Characterizing Sanctuary Soundscapes

MBNMS SAC Meeting

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Background

Dec. 2016: Navy and NOAA settled with plaintiffs (National Resources Defense Council, et al., v. Pritzker, et al.)

Parties agreed to 4 topics:

1. **Developing capacity to protect acoustic habitats, including in national marine sanctuaries managed under the NMSA**
2. Marine mammal density and distribution modeling in data-poor areas
3. Identification of areas of biological importance
4. Density data collection

Terms of Reference from Settlement

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

What is a soundscape?

A SEA OF SOUND
Underwater sound from anthropogenic sources can be so loud that it disrupts marine animals' communications — and can even cause injuries and deaths.
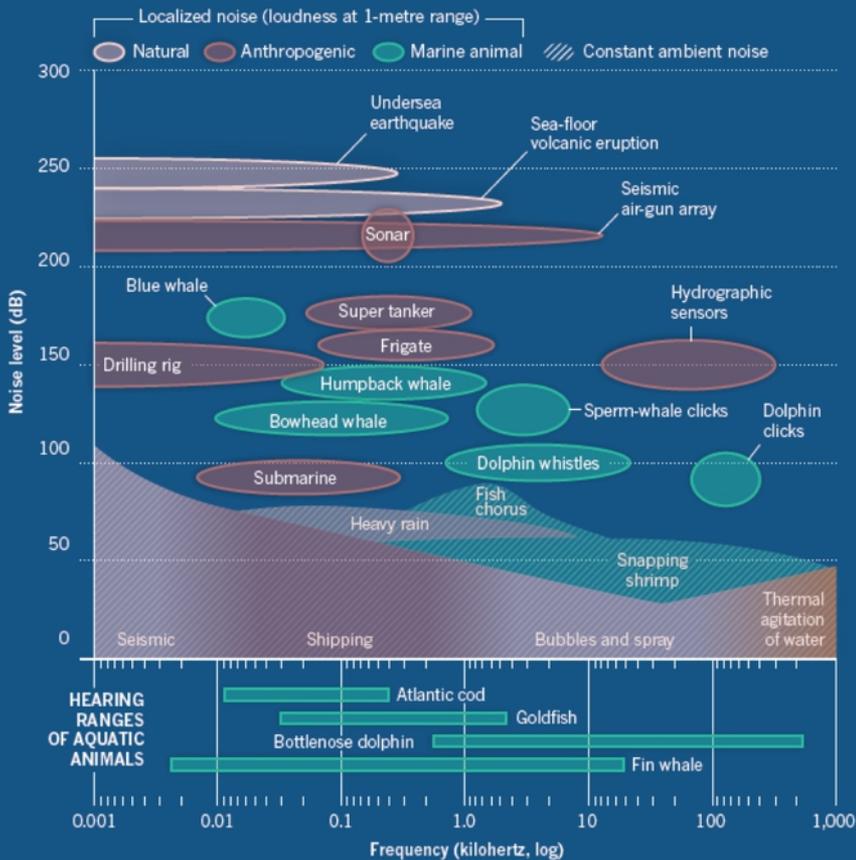
- Ambient sounds

- Biological sounds

- Anthropogenic sounds

Build System-wide Capacity
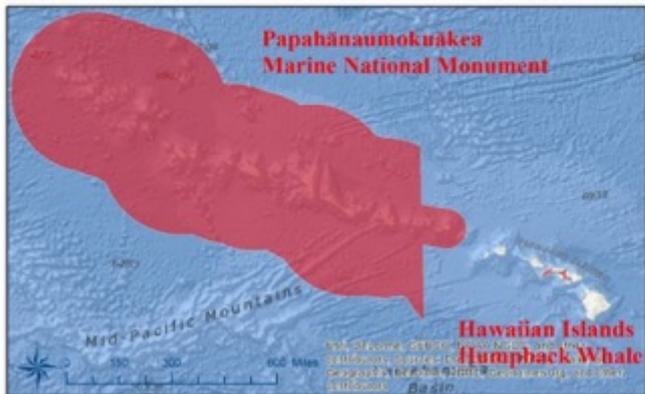
Build System-wide Capacity

