



# Characterizing Sanctuary Soundscapes

## MBNMS SAC Meeting

April 19, 2019

Lindsey Peavey Reeves, Ph.D.

Andrew DeVogelaere, Ph.D.

National Oceanic and Atmospheric Administration  
Department of the Navy

# 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

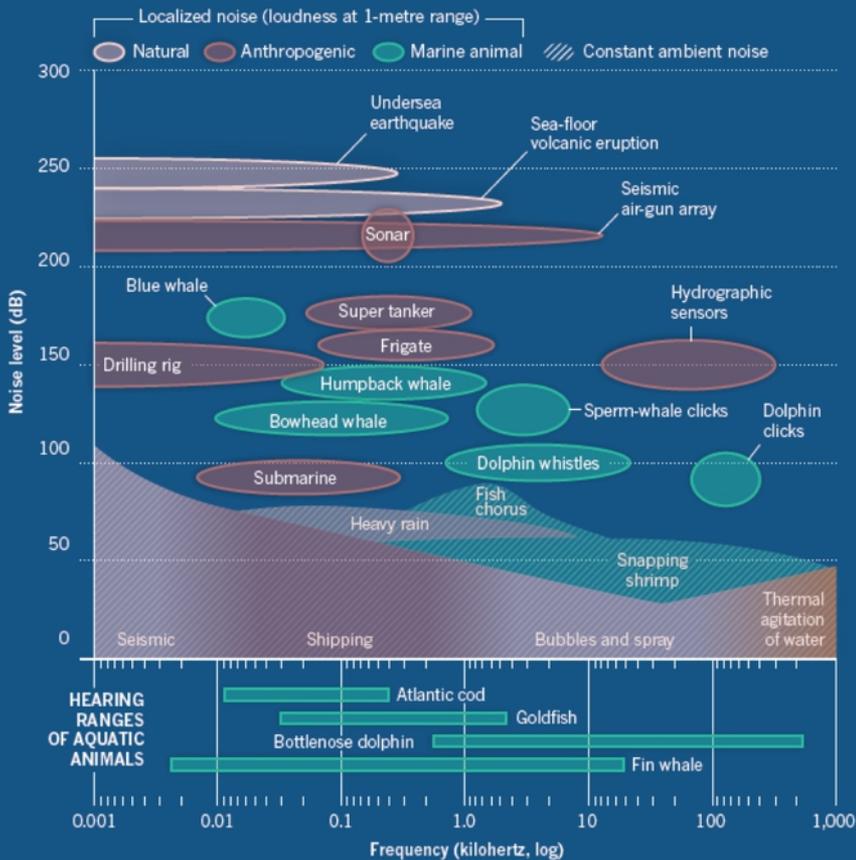
1. Deployment of calibrated passive acoustic recording devices in sanctuaries
2. Holistic sampling of the **soundscape**
3. Further development of **characterization metrics**
4. Archiving of data and public access
5. Integration of acoustic metrics with other data

# What is a soundscape?

## A SEA OF SOUND

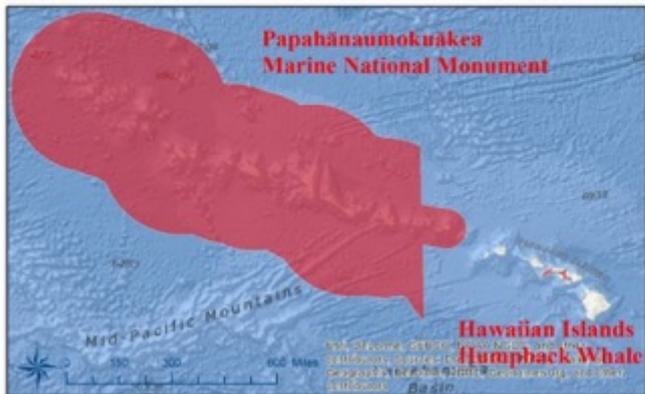
Underwater sound from anthropogenic sources can be so loud that it disrupts marine animals' communications — and can even cause injuries and deaths.

