



U.S. NAVY

MARINE SPECIES MONITORING IN CALIFORNIA

Protecting the Seas through Science



MARINE SPECIES MONITORING PROGRAM

RESEARCH TECHNIQUES

CALIFORNIA TIMELINE

CALIFORNIA PROGRAM HIGHLIGHTS

MARINE SPECIES PROTECTIVE MEASURES

MARINE SPECIES MONITORING PROGRAM

Navy Marine Species Research and Monitoring Efforts

The U.S. Navy continues to be a world leader in marine species research and monitoring, having funded marine research programs, surveys, and data collection efforts since 1992. The Navy partners with federal agencies, universities, research institutions, federal laboratories, and private researchers around the world to better understand marine species ecology and physiology.

Additionally, the monitoring program partners with the Navy's research and development programs. The Office of Naval Research's Marine Mammals and Biology program conducts basic research, and the Living Marine Resources program conducts applied research.

Data and reports from scientific research and monitoring help environmental regulators, scientists, the public, and the Navy to:

- ▶ Build a better understanding of the abundance, distribution, foraging, reproduction, hearing, sound production, and behavior of marine species, which is necessary to assess potential effects from Navy activities.
- ▶ Refine methods used to detect and monitor marine species before, during, and after training activities.
- ▶ Advance the understanding of the effects of underwater sound on marine species.
- ▶ Develop improved tools to model and estimate potential effects of underwater sound on marine species.
- ▶ Establish guidelines to mitigate effects of Navy training and testing on marine species.



Visit www.navymarinespeciesmonitoring.us for more information on the Navy's Marine Species Monitoring Program and to access public reports.

MARINE SPECIES MONITORING PROGRAM

RESEARCH TECHNIQUES

▶ Animal Tagging

- The Navy partners with independent scientists authorized under environmental permits from the National Marine Fisheries Service (NMFS) to use advanced tracking methods, such as satellite tags (tags that transmit animal positioning and other data via satellite) and acoustic recording tags (tags that provide archival recordings for sound and movement). Deploying tags on animals has helped lead to a deeper understanding of marine species movement, dive behavior, foraging behavior, acoustic behavior, and if or how they respond to Navy activities.

▶ Biopsy Sampling and Genetic Analysis

- Tissue samples can identify species, sex, reproductive status, and stress hormone levels; determine stock origin; identify diet and diet-related contaminants; and answer questions related to population structure.

▶ Historical Analysis

- The Navy uses a variety of archived data collected from past field surveys to gain additional insight. The information contributes to more robust, long-term data sets which can better facilitate analysis of potential trends in animal distribution and abundance.



▶ Passive Acoustic Technology/Monitoring

- The Navy has been collecting and analyzing data via passive acoustic monitoring (a tool used to listen to and record sound in the water) for almost two decades. These data provide information for identifying marine species, recognizing diurnal and seasonal movement patterns, and assessing animal responses to military readiness activities. Passive acoustic monitoring is also an essential tool to evaluate levels of natural and human-made noise that can have negative impacts on marine species. The Navy collects passive acoustic data using various technologies, including Navy-instrumented underwater hydrophone ranges, towed arrays, seafloor-mounted recording devices, and autonomous gliders.

▶ Photo Identification

- Matching photos of individual animals from different years or locations allows for the assessment of migration, site fidelity (an animal's tendency to return to a place it previously occupied), residency, social structure, and abundance.

▶ Visual Surveys

- Visual surveys conducted via vessel provide information on marine species occurrence and density.