Standardized instrumentation

1. SoundTraps

2. Gliders
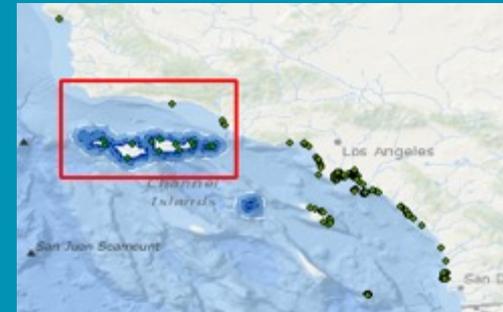
3. Animal Telemetry Networks

Year 1

Convened expert workshop in May 2018

- 35 international soundscape ecologists, including BOEM, Navy and NOAA (ONMS and NMFS)
- Discussion re: available methods and gaps
- Final report available on website

Field Designs

- 36 stationary listening stations across program, 12 across the WCR, **3 in MBNMS**
- Additional data collection (temp, telemetry)
- **MBNMS deployments: Nov. 2018; April/May 2019**

Years 2-5

Data Analysis

- WCR partners: Naval Postgraduate School, SIO, MLML, Southall Environmental Associates, MBARI

- Compare:

  - site sound levels (e.g, ambient noise)
  - species detections (e.g., whales, fish)
  - detections & sound levels of geophysical (e.g, storms), and human activity (e.g., ships) over time

Dissemination of Results

- Archive data at National Centers for Environmental Information

- Web-based interface for visualization and exploration of results

Soundscape Monitoring in MBNMS
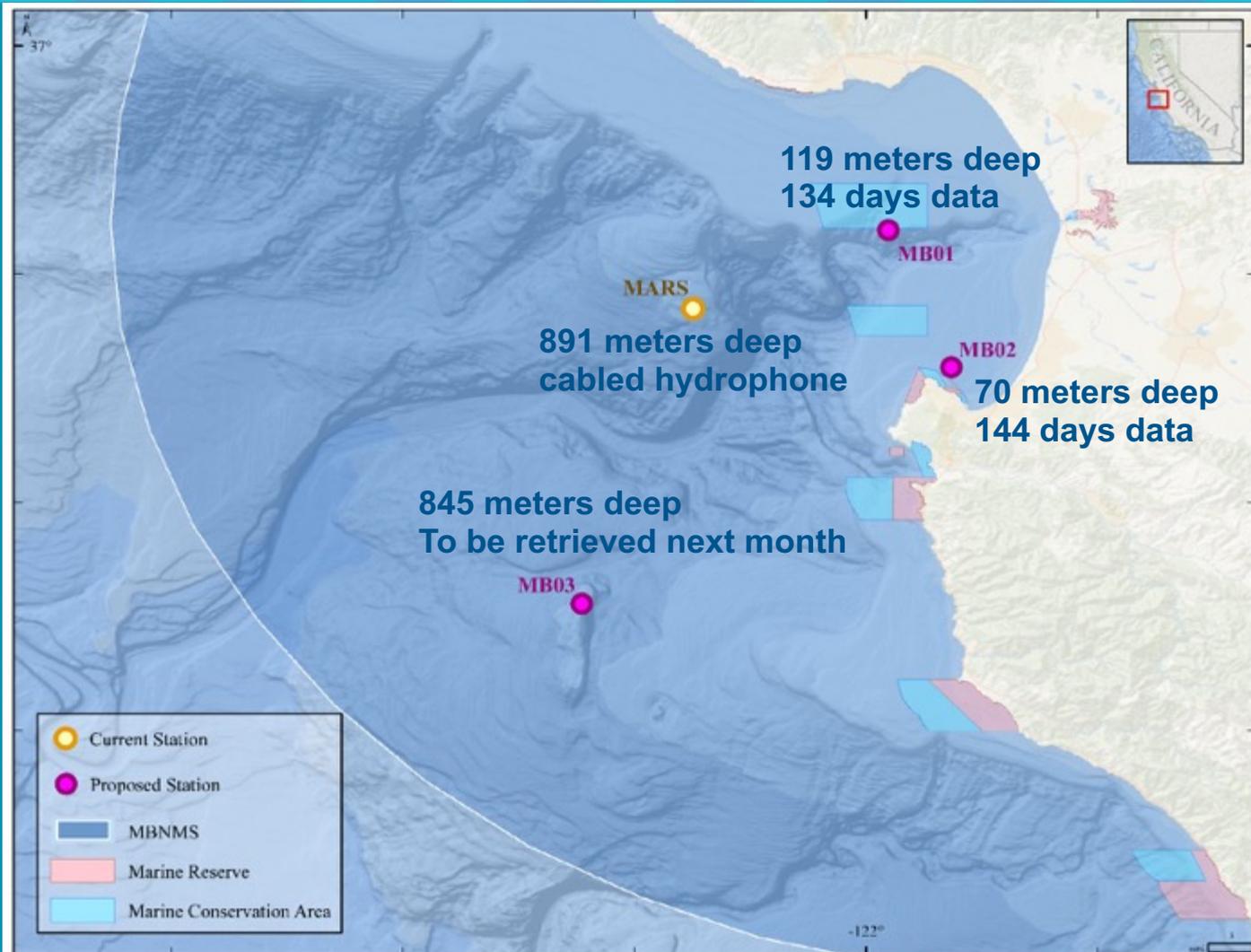
Three Types of Hydrophones