### UNDERSEA SOUND SOURCES



- Ambient sounds
- Biological sounds
- Anthropogenic sounds

# Build System-wide Capacity



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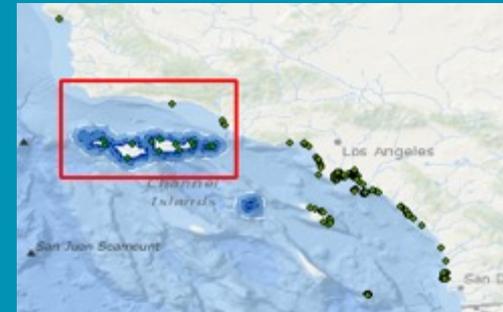
## Standardized instrumentation



**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

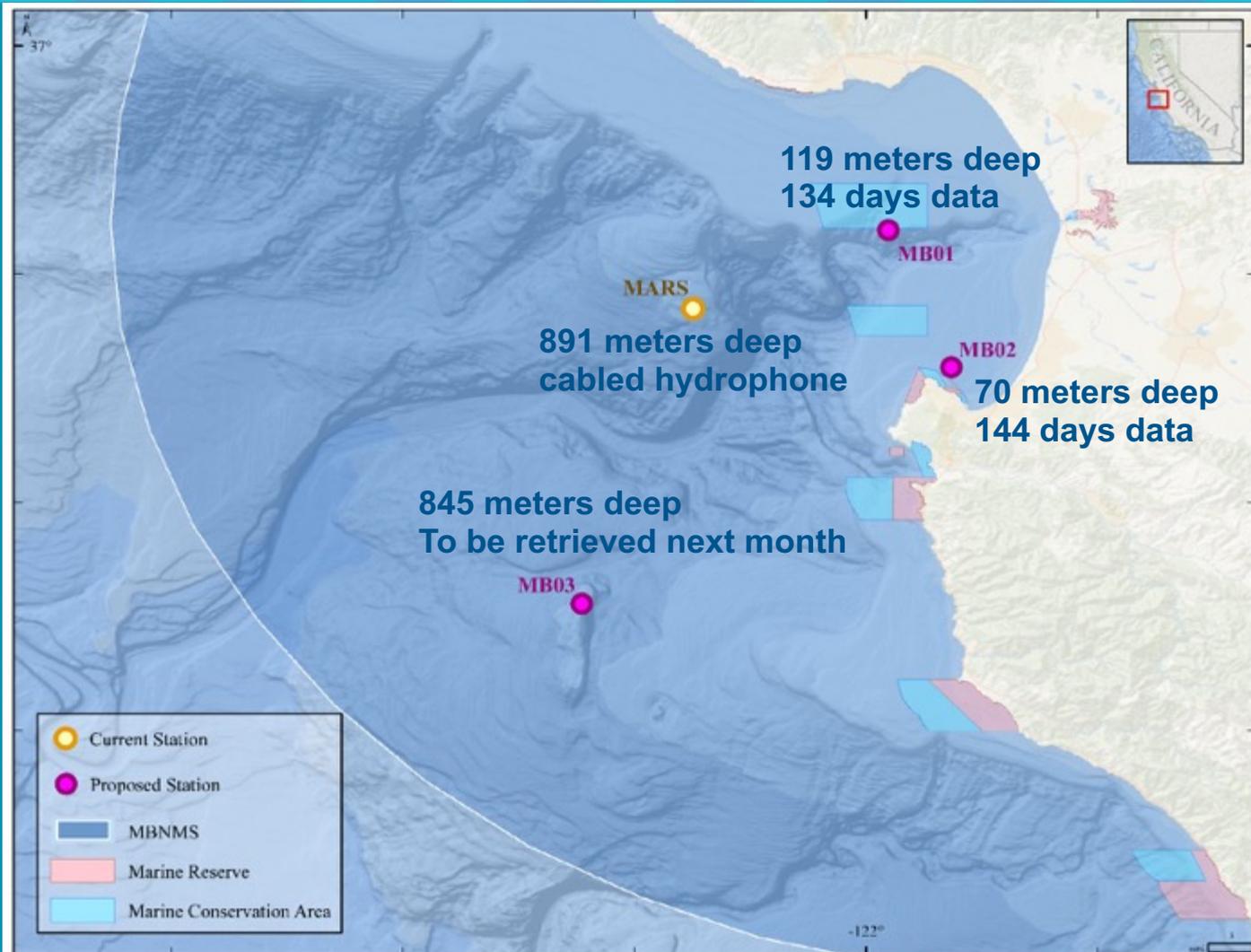
## Data Analysis

- 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

Mooring: MB-01 SoundTrap 2018 Recovered

Mooring: **MB-01**  
 Deployment: 15 Nov 2018  
 Time: 1905 hrs. UTC  
 Recovery: Apr 08, 2019  
 Time: 1642 hrs. UTC  
 Position: 36° 47.880' N  
 121° 56.560' W  
 Depth: 119 m