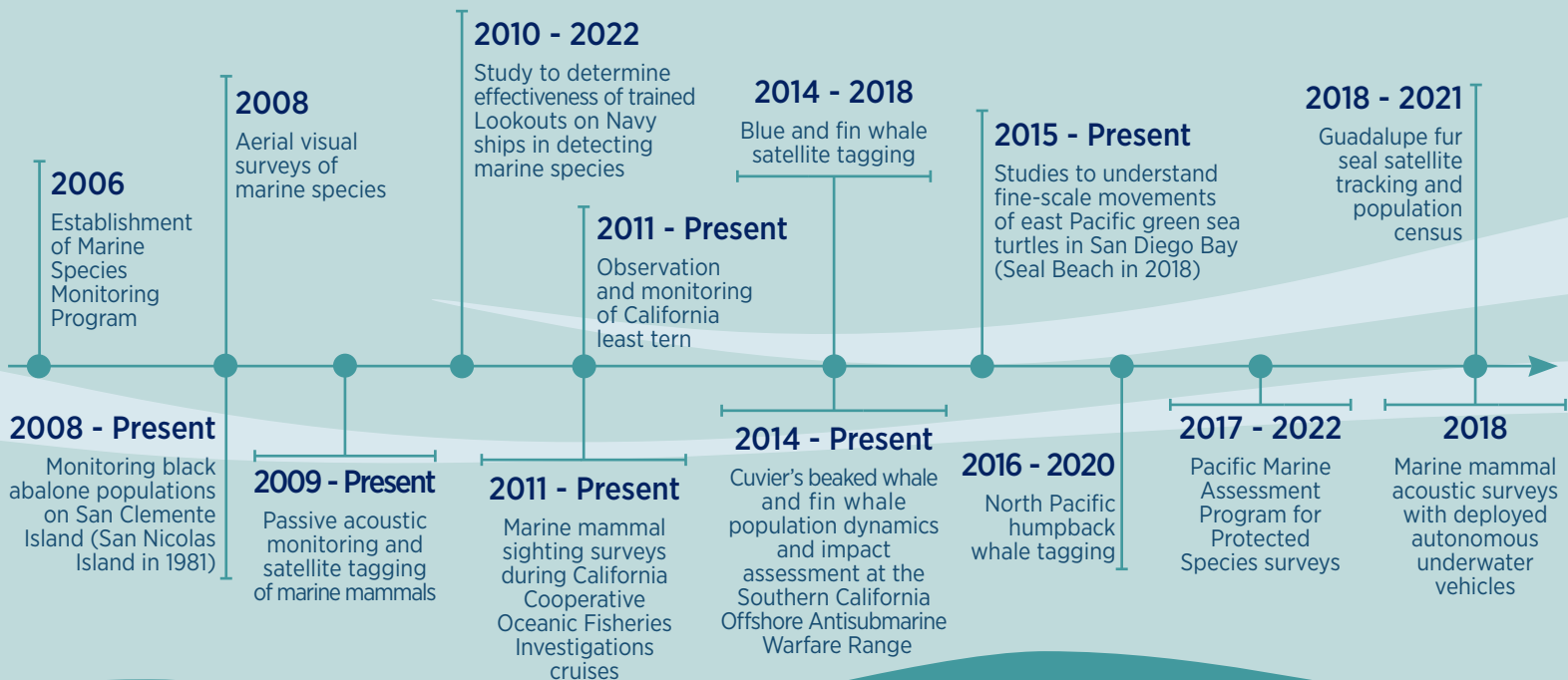


CALIFORNIA TIMELINE

- ▶ Navy training and testing areas offshore of California play a vital role in accomplishing the Navy mission. These areas have unique attributes – including location, proximity to major military installations, conducive environments, infrastructure, and size – that make them ideal for training military personnel and testing equipment and systems.
- ▶ Military readiness training and testing activities must be as realistic as possible to provide Sailors and Marines with the skills, techniques, and experiences necessary for combat success and survival on land, in the air, and on and beneath the open ocean and coastal waters. The Navy's range and training complexes in California provide these realistic environments, with the land, airspace, sea surface, and undersea space necessary for mission success and public safety.

Blue whale
Oregon State University Marine Mammal
Institute taken under NMFS permit no. 14856
Issued to Bruce Mate

The Navy is a world leader in marine species research, investing over \$20 million in research each year. The Navy is dedicated to protecting the marine and coastal environments of California. This timeline highlights some of the Navy-funded efforts in support of the Navy's Marine Species Monitoring Program in the waters of California. The Navy has conducted various types of studies, with some lasting for a few years and others still ongoing.



CALIFORNIA PROGRAM HIGHLIGHTS

▶ **Passive Acoustic Monitoring**

Partner: Scripps Institution of Oceanography

Ongoing passive acoustic monitoring of marine mammals determines the distribution and temporal patterns of beaked whale occurrence in the waters within and outside the Navy's Southern California Range Complex.