SoundTrap Mooring

HARP Mooring

MBARI Hydrophone
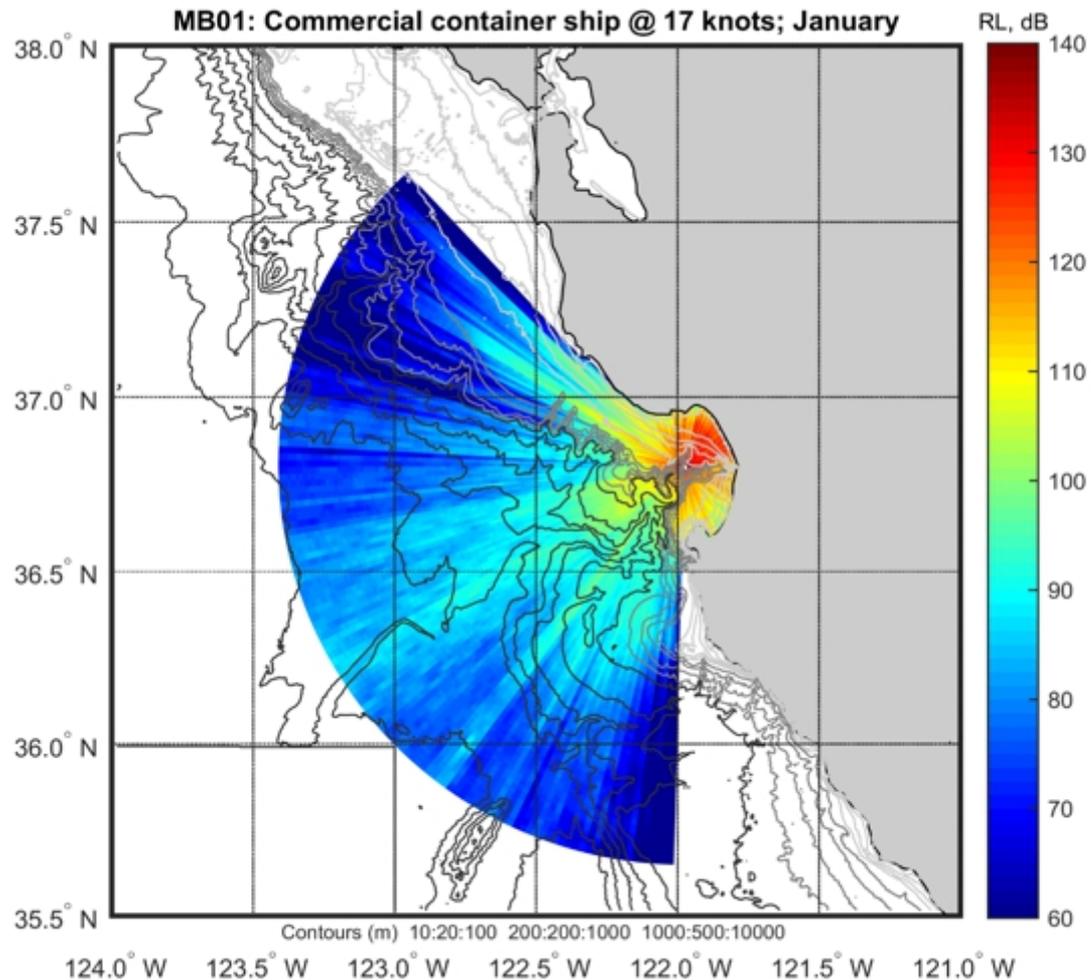
Hydrophone Location Determines What Can Be Heard