Note: not drawn to scale

Distance above bottom:

6.2 m - top of mooring

1 - 10" HandBall Float, syntactic with eyes, wt, water=22 kg (49 lbs.), wt, air=25.1 kg (55 lbs.), 3/8" shackle  
 3 ES&MCT sealed submersed w/ 5/16" shackles on ends, 3/8" pear ring  
 5/16" shackle to 2 m Oub Splice line

3.0 m - 5/16" line  
 Salmon Oub Splice  
 with nylon shrouds

SoundTrap Hydrophone S/N: 1009  
 SoundTrap Housing S/N: 07191090  
 SoundTrap wt, in water = 1.8 kgs, (3.9 lbs.)  
 SoundTrap wt, in air = 4.2 kgs, (9.3 lbs.)

RBR Solo Temp Sensor S/N: 181588  
 5/16" shackle on lower end of 3 m line,  
 5/16" lugs welded, 5/16" shackle, 3/8" pear ring,  
 5/16" shackle to top of release

2.0 m - top of release

EdgeTech Model 8118 PORT LF Release  
 S/N: 00011  
 wt, in water = 4.3 kgs, (9.5 lbs.)  
 wt, in air = 11.3 kgs, (25.0 lbs.)

5/16" shackle from release to top of 5/16" chain  
 5/16" shackle on lower end of 1.13 m 5/16" chain,  
 1/2" pear ring to 3/8" shackle on anchor

Anchor one 100 lb. weight plate with 5/16" chain  
 (24 lbs.) in center secured by 3/8" shackle  
 Air: 100 lbs., Water: 99 lbs.

Bottom Depth: 119 m

Ruth Wynnoff Dep: MB-01\_SoundTrap\_2018\_Recovered.dwg Date: 08 Apr 2019

## HARP Mooring

Mooring MB-03 (PS14) As Deployed

Mooring: **MB-03 (PS14)**  
 Deployment: 13 Nov 2018  
 Time: 1824 hrs. UTC  
 Recovery: \_\_\_\_\_ 2019  
 Position: 36° 22.218' N  
 121° 18.882' W  
 Depth: 845 m

Note: not drawn to scale

Distance above bottom:

23 m - top of mooring

1 - 10" glass ball on 0.8 m 5/16" chain,  
 small ES&MCT sealed with two 5/16" shackles  
 1/2" pear ring  
 1/2" shackle to top of JWR

18 m - Temperature Sensor  
 17 m - Hydrophone

RBR Solo Temp Sensor S/N: 181588  
 HARP hydrophone and cable,  
 extends up 10 m from HARP frame,  
 secured to 3/16" JWR

15 m 3/16" JWR

1/2" shackle on lower end of JWR  
 5/8" pear ring  
 3/8" shackle on top of frame

7 m - top of HARP frame

HARP Package single tube with two L2 batteries,  
 (HARP tube: air wt=36 lbs., water wt=33 lbs.)  
 In diameter 1.5 m long frame with three 1" glass  
 balls attached by chain,  
 Sonotone Deep Marker Transponder ID 88

HARP Pkg. wt. in water = 48 kgs, (106 lbs.)  
 HARP Pkg. wt. in air = 118 kgs, (260 lbs.)

0.4 m 5/16" chain

5/8" shackle on bottom of frame, 1/2" pear ring,  
 5/16" shackle to top of 0.4 m chain

0 m - top of release transducers

5/16" shackle on bottom of chain, 1/2" pear ring,  
 7/16" shackle to top of dual release bracket

EdgeTech PORT LF Dual Releases  
 S/Ns: 45008 and 45016  
 Wt. in water = 12.3 kgs (27.1 lbs.)  
 Wt. in air = 26.4 kgs, (58.1 lbs.)

0.4 m 3/8" chain

1/2" shackle on blower box to 3/8" chain

1/2" shackle on end of 3/8" chain  
 1/8" pear ring to 1/2" shackle on anchor  
 Anchor two 100 lb. and one 40 lb. plates  
 with 24 lbs. of 3/8" chain through centers,  
 secured by 1/2" shackle  
 Air: 247 lbs., Water: 220 lbs.

