Listening to “See” Beneath the Waves: Soundscape monitoring in the Channel Islands National Marine Sanctuary
National Marine Sanctuaries

• Raising public awareness and understanding through education and outreach.
• Improving management through research (e.g., historical, conservation science, social science).
• Helping coastal economies by promoting and protecting healthy resources.
• Facilitating public use compatible with primary objective of resource protection.
National Marine Sanctuary System

Scale varies in this perspective. Adapted from National Geographic Maps.
Channel Islands National Marine Sanctuary

- Designated: Sept. 1980
- Encircles 5 Islands & 2 offshore rocks
- Seaward Boundary: ~ 7 miles offshore (6nm)
- Shoreward Boundary: Mean High Water
- Area: ~ 1,470 square statute miles
- First network of marine reserves on west coast
Soundscape Monitoring

What is a Soundscape?
Soundscape Monitoring

- Anthropogenic
- Geophysical
- Biological
Soundscape Monitoring

Natural Noises
Storms and earthquakes are intense sources. But the animals themselves add to the din—often cod, which grunt a lot in the spawning season.

THE COST OF NOISE
A right whale calling to another faces the twin challenges—intensity and frequency—that noise poses to many marine animals.

INJURY
Intense noises, such as air gun blasts that ricochet off the seafloor, drown out animal sounds and may cause hearing loss and other damage.

INTERFERENCE
Sounds close in frequency interfere, canceling each other. A ship’s propeller miles away can mask a right whale’s call.

Intensity The higher the decibel level, the more likely a sound is to harm animals. A few sources are shown here.

Frequency The lower the sound frequency in hertz (Hz), the longer the wavelength. Whale call frequencies overlap the ranges of many other sources.

0 Hz 10 100 1,000 10,000 100,000
ULTRA LOW LOW MIDDLE HIGH

National Geographic 2011
CINMS: Human Uses and Underwater Sound
CINMS:
Human Uses and Underwater Sound
NOAA Noise Reference Stations

Haver et al. 2018
NOAA Noise Reference Stations

Haver et al. 2018
CINMS Shallow Water Soundscapes
CINMS Shallow Water Soundscapes
Discovery of Sound in the Sea
CINMS Shallow Water Soundscapes
NMFS Technical Guidance
CINMS Shallow Water Soundscapes
CINMS Shallow Water Soundscapes
Soundscape Monitoring: CINMS
Education Resources

- Discovery of Sounds in the Sea: https://dosits.org/
- Cetaceans & Sound Mapping: https://cetsound.noaa.gov/index
- ONMS website: https://sanctuaries.noaa.gov/science/sentinel-site-program/noise.html
- Recent NPR story: https://www.wabe.org/reef-georgias-coast-racket/
- Cabled hydrophone in Monterey Bay National Marine Sanctuary: https://www.mbari.org/hydrophone-stream-release/
- CINMS Soundscape: https://nature-other.ambient-mixer.com/channel-islands-nms-soundscape