▶ **California Cooperative Oceanic Fisheries Investigations Cruises**

Partner: Scripps Institution of Oceanography

Through quarterly California Cooperative Oceanic Fisheries Investigations cruises, spatial and temporal variations in marine mammal density, abundance, distribution, and habitat use in the Southern California Bight are documented for future habitat-based density modeling efforts.

▶ **Beaked Whale Monitoring**

Partner: Naval Undersea Warfare Center Newport

Marine mammal monitoring on the Navy's Southern California Offshore Antisubmarine Warfare Range improves the understanding of long-term trends in the occurrence of marine mammals, with a focus on beaked whales.

- As the system developed over 15 years, automated detection algorithms for beaked whales and other species have improved, allowing for estimates of relative population density and the ability to accurately estimate long-term population trends in an area where Navy sonar is used.
- Researchers discovered habitat preferences for Cuvier's beaked whales and estimated calving rates, site fidelity, occupancy rates, and abundance levels.

▶ **Pacific Marine Assessment Program for Protected Species**

Partners: NMFS and Bureau of Ocean Energy Management

The Navy, in collaboration with the National Oceanic and Atmospheric Administration (NOAA), has funded a collaboration of large ship systematic line-transect surveys with the goal of updating marine species density estimates to be used for modeling impacts.

▶ **Humpback Whale Tagging**

Partner: Oregon State University

The Navy funded a multi-year humpback whale tagging study in the North Pacific Ocean, which used a combination of satellite-tracking technology (tags), genetic sampling, and photo-identification analysis.

- The project's objective was to conduct a comprehensive characterization of humpback whale movements during breeding, migration, and feeding periods using data from animals tagged in breeding and feeding areas.
- Genetic analysis of biopsy samples provided valuable information on the mixing of Distinct Population Segments in feeding areas.

▶ **Passive Acoustic Detection of Whales**

Partners: Oregon State University and HDR, Inc.

Two autonomous underwater vehicles were deployed to acoustically survey marine mammal occurrence at the continental shelf break and deeper abyssal waters, which are poorly studied. Fin and humpback whale calls were more abundant than expected in the deep abyssal waters.

▶ **Cuvier's Beaked Whale and Fin Whale Population Dynamics and Impact Assessments**

Partners: Marine Ecology & Telemetry Research and Naval Undersea Warfare Center Newport

The Navy monitors activities acoustically and partners with MarEcoTel researchers to maximize tagging efforts in the Southern California Offshore Antisubmarine Warfare Range.

- The goals of this research are to: 1) improve knowledge of baseline population demographics, vital rates, and movement patterns of Cuvier's beaked whales and fin whales, 2) examine what, if any, short-term behavioral and/or vocal responses occur when exposed to Navy sonar or underwater explosions at different sound pressure levels and conditions, and 3) determine if exposure to sonar or underwater explosives impact the long-term fitness and survival at the individual, stock, or species level.
- Researchers identified individuals having long-term site fidelity. Females with calves have provided reproductive rate estimates.

▶ **Blue and Fin Whale Satellite Tagging**

Partner: Oregon State University

Blue and fin whale satellite tagging determines movement patterns, occurrence, and occupancy rates of blue and fin whales within Navy testing and training areas, as well as biologically important areas along the West Coast.

▶ **Black Abalone Monitoring**

Partner: Navy Marine Ecology Consortium

The Navy has monitored black abalone populations on San Clemente and San Nicolas islands for over a decade. Effects of climate change, predation, and habitat characterization (changes over time in algal habitats) are being studied.

▶ **Guadalupe Fur Seal Tagging**

Partner: The Marine Mammal Center

Guadalupe fur seal tagging determined the at-sea distribution of this endangered species and whether they use or travel through the offshore waters of the Navy's Southern California Range Complex.

- There was a 42% overlap between the area used by all 35 tagged seals and the Navy's sea ranges.
- Guadalupe fur seals appeared to primarily use the sea ranges as a transit corridor between Guadalupe Island and foraging grounds further north.

▶ **Fine-Scale Movements of East Pacific Green Sea Turtles**

Partner: NOAA Marine Turtle Ecology and Assessment Program

Green sea turtle tagging began in San Diego Bay in 2015 and at Seal Beach in 2018.