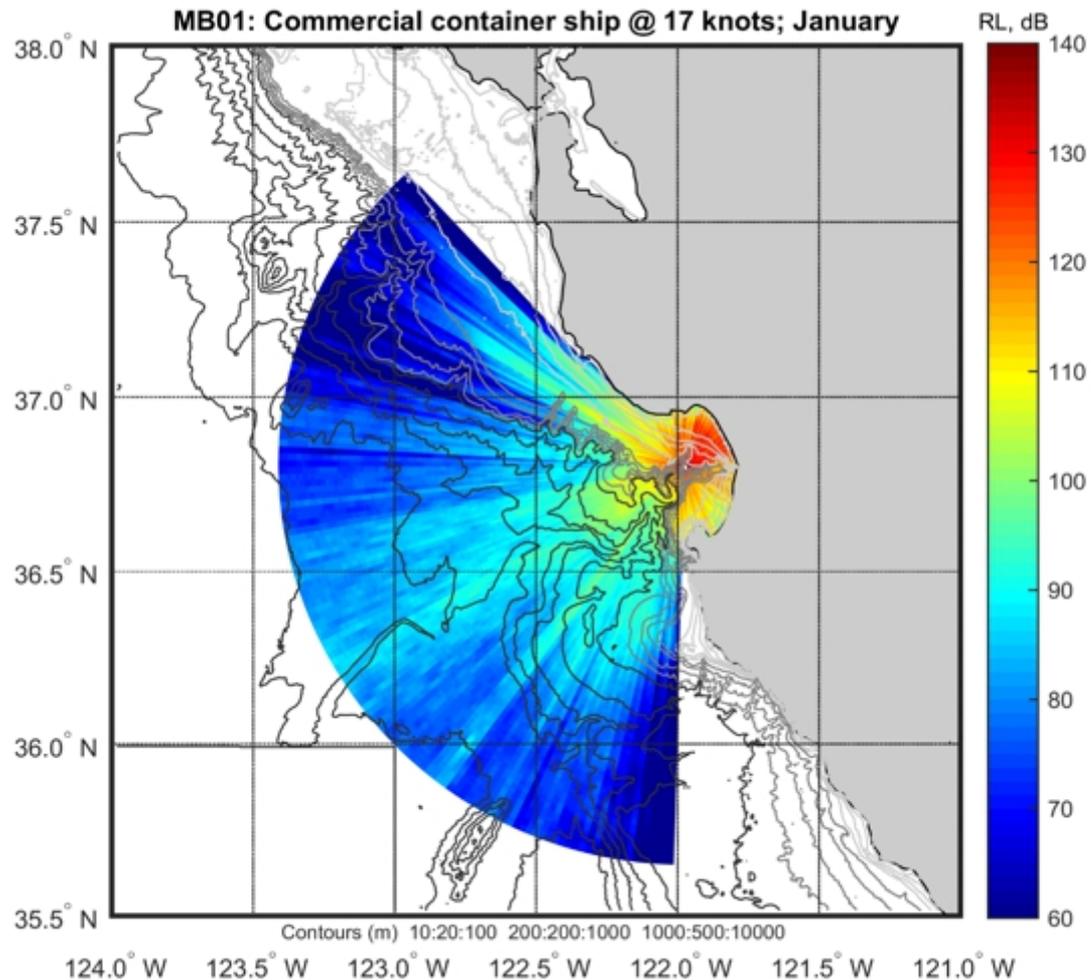
Bottom Depth: 845 m

Mark Stone Dep: MB-03\_PS14\_As Deployed.dwg Date: 13 Nov 2018

