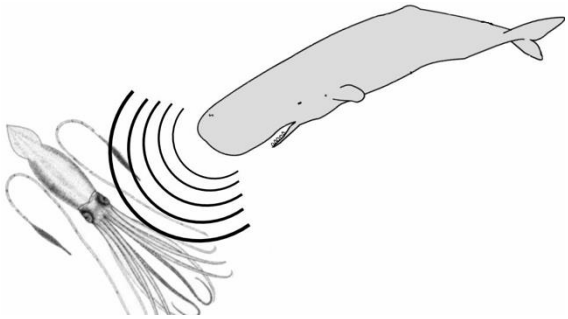
MYSTIC SEAPORT THE MUSEUM OF AMERICA AND THE SEA TM

**Mystic Seaport for Educators**
**Science on the 38th Voyage of the *Charles W. Morgan***
**Lesson 2 of 6: Eavesdropping on Echolocation**
**Student Reading**

## Sound and Marine Mammals

"Sound" is a vibration that is created from a specific source and then spreads as a physical wave of pressure. The medium, or environment, through which the sound waves travel affects how the sound is perceived. For example, we hear noises very differently underwater than we would in air. To the human ear the ocean may seem muted, quiet, or even silent. In fact, this environment is a very noisy place - our ears are simply not adjusted to this type of sound.

Unlike humans, many animals possess the tools that allow them to rely on sound to monitor their surroundings. Whales use a type of biological sonar known as echolocation, producing sound and listening for the echoes to locate objects in the water (*image:* [Public domain], via Wikimedia Commons). This system allows them to find food, safely travel along unfamiliar coastlines, and migrate between breeding and feeding grounds. As highly social organisms, sound is also crucial to whale communication. This communication varies from species to species. Minke whales use clicks and grunts. Humpbacks produce long, complex songs.



Whale songs and other underwater noises travel thousands of miles through a horizontal layer in the ocean known as the SOFAR channel. SOFAR stands for "Sound Fixing and Ranging." The channel forms where the right combination of temperature and water pressure allow sound to travel the fastest and farthest.

After listening to whales and other organisms use sound in the ocean, scientists have started to focus on studying underwater noise. Whale sounds can be recorded using an instrument known as a hydrophone, a passive underwater listening device that converts sound into electricity. In addition, scientists are also beginning to examine how human noise affects the underwater environment.

## Anthropogenic Sound

Humans are often inspired to mimic the "tools" possessed by different organisms in nature. For example, we use sonar as a method for identifying underwater objects, which closely resembles the echolocation used by whales. Scientists have recently discovered, however, that the number of ships using sonar is increasing. This "noise pollution" may not only impede echolocation sound waves that travel through the water, but can also damage hearing or cause negative behavioral changes.

For whales, this means that man-made noise may affect their ability to detect prey, safely navigate along their migration routes, or even scare them into harmful situations. Studies have

found that whales will evacuate areas where there is too much noise, occasionally rising too quickly to adjust to the pressure change at the surface and damaging their blood flow. This action can result in death. Furthermore, because we understand so little about their methods of communication, any form of noise pollution may have consequences on their social behavior that we cannot yet predict.

**Key Words:**

**Sonar:** SONAR stands for “Sound Navigation and Ranging.” This technique uses sound to detect objects under water, similar to whale echolocation.

**Anthropogenic:** Man-made.

**Noise Pollution:** This occurs when too much noise, usually caused by humans, is released into an environment, which causes negative effects on that environment.