U.S. NAVY

MARINE SPECIES MONITORING IN THE GULF OF ALASKA

Protecting the Seas through Science




MARINE SPECIES MONITORING PROGRAM

MARINE SPECIES MONITORING – GULF OF ALASKA TIMELINE

MARINE MAMMAL VISUAL AND ACOUSTIC SURVEYS

MARINE SPECIES TAGGING

PASSIVE ACOUSTIC MONITORING

MARINE SPECIES MONITORING PROGRAM

The Navy is dedicated to protecting the marine and coastal environments of the Gulf of Alaska.

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, and since 2009 in the Gulf of Alaska. The Navy partners with state and federal agencies, universities, research institutions, federal laboratories, and private researchers around the world to better understand marine species occurrence, distribution, movement, and behavior. This scientific research helps environmental regulators, scientists, and the Navy to:

- Better understand the abundance, distribution, foraging, reproduction, physiology, hearing, sound production, behavior, and ecology of marine species in order to assess effects from naval activities.
- Develop and improve models to better predict potential effects of underwater sound and explosives on marine species.
- Develop effective protective measures.


Andrew P. Hendry

Integrated Comprehensive Monitoring Program

As part of its Integrated Comprehensive Monitoring Program, the Navy works closely with the National Marine Fisheries Service (NMFS) to coordinate monitoring efforts across all ocean regions where the Navy trains and tests. The Navy provides annual reports of training and testing activities and monitoring studies to NMFS. These reports are also available to the public (link below).


Brenda Rone, Alaska Fisheries Science Center, NOAA Fisheries Service

The Monitoring Program Coordinates with Other Navy Research Programs

The monitoring program works closely with the Navy's research and development programs. The Office of Naval Research Marine Mammals and Biology program conducts basic research, and the Living Marine Resources program conducts applied research. Technology and knowledge developed by these research programs are transitioned for environmental compliance and used by the monitoring program.


Rolf Ream, Alaska Fisheries Science Center, NOAA Fisheries Service


Holly Fearnbach, Alaska Fisheries Science Center, NOAA Fisheries Service

Visit ***www.navymarinespeciesmonitoring.us*** for more information on the Navy's Marine Species Monitoring Program.

MARINE SPECIES MONITORING PROGRAM

MARINE SPECIES MONITORING — GULF OF ALASKA TIMELINE

Northern Edge Joint Training Exercises

- Northern Edge joint training exercises are conducted biennially (every other year) in the Gulf of Alaska for approximately three weeks between April and October.
- The Navy establishes a maritime training area for these activities in the Gulf of Alaska known as the Temporary Maritime Activities Area (TMAA; see Figure 1). The Gulf of Alaska TMAA is located offshore and avoids many sensitive coastal resources.
- Studies occurring within and beyond the Gulf of Alaska TMAA help the Navy better understand species distribution in relation to Navy activities to support the Navy's environmental impact analysis, consultations, and permitting, as shown in the below timeline.