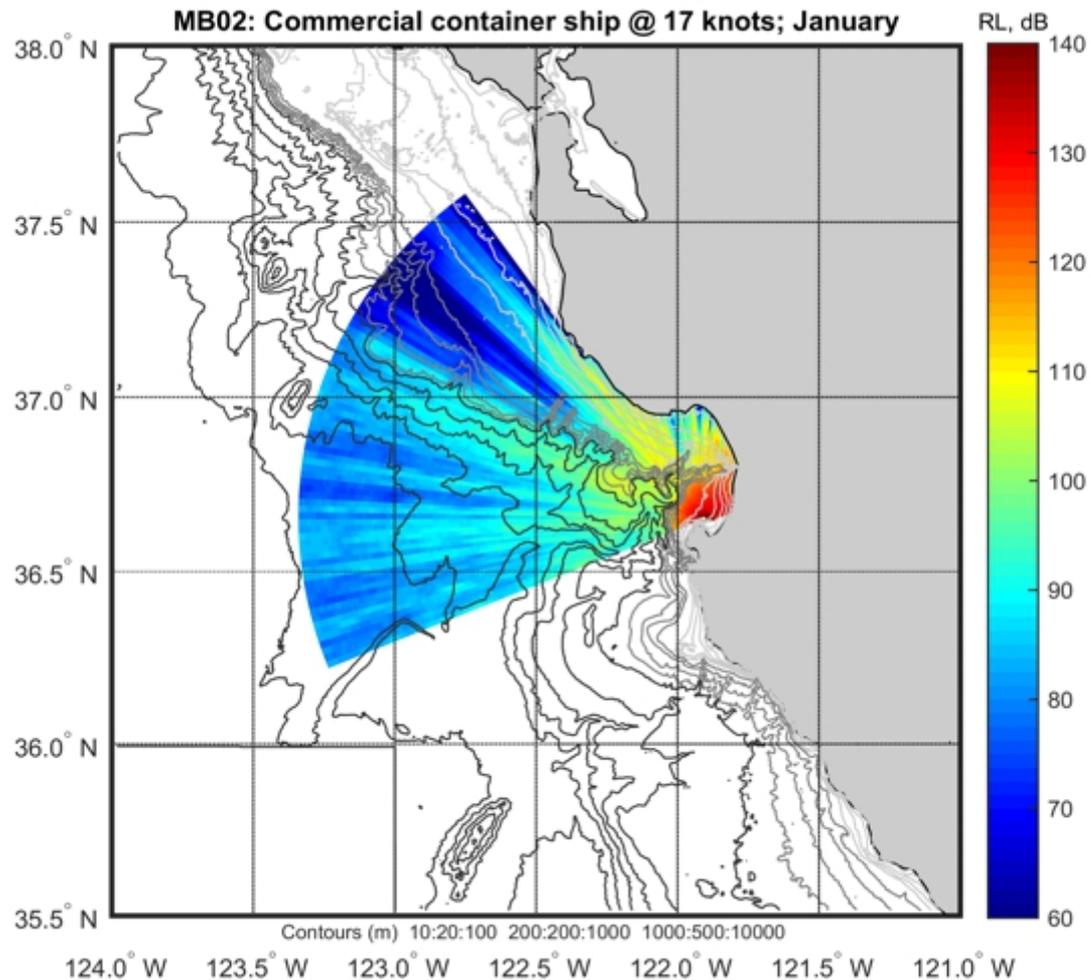
## MBARI Hydrophone



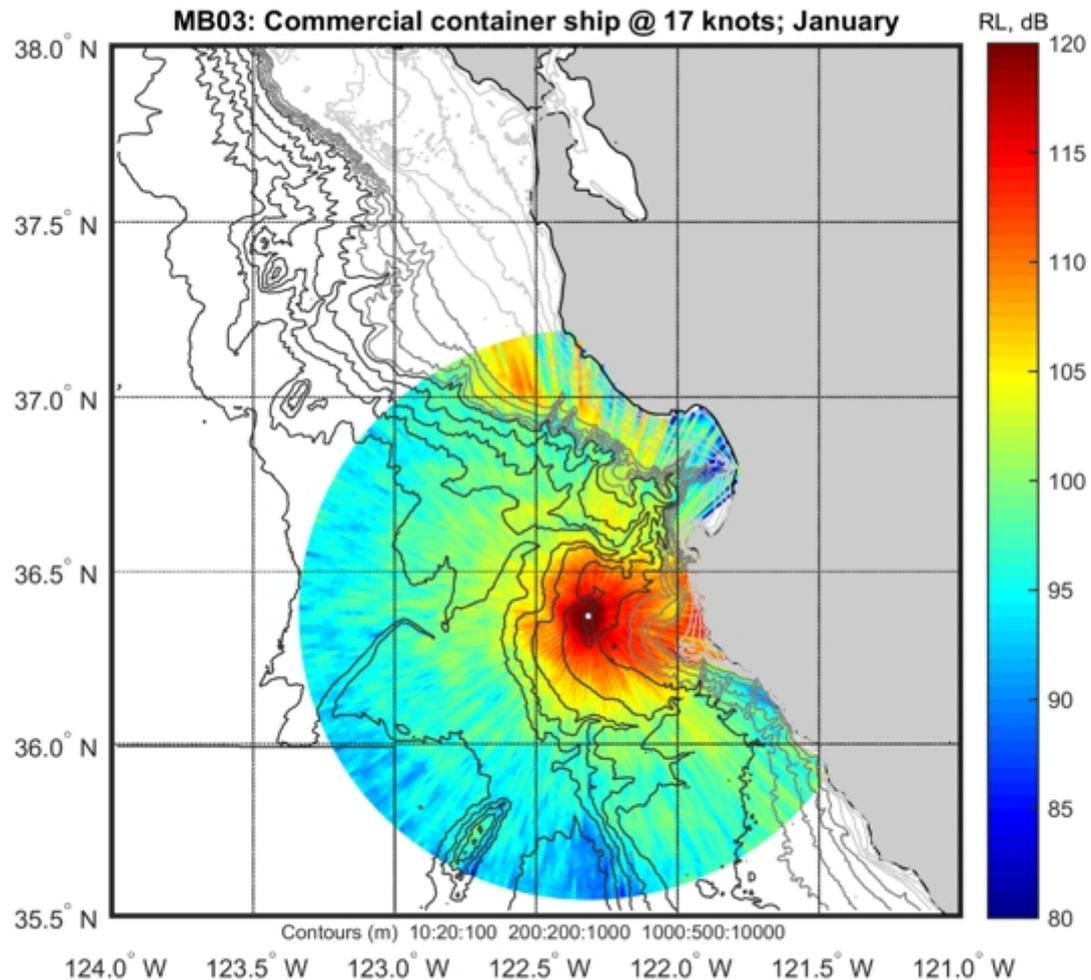
# Hydrophone Location Determines What Can Be Heard