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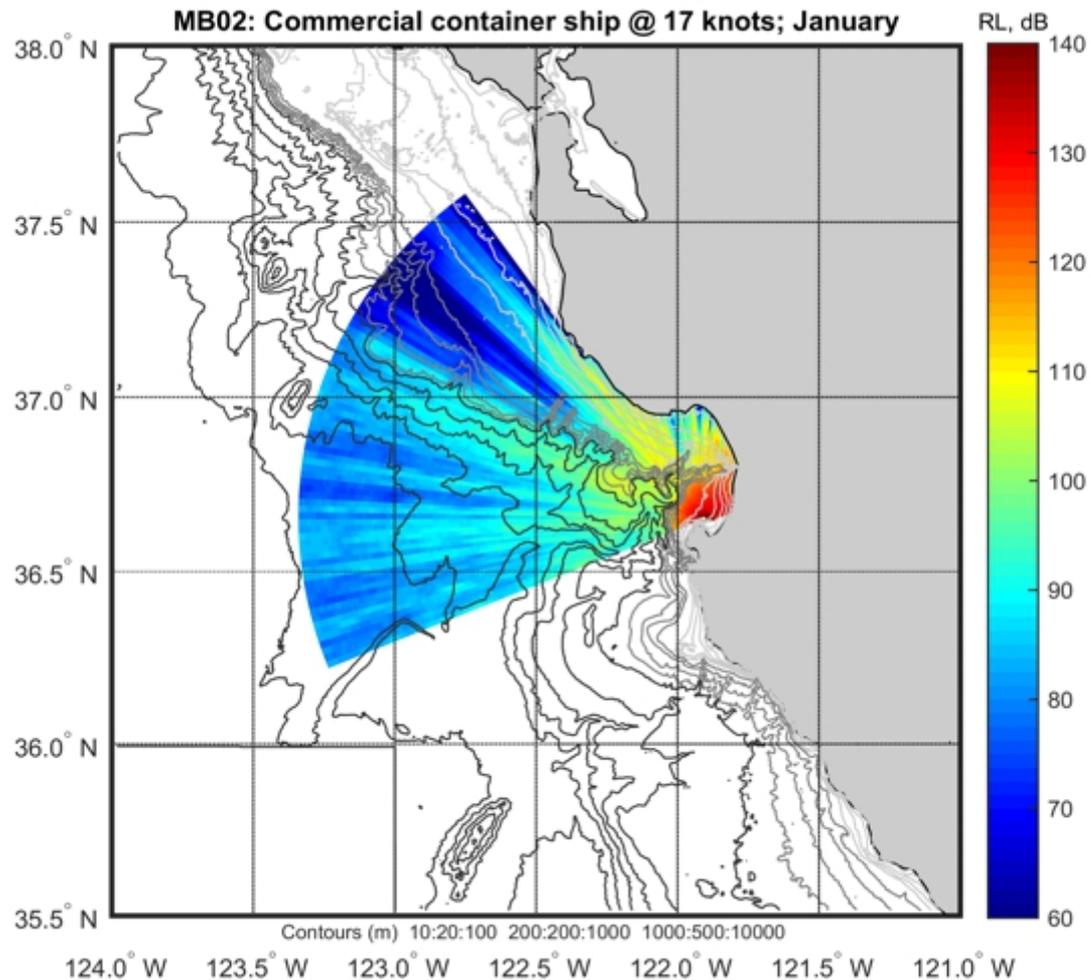
MB02: Commercial container ship @ 17 knots; January

