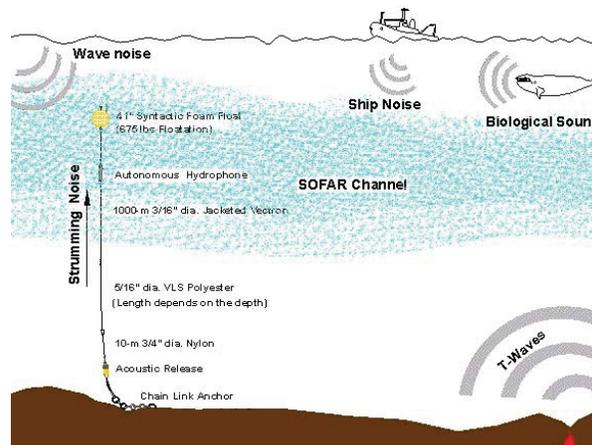




SONAR AND MARINE MAMMALS

SOUND is a dominant feature of the marine environment and the primary tool for conveying information over extended space underwater.

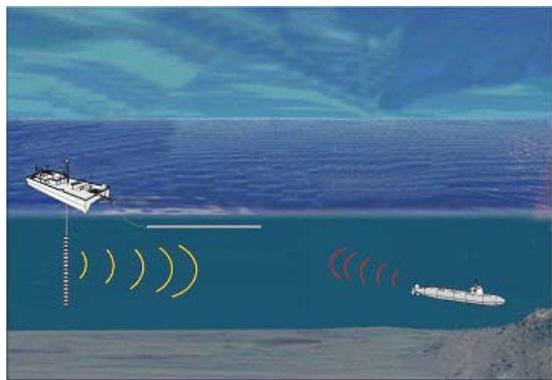
- Most, if not all, **marine animals** rely to some extent on sound for a wide range of biological functions, including: communication, navigation, foraging, and predator detection.
- Natural physical processes** produce sounds that can travel great distances underwater and dominate local ambient noise in certain frequency bands.
- Human activities** can also introduce sound into the marine environment, either incidental to industrial activities or intentionally in the context of navigation or remote sensing (e.g., active sonar).



NOAA's Ocean Explorer Program uses Sound Fixing and Ranging (SOFAR) technology to collect ocean sound data.

ACTIVE SONAR is the transmission of sound energy for the purpose of sensing the environment by interpreting features of received signals. People have developed sophisticated ways of using sound to probe the marine environment, including:

- High-frequency**, bottom-mapping multi-beam sonar systems that provide high-resolution images of bottom features
- Mid-frequency** tactical military sonars to detect submarines and other underwater objects
- Low-frequency** systems to detect large objects with lower resolution over large ranges



An active sonar transmitter below a surface ship sends out pulses of sound that bounce off a submarine underwater and are detected as returning echoes.

(U.S. Department of the Navy)

Animals have developed similarly sophisticated systems as a means of sensing their environments and locating submerged objects. Dolphins and porpoises have a biosonar system—called **“echolocation”**—in which high frequency sounds are produced and the echoes interpreted in foraging and other important functions.

The **extent to which human sonar systems may affect marine life** depends critically on the systems in question, the environments in which they are operated, and animals exposed to them.

In certain conditions, it appears likely, if not certain, that mid-frequency military sonars have played some role in marine mammal strandings. These further appear to be more likely to involve deep-diving marine mammal species in areas of complex, steep bottom bathymetry. However, there are many more unknowns than information regarding the certainty of these effects, and whether they are necessarily limited to these conditions.

NOAA and a number of partners in other agencies and academia are striving to understand these issues more fully and to identify the most effective way to mitigate effects of operations while balancing important national security needs.