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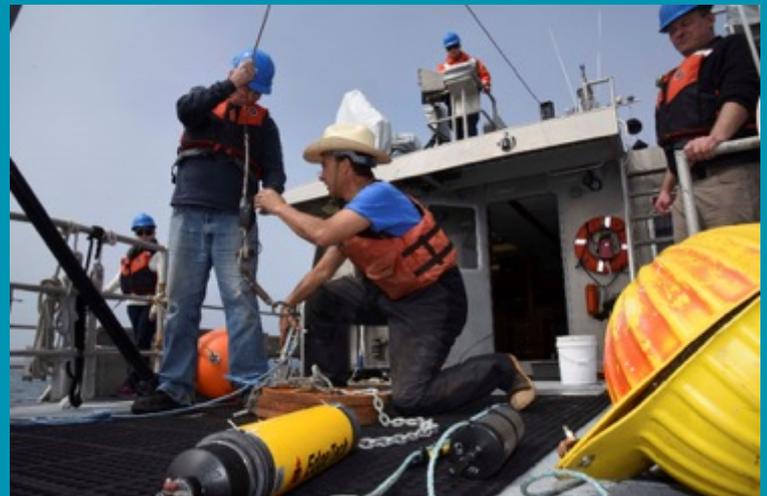
# Hydrophone Location Determines What Can Be Heard