Hydrophone Location Determines What Can Be Heard

MB03: Commercial container ship @ 17 knots; January
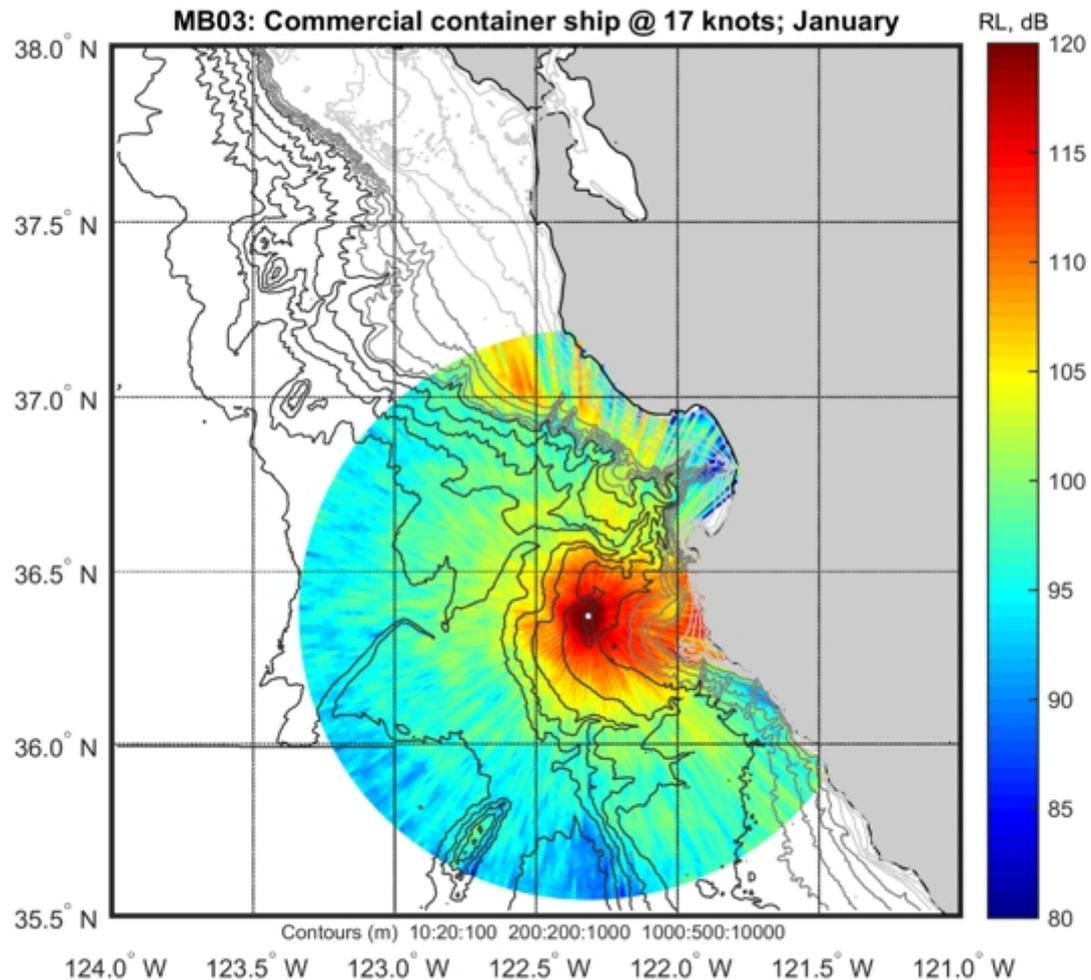
Issues That Can Be Addressed By Each Hydrophone

