

8 Sounds at Sea: Think Like a SONAR Operator

Marine Month
IN CANADA

How do you identify something you can't see? Beneath the ocean's surface, visibility is often limited. Instead of relying on sight, Royal Canadian Navy SONAR operators listen carefully to sounds travelling through the water. From humpback whales to cargo ships, every sound contains clues that help them understand what's happening beneath the waves.

In this activity, students will use their listening skills to identify a variety of natural and human-made underwater sounds before trying a simplified version of a real SONAR operator task.

Sound Recordings:



Humpback Whale



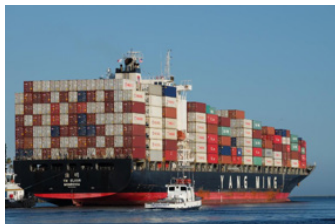
Atlantic Spotted Dolphin



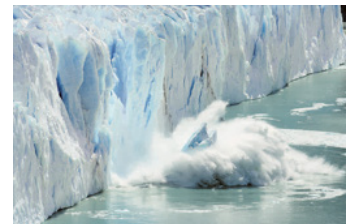
Snapping Shrimp



Buoy Bell



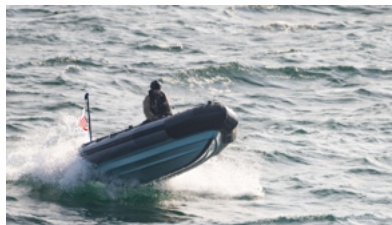
Large Merchant Ship



Iceberg



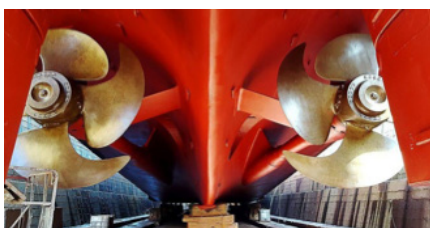
Fishing Vessel



Speedboat



Bearded Seal



Singing Screw



Ice

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Instructions:

Begin by asking: *"If you were underwater and couldn't see anything around you, what clues could help you figure out what was nearby?"*

Explain that sound travels nearly four times faster through water than through air. Because of this, many marine animals, as well as people working at sea, use sound to learn about their surroundings.

Play each recording one at a time. After each recording, allow students to:

- describe what they heard
- decide whether it is natural or human-made
- predict the sound source
- explain what clues led them to that answer

After discussion, reveal the answer before moving to the next sound.

Wrap-up: Ask students which sounds were the easiest, or most difficult, to identify and why. Explain that SONAR operators learn to recognize these unique sound "signatures" to help identify marine life, nearby vessels, navigation aids, and changing ocean conditions, allowing them to build a picture of the underwater environment even when they can't see it.

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Extension Activity: Shaft Rotation Challenge

Play the Large Merchant Ship recording again.

Students identify the sound pattern and count the number of complete propeller rotations in 10 seconds.

Multiply the count by six.

This estimates the ship's Shaft Rotations Per Minute (SRPM).

Answer: 130 SRPM

Discuss:

Why might a SONAR operator want to know how fast a ship's propeller is turning?

What information could this provide?

A ship's propeller rotates at different speeds depending on how fast the vessel is travelling. By estimating the SRPM, SONAR operators can gather valuable information about a vessel's movement and behaviour. Combined with other sound characteristics, this helps them identify, classify, and monitor vessels using sound alone.



Shaft of a large cargo ship

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Appendix – Sound Gallery



Humpback whales make some of the most unique and haunting sounds in the animal world, and different species sound very different. Overall, whale sounds are deep, echoing, and often musical. They make very deep, vibrating tones, and long, drawn-out calls that can travel hundreds of kilometers underwater. These can feel more like vibrations than sounds if you're nearby.



