The primary objectives of this project include:

1. Apply previously developed and executed methods to track sea lion movement to better characterize baseline (undisturbed behavior).
2. Obtain direct measurements of behavior from individual sea lions and assess their response (if any) to experimentally controlled, mid-frequency active sonar sources.
3. Update the published PCoD model developed by the project team to include spatially explicit behavioral decisions to assess whether the sea lions observed behavioral response could negatively affect their population.

The team will deploy behavior tags and acoustic data loggers on lactating sea lions off southern California, on San Nicolas Island, home to one of the largest breeding aggregations of California sea lions. The lactating females are known to return to their pups after foraging. The tags will include Fastloc GPS, depth sensors, 3-axis accelerometers and acoustic data loggers (e.g., DTAG tag or similar). The team will collect baseline behavioral data from at least two foraging trips prior to starting acoustic exposures. This will also allow females to recover from capture and tag deployment.

The priority will be to examine the response of sea lions in locations where they are foraging. However, if time and resources permit, the sea lions' responses to sound exposure during transit will also be examined. These are the periods during which response to sonar is likely to have the greatest energetic effect.

In addition to tag deployments, the team will collect blood, blubber and fecal samples from sea lions upon initial capture and recovery of any recaptured animals to evaluate physiological responses.

SCHEDULE

The three-year project will begin with a pilot study in 2025 to collect baseline data, validate instruments and prepare the logistics plan for the CEEs. The CEEs, data analyses, modeling and reporting will be conducted from 2026 through 2028.

NAVY BENEFITS

The project will provide direct measures of previously unmeasured exposures and behavioral response of California sea lions to naval operations and assess whether these responses may have the potential to affect the population. The results will be directly

incorporated into the Navy acoustic criteria and thresholds, which are needed to estimate incidental takes. These estimates of potential impacts are required to obtain at-sea compliance permits that enable the Navy to train and test.

DELIVERABLES

The final technical report will summarize the results of the fieldwork, associated post-analysis outcomes and estimates of whether and when sea lions respond to naval operations. Behavioral response functions for pinnipeds will be directly incorporated into the Navy acoustic criteria and thresholds. Results will also be published in peer-reviewed publications and presented at professional conferences.

ABOUT THE PRINCIPAL INVESTIGATOR

Daniel Costa is a Distinguished Professor of Ecology and Evolutionary Biology at University of California Santa Cruz and former Director of the Institute of Marine Sciences. His research focuses on the ecology and physiology of marine mammals. Dr.



Costa has over 40 years of experience working on California sea lions and Northern elephant seals. Dr. Costa developed many of the capture and sedation methods still widely used today and has had multiple NMFS permits for similar work on California sea lions.

Co-investigators and key team members include Rachel Holser, Caroline Casey, Ryan Jones, Kelly Keen (University of California Santa Cruz) and Brandon Southall (Southall Environmental Associates).

About the LMR Program

The LMR program's fundamental mission is to support the Navy's ability to conduct uninterrupted training and testing, which preserves core Navy readiness capabilities. LMR is an applied research program that funds Navy-driven research needs to support at-sea compliance and permitting. For more information, contact the LMR program manager at exwc_lmr_program@us.navy.mil or visit exwc.navfac.navy.mil/lmr.