MB01 - Soquel and Monterey Canyon

- Correlating seal bomb and Harbor Porpoise detections
- Characterizing vessel traffic within Monterey Bay
  - ships, whale watching, fishing
- Developing sound indicators for future Condition Reporting
- Detecting marine animals
  - mammals, fish, invertebrates
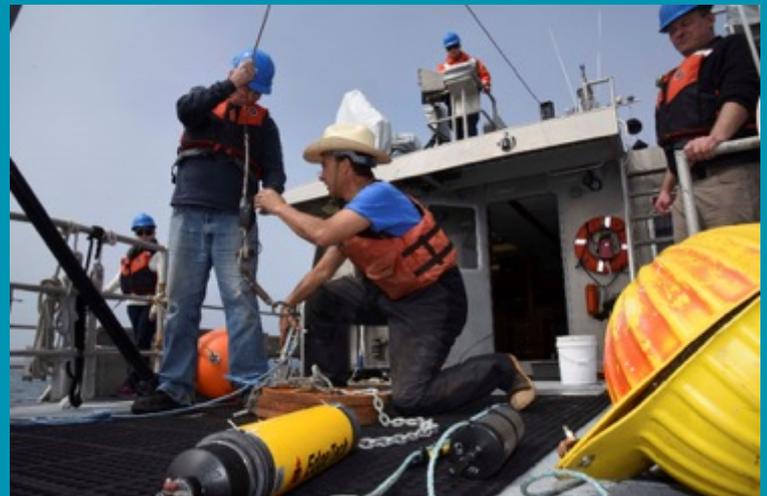
US Navy Photo by Javier Chagoya

Issues That Can Be Addressed By Each Hydrophone

US Navy Photo by Javier Chagoya

MB02 - Monterey Peninsula

- Characterizing construction sound (e.g., Aquarium intake pipes)
- Characterizing cruise ship sound
- Frequency of sound from fishing vessels
  - engines, explosions
- Characterizing sound levels exposure for SCUBA divers at San Carlos Beach
- Other anthropogenic sounds?

Issues That Can Be Addressed By Each Hydrophone

MB03 - Sur Ridge

- Characterizing vessel traffic sound from shipping lanes
  - Sound variability (e.g., tanker vs cargo)
- Long-term changes in the Sanctuary soundscape? (Navy SOSUS array)
- How quiet or noisy is MBNMS compared to other areas (e.g., sanctuaries vs non-MPAs)
- Can we detect animals by sound, if they are hard to detect visually (e.g., beaked whales)

US Navy Photo by Javier Chagoya

Soundscape Outreach

For More Information

https://sanctuaries.noaa.gov/science/monitoring/sound/
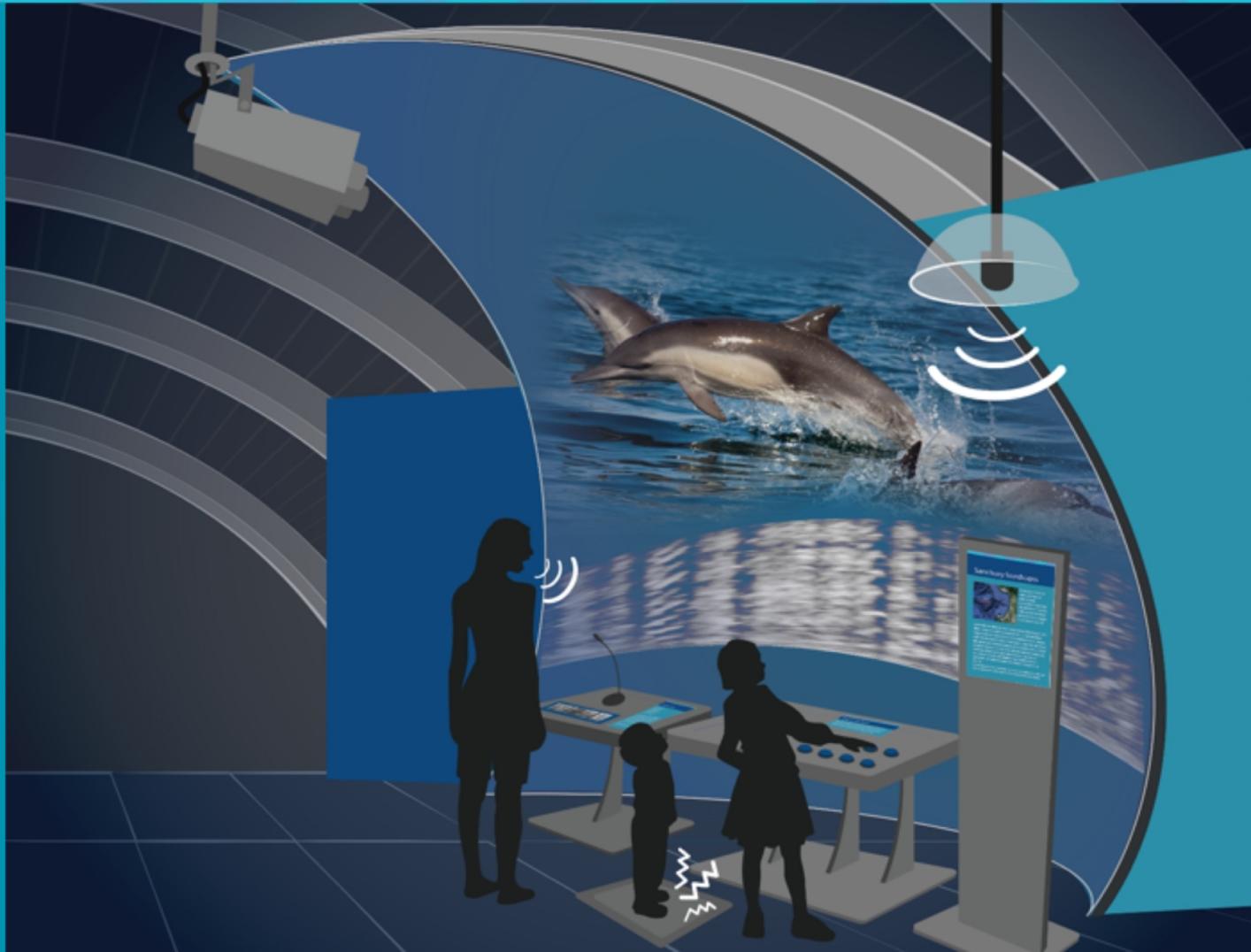
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National Marine Sanctuaries
National Oceanic and Atmospheric Administration

