

Ask an Expert: Understanding Ocean Noise in California

Briefing Handout

The Ocean is a Noisy Place: Natural Soundscapes

Natural sources of noise in the ocean are mostly from animal activity, weather conditions, or geological processes (e.g. earthquakes). Marine animals hear and produce sounds across a spectrum of frequencies for many purposes, such as mating, navigation, or finding food¹. Long-term listening studies, or passive acoustic monitoring, and other research into natural soundscapes can provide valuable insights into ecosystem change and species dynamics to better inform the management of coastal and ocean environments.

How Sound Works In the Water

- Travel: The distance and speed that sound travels depends on the medium. For example, sound travels further and faster in seawater compared to air. Sound can reflect off the seafloor, animals, and other marine objects².
- Amplitude: The intensity of a sound is measured in decibels (dB).
- Frequency: Sound pitch is measured in hertz (Hz), e.g. a whistle is high pitch and a bass is low pitch^{2,} (see Fig. 1).



Figure 1: Sound sources by Navy-NOAA's <u>SanctSound project</u>. Yellow bar highlights the range of human hearing in the air.

Potential Environmental Impacts of Human Noise

Human-generated noise can have a range of impacts on marine species, from no effect, to temporary behavioral change (e.g. moving away from more stressful habitats) to physical injury due to harmful increases or changes in sound energy, duration, or pitch. Pinpointing direct links between human-generated noise and specific species can be challenging due to difficulties in isolating the impact of sounds on particular species or individuals¹.

For example, research shows:

- Fish: Some fish larvae rely on sound to identify their habitat⁴ and utilize sound as an indicator for a suitable environment⁵. Fish produce sound during spawning season as part of a chorus⁶. Increases in noise pollution can mask cues that fish rely on to identify optimal habitats and acoustically obscure fish choruses⁷.
- Marine Mammals: Marine mammals rely on sound to navigate, communicate, and forage. Direct and indirect increases in noise pollution can affect marine mammals such as whales, dolphins, or porpoises by masking communication, increasing stress hormone levels, and altering behavior, depending on the noise source and intensity^{8,9}.

Direct & Intentional

- Vessel traffic: commercial shipping, recreational boats, other water activity
- Infrastructure: bridges, development
- Military testing: submarine surveys, antiwarfare surveillance

Indirect & Unintentional

- **Surveys**: seismic, industry e.g. oil & gas, offshore wind
- Fisheries: species detection or predator deterrents e.g. seal bombs
- Ship Hulls: ultrasonic antifouling for vessels

Relevant Programs in California

- The <u>Sanctuary Soundscape Monitoring Project</u> (SanctSound) monitors marine species and habitats in National Marine Sanctuaries via passive acoustic monitoring.
- Various voluntary vessel speed reduction (VSR) programs seek to reduce vessel strikes on whales along with air emissions and noise pollution from commercial shipping.

Protecting Blue Whales and Blue Skies NOAA voluntary speed reduction Port of Los Angeles



More Information:

Discovery of Sound in the Sea Navy Ocean Acoustics NOAA Ocean Noise Strategy National Marine Sanctuary Sound Monitoring

Figure 2: The marine soundscape and sources: orange are human-generated; green are natural sources; blue are natural from animals.

Source: <u>NOAA Fisheries Ocean Noise and</u> Soundscape Projects.

References: ¹Duarte et al. 2021; ²Hildebrand 2009; ³Miksis-Olds et al. 2018; ⁴Radford et al. 2010; ⁵Kim et al. 2023; ⁶Pagniello et al. 2019; ⁷Weilgart et al. 2018; ⁸Cox et al. 2023; ⁹Erbe et al 2019;