- At Seal Beach, 14 capture and release efforts have been completed from November 2018 through August 2022. Of 43 individual turtles, 28 of those turtles were outfitted with satellite tags.
- In San Diego Bay, a total of 176 turtles have been captured and released, and 25 of those were outfitted with satellite tags. Tagging efforts are ongoing.

▶ **California Least Tern Observations**

Partner: Navy Marine Ecology Consortium

In 2011, observations of California least terns that nest on Naval Base Coronado were collected to understand foraging patterns, prey availability, flight patterns, provisioning efforts, and prey consumption. California least tern foraging activity has been found to predominantly take place in southern areas of San Diego Bay and the Pacific Ocean adjacent to the bay.

MARINE SPECIES PROTECTIVE MEASURES

It is important to the Navy to avoid or minimize impacts on marine species from at-sea activities. The Navy follows strict guidelines and employs measures that reduce potential effects on marine species while training or testing. The measures listed here include some, but not all, of the Navy's existing protective measures.

- ▶ The Protective Measures Assessment Protocol (PMAP) is a software tool the Navy uses prior to conducting military readiness activities. Based on the location, date, and type of activity being conducted, PMAP generates a report of the specific mitigation measures naval units must implement to protect marine animals and the marine environment and ensure compliance with mitigation requirements.
- ▶ Navy environmental staff issue seasonal awareness messages to alert Navy ships to the possible presence of certain marine species to avoid ship strikes.



- ▶ Before certain training or testing activities are conducted, the Navy visually scans areas and, when possible, monitors areas acoustically to detect marine mammals and sea turtles.
- ▶ Designated Lookouts on Navy ships help spot marine species that may be present during military readiness activities. The Navy may cease or modify its activities to minimize interaction with certain marine species.
- ▶ The Navy establishes mitigation zones to reduce potential impacts on marine species from certain training and testing activities. Navy personnel visually observe each zone. If signs are detected indicating marine mammal, sea turtle, or seabird activity, applicable activities cease until the animal exits the zone or other activity recommencement criteria are met.



- ▶ There are areas along the California coast where marine mammals conduct important reproductive or feeding behaviors. To mitigate potential effects of specific training activities on marine mammals, the Navy implements additional protective measures during certain times of the year and in specific geographic areas.
- ▶ To aid scientists in better understanding how marine species react to human activities, the Navy provides reports on its training and testing activities, including findings from passive acoustic monitoring, to NMFS. These reports are also available to the public.





AUGUST 2023

For More Information:

- ▶ U.S. Navy Marine Species Monitoring Program
www.navymarinespeciesmonitoring.us
- ▶ Commander, U.S. Pacific Fleet
www.cpf.navy.mil
- ▶ U.S. Navy Living Marine Resources Program
exwc.navfac.navy.mil/lmr
- ▶ Office of Naval Research Marine Mammals and Biology Program
www.nre.navy.mil/organization/departments/code-32/division-322/marine-mammals-and-biology
- ▶ Commander, U.S. Pacific Fleet Facebook Page
www.facebook.com/USPacificFleet
- ▶ U.S. Navy Stewards of the Sea
www.usff.navy.mil/environmental/
- ▶ U.S. Navy Stewards of the Sea Facebook Page
www.facebook.com/USNavyStewardsoftheSea

Front cover photo credits, left to right:

Jessica Bredvik, NAVFAC SW, SERMARNAT permit no. SGPA/DGVS/01643/19, CONANP F00.DRPBCPN.RBIG.0242/2019, and SEMAR 368/19 (Guadalupe fur seals)

Brenda Rone, NOAA Fisheries Service (fin whales)

Ralph Pace, NOAA Fisheries Service (green sea turtle)

U.S. Fish and Wildlife Service (California least tern)

National Park Service (black abalone)

Jennifer Trickey, SERMARNAT permit no. SGPA/DVGS/00451/18 (Cuvier's beaked whale)

Back cover photo credit: Jeff Harris, SERMARNAT permit no. SGPA/DGVS/01643/19, CONANP F00.DRPBCPN.RBIG.0242/2019, SEMAR 368/19; Funded by: Commander, U.S. Pacific Fleet (Guadalupe fur seals)