NATIONAL MARINE
SANCTUARIES

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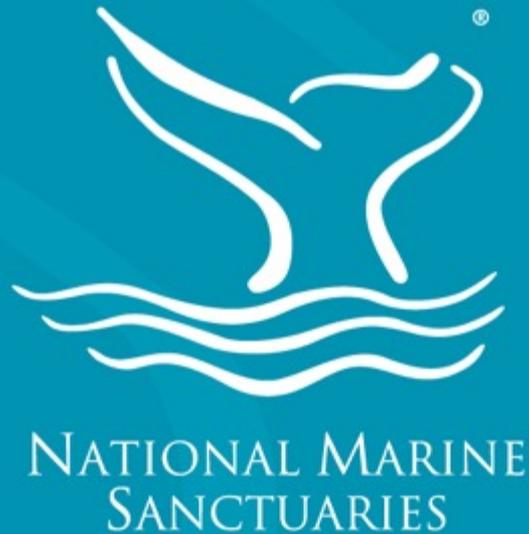
Project Management

Co-leads: ONMS and Navy (OPNAV N45)
Support: Navy Living Marine Resources, NOAA Fisheries

Expert Solicitation: Soundscape Metrics Workshop Participants

Administrative: NOAA and Navy Inter-agency Agreement, MOUs and Budget Oversight

Legal: NOAA and Navy Interagency Agreement, Settlement Oversight

Communications & External Affairs: NOAA and Navy

East Coast Regional Lead: Woods Hole Oceanographic

West Coast Regional Lead: Naval Postgraduate School

Hawaiian Islands Regional Lead: HIHWNMS

Acoustic Data Collection, Analysis & Archiving

Non-acoustic data integration (statistics, modeling)

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Acoustic Data Collection, Analysis & Archiving

Other data collection: Gliders, Cetabuoy

Other Data Collection: Gliders, Telemetry

Data Visualization, Exploration

Other Data Collection: Gliders, Telemetry

Data Visualization, Exploration

Site Staff (Research, Permitting, Operations, Admin, Communications)

Navy Pacific Fleet Staff

ONMS Site Staff (Research, Permitting, Operations, Admin, Communications)

Navy Atlantic Fleet Staff

ONMS Site Staff (Research, Permitting, Operations, Admin, Communications)

Navy Pacific Fleet Staff