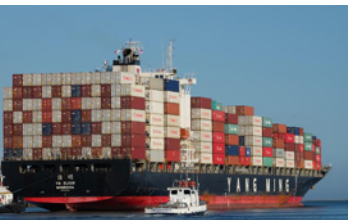
An Atlantic spotted dolphin has a lively, fast, and "chatty" sound compared to whales. Their vocalizations are more energetic and higher pitched. Very rapid, sharp clicks used to "see" underwater, often in bursts that speed up when they're focused. At high speed, it becomes almost a buzz or crackle.



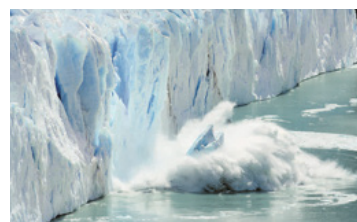
Snapping shrimp (also known as pistol shrimp) create a very distinct noise when heard in large groups underwater. Oftentimes thousands of these shrimp will snap their claws at the same time which creates a sound almost like frying oil or pop rocks. Many times this can tune out other sounds operators are trying to hear.



A buoy bell, the kind attached to a navigation buoy at sea, has a very distinct, simple, and rhythmic sound driven by waves. As the buoy rocks, an internal clapper hits the bell. In rough water, it rings more often; in calm water, it can be slow and occasional.



A large merchant ship (like a container ship, tanker, or bulk carrier) has a surprisingly distinct and powerful "soundscape." It's not just one noise, it's a combination of deep mechanical sounds, water movement, and occasional signals. The dominant sound is a slow, heavy "thrum-thrum-thrum" from the diesel engine. It's very low-pitched, almost like a distant drumbeat or a giant heartbeat. You can sometimes feel it in your chest if you're nearby or on board.



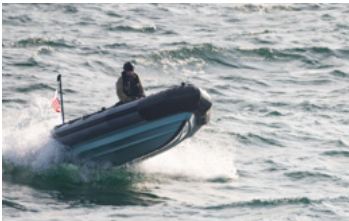
Icebergs also have a rich, dramatic range of sounds from delicate crackling to deep, thunder-like booms. Most of this happens underwater, even if you're standing nearby above the surface. A constant fizzing crackle like a giant soda, and sudden sharp pings zipping through the water. The deep distant booms that roll past you, makes the whole environment feel alive and shifting.

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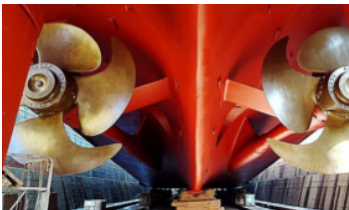
A fishing vessel has a more “busy” and varied sound than a big merchant ship. It’s still mechanical, but closer, rougher, and often noisier in short bursts. You can often hear the chains of the nets moving with the ship. The engine on these vessels is smaller than merchant ships which creates a higher pitched sound that’s more chugging and uneven.



A speedboat sounds energetic, loud, and high-powered, very different from the deeper, slower sounds of larger ships. It is a mix of engine roar and wind rushing and water slapping the hull. The sound fades quickly into the distance but is loud up close. Similar to snapping shrimp, the sound of a speedboat can deafen sensors especially at close range.



A bearded seal has one of the most unusual and surprisingly “musical” voices in the Arctic. Male bearded seals are known for producing complex, haunting songs, especially during breeding season. People often compare it to a wave rising and falling. These noises start as a low tone, then rise into a vibrating trill that can last over a minute, repeating in patterns, almost like a performance.



A “singing screw”, or singing propeller, is a very distinctive sound made by a ship’s propeller when it vibrates. It’s not a fault in the sense of grinding or faulty equipment, it’s more like the propeller producing a tone, almost like a musical instrument which only plays at certain speeds. As the propeller spins faster, the sound becomes higher pitched, similar to an electric motor, a distant turbine or even a scifi spaceship sound.



Ice produces some of the most strange, delicate, and sometimes dramatic sounds in the ocean. It can sound quiet and beautiful or loud and crackling depending on what the ice is doing. Ice often sounds very clear and crisp because sound travels faster and farther in water. Often described as alien or scifilike, ice makes a mix of tiny, delicate pings and deep, slow groans mixed with quiet moments broken by sudden, sharp noises.