# 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

## 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?



US Navy Photo by Javier Chagoya

# Issues That Can Be Addressed By Each Hydrophone

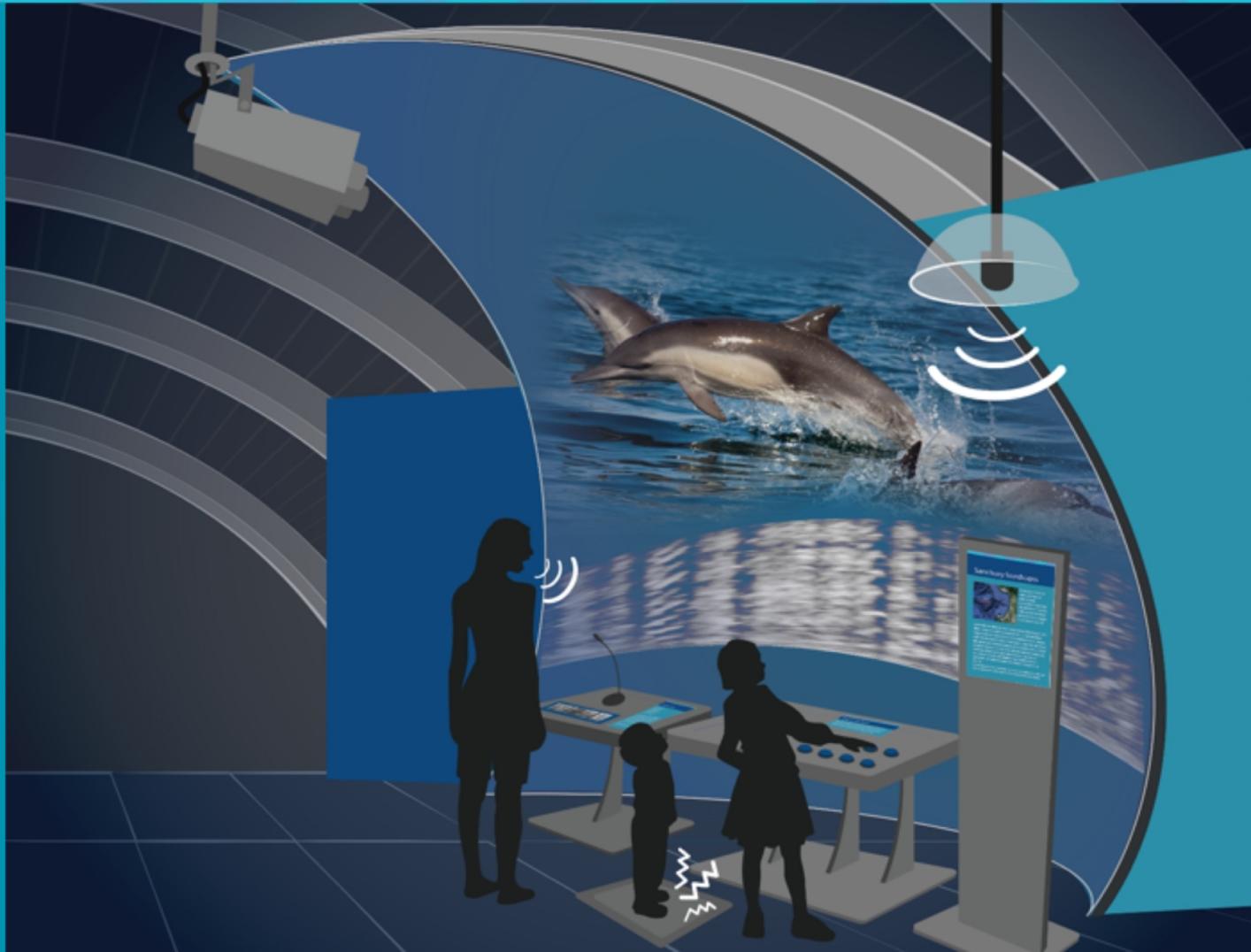
## MB03 - Sur Ridge

- 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/>

## National:

Leila Hatch, Stellwagen Bank NMS (NOAA), [leila.hatch@noaa.gov](mailto:leila.hatch@noaa.gov)

Danielle Kitchen, OPNAV N45 (Navy), [danielle.kitchen@navy.mil](mailto:danielle.kitchen@navy.mil)

## Regional:

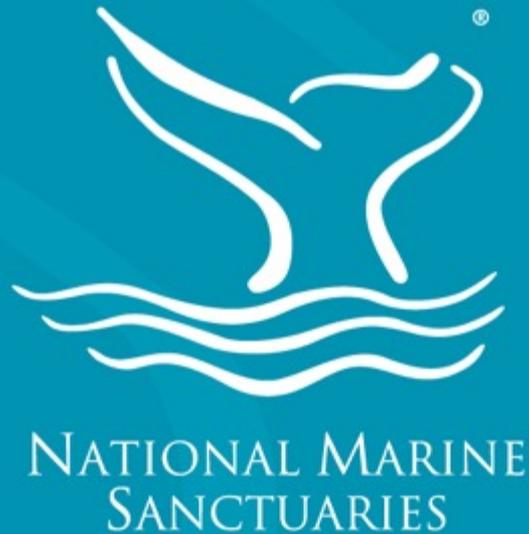
John Joseph, Naval Postgraduate School, [jejoseph@nps.edu](mailto:jejoseph@nps.edu)

Lindsey Peavey Reeves, CINMS, [lindsey.peavey@noaa.gov](mailto:lindsey.peavey@noaa.gov)

## Local:

Andrew DeVogelaere, MBNMS, [andrew.devogelaere@noaa.gov](mailto:andrew.devogelaere@noaa.gov)

National Marine Sanctuaries  
National Oceanic and Atmospheric Administration



<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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Non-acoustic data integration (statistics, modeling)

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