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

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?

- 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
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

- 891 meters deep
  - Cabled hydrophone

- 119 meters deep
  - 134 days data

- 70 meters deep
  - 144 days data

- 845 meters deep
  - To be retrieved next month

Map showing MBNMS stations with depth and data duration.
Three Types of Hydrophones

- SoundTrap Mooring
- HARP Mooring
- MBARI Hydrophone
Hydrophone Location Determines What Can Be Heard
Hydrophone Location Determines What Can Be Heard
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
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?
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
Danielle Kitchen, OPNAV N45 (Navy), danielle.kitchen@navy.mil

Regional:
John Joseph, Naval Postgraduate School, jejoseph@nps.edu
Lindsey Peavey Reeves, CINMS, lindsey.peavey@noaa.gov

Local:
Andrew DeVogelaere, MBNMS, andrew.devogelaere@noaa.gov
https://sanctuaries.noaa.gov/science/monitoring/sound/
Co-leads: ONMS and Navy (OPNAV N45)
Support: Navy Living Marine Resources, NOAA Fisheries

Expert Solicitation: Soundscape Metrics Workshop Participants

Legal: NOAA and Navy Interagency Agreement, Settlement Oversight

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

Communications & External Affairs: NOAA and Navy

East Coast Regional Lead: Woods Hole Oceanographic
- Acoustic Data Collection, Analysis & Archiving
- Non-acoustic data integration (statistics, modeling)
- Data Visualization, Exploration
- Other Data Collection: Gliders, Telemetry
- ONMS Site Staff (Research, Permitting, Operations, Admin, Communications)
- Navy Atlantic Fleet Staff

West Coast Regional Lead: Naval Postgraduate School
- Acoustic Data Collection, Analysis & Archiving
- Non-acoustic data integration (statistics, modeling)
- Other Data Collection: Gliders, Telemetry
- Data Visualization, Exploration
- ONMS Site Staff (Research, Permitting, Operations, Admin, Communications)
- Navy Pacific Fleet Staff

Hawaiian Islands Regional Lead: HIHWNMS
- Acoustic Data Collection, Analysis & Archiving
- Other data collection: Gliders, Cetabuoy
- Site Staff (Research, Permitting, Operations, Admin, Communications)
- Navy Pacific Fleet Staff

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