NOAA-Navy Sanctuary Soundscape Monitoring Project (SanctSound)

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https://sanctuaries.noaa.gov/science/monitoring/sound/
Project Objectives

1. Deployment of calibrated passive acoustic recording devices in sanctuaries
2. Holistic sampling of the soundscape
3. Further development of characterization metrics
4. Archiving of data and public access
5. Integration of acoustic metrics with other data
Passive Acoustic Monitoring
National Marine Sanctuaries System
Data Flow

- Cleared .wav files with calibration metadata
- Oceanographic and climatological data
- Human activity and species presence data

- Exemplar sound clips
- Sound levels
- Call detections
- Sound propagation models

- Data products

- Raw data

- PassivePacker

- NCEI Archive and Access

- SWFSC ERDDAP Server

- IOOS-hosted Data Portal
  Visualize, explore and explain results
Data Flow

Raw data → PassivePacker → NCEI Archive and Access → SWFSC ERDDAP Server → IOOS-hosted Data Portal

- Cleared .wav files with calibration metadata
- Oceanographic and climatological data
- Human activity and species presence data

Sound levels → Call detections

Data products

ERDDAP > griddap > Make A Graph

IOOS-hosted Data Portal

Visualize, explore and explain results

Exemplar sound clips

Data Flow
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Visualize, explore and explain results
SanctSound.IOOS.US

New SanctSound tile

NOTE: Final IOOS.us SanctSound page is not LIVE.
Currently redirects to the ONMS Sound webpage
Currently DRAFT 2.0 webportal URL is ‘hidden’ from discovery
Portal Overview

Foyer
- General audience focused
- Curated
- Education

Jennifer Brown, ECOS Consulting, LLC
Ben Best, EcoQuants, LLC

House
- Data focused
- Interactive
- Exploration

Brian Stone, Axiom Data Science LLC
What did we hear?

Channel Islands National Marine Sanctuary

Click on an element to see & hear more.

- Animal
  - Blue whales
  - Bocaccio
  - Dolphins
  - Fin whales
  - Humpback whales
  - Plainfin midshipman
  - Sea lions
  - Snapping shrimp
- Human-made
  - Military sonar
  - Seabomb
  - Vessels
- Physical
  - Wind

Humpback whales in CINMS

less detections

more detections
Where did we listen?

Hydrophone recordings of the CINMS soundscape began in November 2018 at sites CI01 (blue), CI02 (green), CI04 (yellow), and CI05 (red) and in October 2019 at site CI03 (orange). There were some gaps in recordings (no shading) or times with lower quality data (shaded box) at each site, but good quality data (solid) was recorded at one or more sites in CINMS (black) for most of the project period.

Peach shading shows the potential listening range of the hydrophone at station CI01 on the north side of Santa Rosa Island. The listening range is influenced by many factors including water temperature, depth, shape of the seafloor, and frequency of the sound.

Station: CI-04
This site was selected because it is adjacent to the voluntary lanes ships used to the south of the four northern islands. It is also a site that is being considered for developing offshore wind energy.

Click here to see similar maps of the listening range for the other hydrophones in this sanctuary and in other sanctuaries.

Click here to learn more about how we listened to and recorded soundscapes.
What did we measure?

Channel Islands National Marine Sanctuary

**Spectrogram: Intensity of different pitches over time**

Low pitch sound was much louder (warmer colors) in November and early December at CMMS station 5 than in late December and January. The intensity, or loudness, of higher pitch sound remained fairly consistent during this recording period.

**Streamplot: Loudness and contribution of different pitches**

CMMS station 5 was louder (wider bands) in November and early December with lower pitch sounds (cooler colors) dominating the most of the soundscape. In January, the soundscape was quieter (warmer bands) and dominated by higher pitch (warmer colors) sound.

**Power spec: Variability of loudness across pitch**

From November to February at CMMS station 5, the greatest variability in loudness (wider grey shading) occurred around the middle pitches and the least variability in loudness (narrower grey shading) at highest pitches. Average loudness (black line) increased across the lower and middle pitches and peaked around 8000 hertz.

**Anomaly plot: Deviation of loudness from average**

The anomaly plot helps to highlight that CMMS station 5 was louder than average (shades of red) in November and early December with lower pitch sounds contributing the most to the soundscape. In January and early February, the soundscape was quieter than average (shades of blue) and lower pitch sounds contributed much less to the soundscape at that time.
What did we learn?
Portal Overview - House

SanctSound Data Portal
Sanctuaries

- Channel Islands
- Florida Keys
- Gray's reef
- Hawaiian Islands Humpback Whale
- Monterey Bay
- Olympic Coast
- Papahanamokuakana
- Stellwagen Bank

Comparisons

- Broadband
- Power spec