David Ellifrit, Alaska Fisheries Science Center, NOAA Fisheries Service

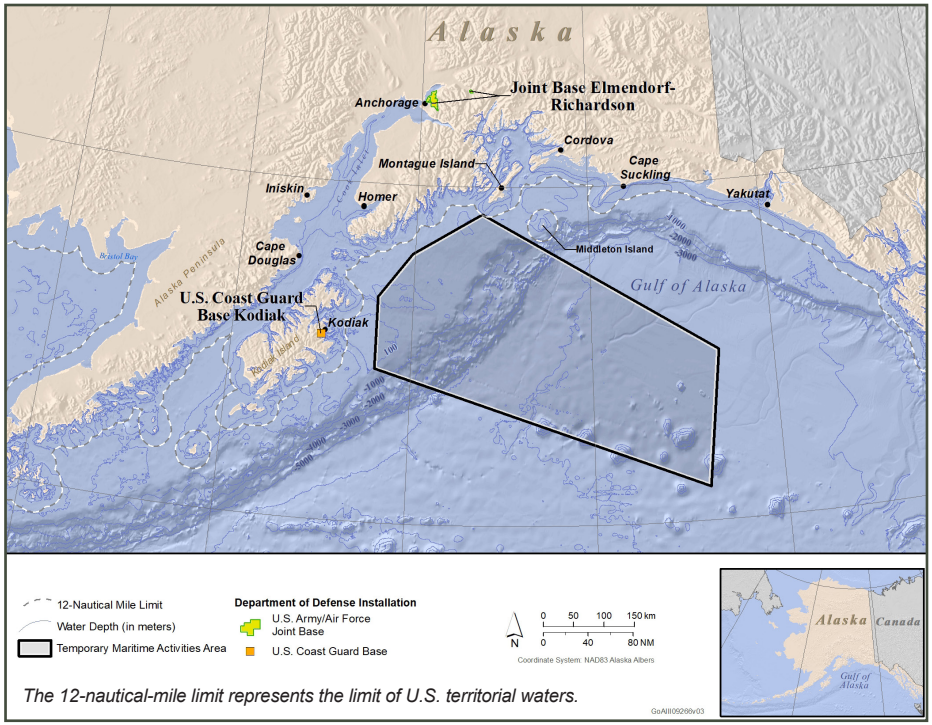


Figure 1. The Gulf of Alaska Temporary Maritime Activities Area.

The Navy is dedicated to protecting the marine and coastal environments of the Gulf of Alaska. The Navy has funded marine species monitoring within the offshore waters of the Gulf of Alaska since 2009 (see timeline), with approximately $6 million invested through 2021.

2009
Line-transect surveys using visual and passive acoustics in the Gulf of Alaska TMAA (GOALS I)

2011 – 2015
Passive acoustic monitoring in the Gulf of Alaska TMAA using bottom-mounted devices (High-frequency Acoustic Recording Packages [HARP])

2013
Line-transect surveys using visual and passive acoustics in the Gulf of Alaska TMAA (GOALS II)

2015
Underwater glider passive acoustic study

2017 – 2019
Passive acoustic monitoring in the Gulf of Alaska TMAA using bottom-mounted devices (HARP)

2017 – 2019
Humpback whale tagging study across multiple Navy training areas

2020 – Present
Chinook salmon tagging in Alaska

2021
Line-transect surveys using visual and passive acoustics in the Gulf of Alaska TMAA (PacMAPPS)

MARINE SPECIES MONITORING – GULF OF ALASKA TIMELINE

MARINE MAMMAL VISUAL AND ACOUSTIC SURVEYS

Gulf of Alaska Line-transect Surveys

Researchers from NMFS and other organizations conducted two large vessel Gulf of Alaska Line-transect Surveys (GOALS) in 2009 and 2013 with Navy funding (see Figure 2). Researchers used a combination of photo-identification, passive acoustics, and satellite tagging to determine distribution, movements, and densities of marine mammals.

Partners: Alaska Fisheries Science Center, Southeast Fisheries Science Center, Cascadia Research Collective, Bio-Waves, Inc.

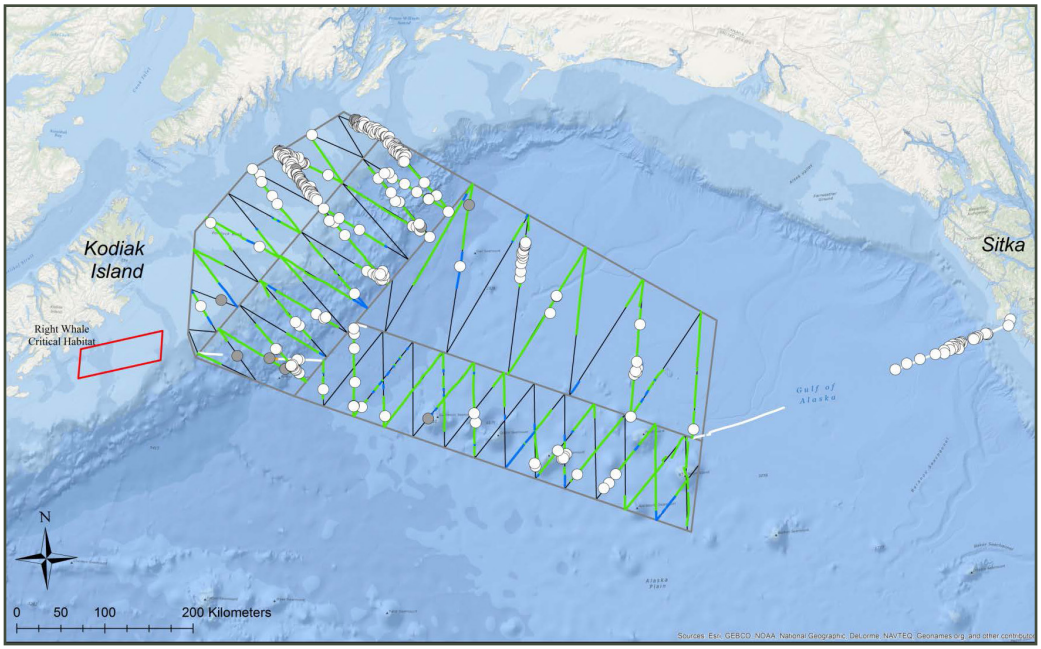
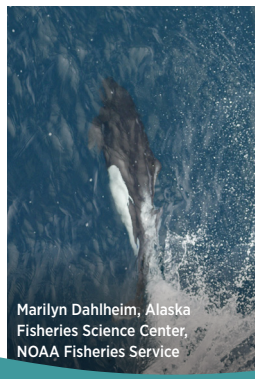


Figure 2. Visual effort and Dall's porpoise sightings from the Gulf of Alaska Line-transect Surveys (GOALS II) research cruise from June to July 2013 (white = on-effort sightings, gray = off-effort sightings) (Rone et al., 2014).

- GOALS I (2009)
  - Visual survey of 760 kilometers (km) with 96 sightings of 11 marine mammal species seen.
  - Towed-array passive acoustic survey covered 3,519 km and recorded acoustic detections of two species (sperm whale and killer whale).
- GOALS II (2013)
  - Visual survey of over 4,504 km with 802 sightings of 13 marine mammal species seen.
  - Towed-array passive acoustic survey covered 6,304 km and recorded six cetacean species.
  - A total of 186 passive acoustic sonobuoys were deployed, with seven cetacean species detected.
  - Two short-term satellite tracking tags were deployed (attached to a blue whale and a Baird's beaked whale).


Alaska Fisheries Science Center, NOAA Fisheries Service


Marilyn Dahlheim, Alaska Fisheries Science Center, NOAA Fisheries Service

Navy-funded line-transect surveys (GOALS 2009 and 2013) were combined with surveys funded by NMFS and the Marine Mammal Commission (Collaborative Large Whale Survey [CLaWS 2015]), and summarized in the Navy-funded Rone et al., 2017 report, *Abundance and Distribution of Cetaceans in the Gulf of Alaska*. The Pacific Marine Assessment Program for Protected Species (PacMAPPS) will conduct the Gulf of Alaska Cetacean Survey in summer 2021, also with Navy funding.

MARINE SPECIES TAGGING

Humpback Whale Tagging and Genetic Studies (2017 – 2019)

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

Partners: Oregon State University

- 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 areas (Hawaii) and feeding areas (Aleutian Islands, southeast Alaska, Washington, Oregon, and California).
- Through the combined use of survey methods, the results revealed complex migratory linkages between Hawaii and the Chukchi Sea, Bering Sea, Aleutian Islands, Gulf of Alaska, southeast Alaska, northern British Columbia, and Washington; as well as linkages between southeast Alaska and Mexico; and linkages between Washington/Oregon and Central America.
- Genetic analysis of biopsy samples provided valuable information on the mixing of Distinct Population Segments in the feeding areas, which complicates unequivocal assignment of individuals to breeding stock without further information.

Amy Kennedy, Alaska Fisheries Science Center, NOAA Fisheries Service

Sally Mizroch, Alaska Fisheries Science Center, NOAA Fisheries Service

Janice Waite, Alaska Fisheries Science Center, NOAA Fisheries Service

Tagged Chinook salmon, taken under Alaska Department of Fish and Game permit no. ARP CF-20-039. Photo courtesy of University of Alaska – Fairbanks

Andrew P. Hendry

Salmon Tagging (2020 – Present)

The Navy deployed Pop-up Satellite Archival Tags and acoustic telemetry tags on Chinook salmon in the Gulf of Alaska.

Partners: University of Alaska – Fairbanks, in coordination with the Northwest Fisheries Science Center

- The goals of tagging are to:
  - Identify the temporal and spatial overlap of large, immature Chinook salmon with human activities in the Gulf of Alaska.
  - Understand large, immature Chinook salmon habitat use in the Gulf of Alaska and migratory routes from Alaska to the Pacific Northwest.
  - Identify specific Chinook salmon populations in Alaska using genetic analysis of tissue samples taken during fieldwork.
- Preliminary findings of tagging include:
  - Chinook salmon prefer to feed and occupy coastal, on-shelf habitats.
  - Chinook salmon appear to have limited occupancy of over-slope habitats.
  - Some Chinook salmon utilize basin habitats during migration back to natal rivers.

PASSIVE ACOUSTIC MONITORING

Bottom-Mounted High-Frequency Acoustic Recording Packages (HARPs)

The Navy determined the presence of marine mammal and anthropogenic sounds through passive acoustic monitoring via bottom-mounted HARPs in the Gulf of Alaska TMAA, which spanned the continental shelf, slope, and offshore seamounts at depths from 200 to 1,000 meters (m) (see Figures 3 and 4).

Partners: Scripps Institution of Oceanography Whale Acoustic Laboratory - University of California San Diego

► 2011 to 2015

- 90,000+ hours of passive acoustic data were recorded and analyzed.
- No mid-frequency active sonar (MFAS) or low-frequency active sonar (LFAS) detected.
- A few non-Navy explosions detected, likely fishery-related seal bombs based on the spectral properties of the signals.

► 2017 to 2019

- 14,060 hours of passive acoustic data was recorded and analyzed.
- MFAS detected only in May 2019, overlapping with known dates of naval exercise.
- LFAS detected April and May 2019. Navy confirmed no LFAS was used during this time.
- Non-Navy explosives were detected at both the KOA and CB HARPs (see Figure 3). Navy confirmed that no at-sea explosives were used during the recording period.

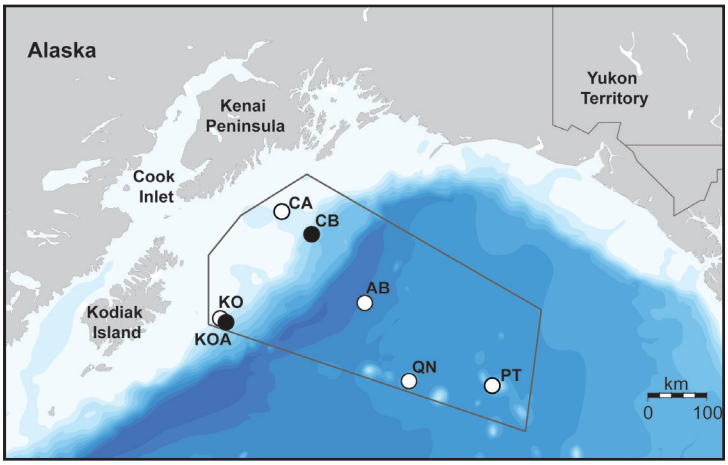


Figure 3. Locations of 2011 to 2015 (white circles) and 2017 to 2019 (black circles) High-frequency Acoustic Recording Packages deployment in the Gulf of Alaska Temporary Maritime Activities Area (Rice et al., 2020).

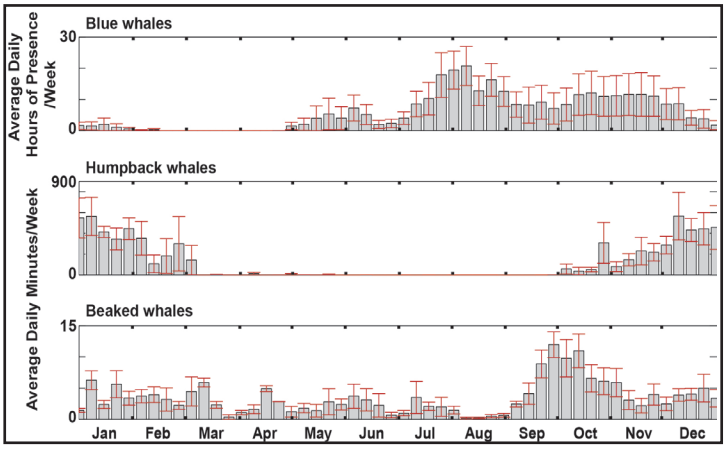


Figure 4. Mean weekly presence (gray bars) of blue whale calls, humpback whale calls, and beaked whale clicks at a recording location on the continental slope in the Gulf of Alaska Temporary Maritime Activities Area. Data averaged across years with recording effort from 2011 to 2015; red bars represent standard error (Rice et al., 2020).

Data summarized in the Navy-funded Rice et al., 2021 report, *Cetacean Occurrence in the Gulf of Alaska from Long-Term Passive Acoustic Monitoring,* include:

- Increased calling of blue and humpback whales in fall and winter, indicated possible behavioral shifts between feeding and breeding, contrasted by the year-round presence of fin whales.
- Seasonal presence of gray whales matched known migration routes.
- Only rare detections of North Pacific right whales occurred outside of designated critical habitat.
- Sperm whale detections highest on the continental slope.
- Killer whale call types had different spatial distributions, possibly related to the presence of resident killer whales on the shelf, and transients and offshore killer whales in deeper waters.

Commercial Underwater Glider

The Navy investigated spatial distribution and temporal occurrence of baleen and toothed whales in the Gulf of Alaska TMAA through a passive acoustic glider survey (see Figure 5). The survey focused on the shelf break area between Middleton Island and Kodiak Island (see Figure 6).

Partners: Bioacoustics Research Program – Cornell University, Cooperative Institute for Marine Research Studies – Oregon State University, and Applied Physics Laboratory – University of Washington

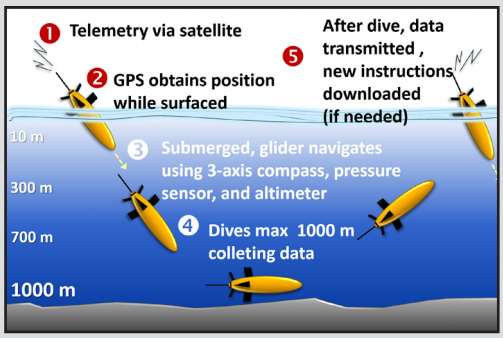
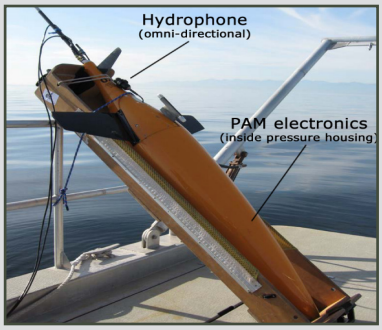


Figure 5. Dive sequence for the underwater Seaglider™.

- Covered 744 km and collected 680 hours of acoustic data from July and August 2015.
- Recorded 315 cetacean encounters representing six species.
- Blue whale and fin whale calls were the most abundant baleen whale detected.
- Acoustic data showed the potential presence of sei whales, but no known vocalizations of humpback, North Pacific right, minke, or gray whales were recorded.
- Sperm whale and killer whale calls were the most abundant toothed whale detected.
- Acoustic data also detected Pacific white-sided dolphin, a possible Stejnejer's beaked whale, and a few unidentified odontocetes.
- No acoustic detections of naval sonar in the study area during the survey.



Seaglider™, photo courtesy of Applied Physics Laboratory, University of Washington, Seattle, WA.

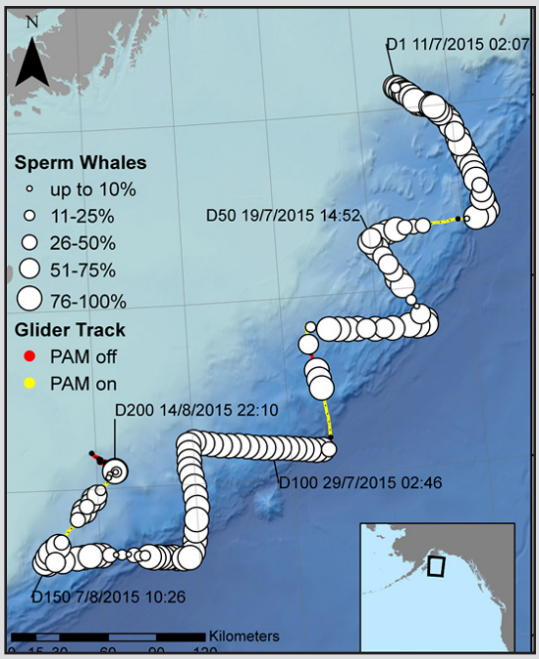


Figure 6. Glider detected sperm whale clicks with circle size indicating percentage of recording time per dive with sperm whale detections. Path shown traveled is the pre-planned survey track along the slope (Klink et al., 2016).

For More Information:

- U.S. Navy Marine Species Monitoring Program
  www.navymarinespeciesmonitoring.us
- U.S. Navy Marine Mammals and Biology Program
  www.onr.navy.mil/en/Science-Technology/Departments/Code-32/all-programs/marine-mammals-biology
- U.S. Navy Living Marine Resources Program
  www.navfac.navy.mil/navfac_worldwide/specialty_centers/exwc/products_and_services/ev/lmr.html
- Commander, U.S. Pacific Fleet
  www.cpf.navy.mil
- U.S. Navy Stewards of the Sea
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