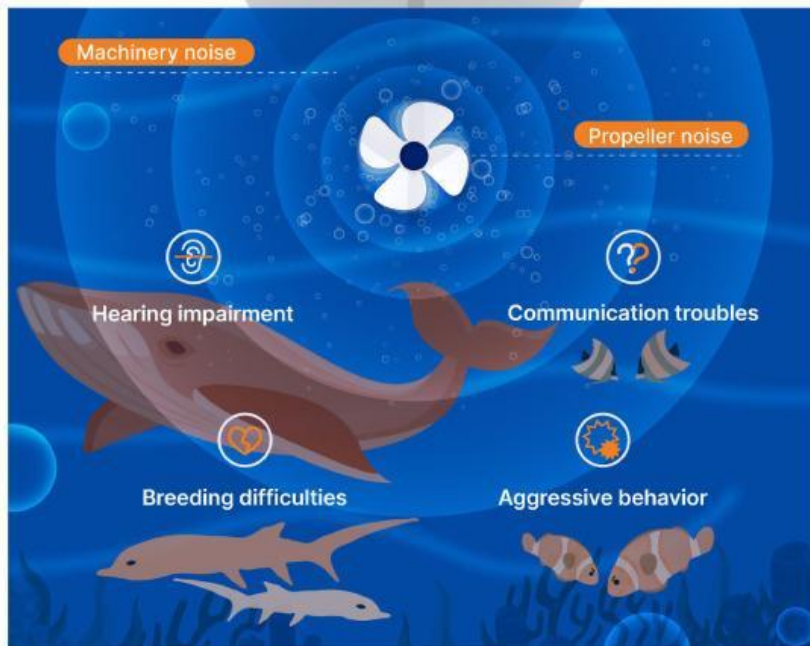


Sources and impacts of underwater radiated noise



What is ocean noise pollution?

Marine animals evolved over millions of years in an underwater soundscape that included waves, rain, fish sounds, and the songs of cetaceans, such as whales and dolphins. But now, they have to endure increasing levels of noise from human activities. According to a 2021 article in Science, **the growing shipping industry is a major culprit**. Over the preceding 50 years, low-frequency noise along major shipping routes **increased more than 30-fold**.

Ships generate a variety of noises, and there are two main types. The first type of noise is generated by machinery including ship engines, generators, and other equipment. The second is propeller noise, generated by the rotation of the propellers as they produce power to push the ship through the water. The URN caused by ships is primarily the result of cavitation — the formation and collapse of bubbles on the ship's propeller — that creates an incredibly loud noise when the propellers rotate at high speed. A cargo vessel can emit up to **190 decibels of noise**, which is louder than a jet engine at takeoff or a rocket launching from its pad. Given that noise travels faster in water than in air, the noise from a ship can impact a large expanse of the sea.

Why is ocean noise pollution a problem?

Marine life is affected by ocean noise pollution in many ways.

It impedes communication

Many animals, including [dolphins](#), [whales](#), and fish, use vocalisations to communicate. When consistent unnatural noise masks these calls, it becomes harder for the animals to hear and find each other, coordinate hunts, and detect and warn others about predators.

It disorients animals

Ocean noise is especially problematic for animals that rely on echolocation, like dolphins and toothed whales. Excessive noise can disrupt these signals, causing the animal to become disoriented and unable to hunt successfully.

It can cause injury

As well as disturbing essential life activities, noise can also indirectly cause injury. Military sonar and seismic air guns are high intensity and excessively loud, and can send animals into a panic. To get away from the noise, they might ascend too quickly, leading to decompression sickness and skin damage from gas bubble lesions. In some cases, loud sounds can cause hearing loss or even cause animals to strand and die.

It impacts the entire marine ecosystem

As ecosystems in the ocean are so complex and interconnected, the direct effects of noise pollution on one species will indirectly affect another. For instance, if a whale strands on a beach in response to sudden, intense noise from a human activity, the whale dies on land instead of at sea, and its body doesn't sink to the sea floor as it normally would. The seafloor-dwelling animals that rely on the whale's body for food and sustenance then lose a key food source.

What animals are most impacted by ocean noise?

All marine life is impacted by ocean noise to some extent, but marine mammals like whales and dolphins are particularly affected. Underwater noise pollution can change their behaviour in multiple ways. It can drive them out of important feeding or breeding grounds or force them to alter their migration routes. This may put them at risk of getting trapped in sea ice or encountering predators.

Ocean noise also affects communication. In some areas, dolphins and whales have changed their calls in an attempt to be heard over noise pollution. These new vocalisations make it harder for members of the same species to recognise each other and find mates. It also makes it more difficult to communicate that predators or prey are nearby.

Dolphins, who rely on echolocation to hunt and navigate, can also get separated from their pods due to ocean noise. This results in the displacement or fragmentation of dolphin populations, making it harder for these [marine mammals](#) to hunt and reproduce successfully.

Unfortunately, loud ocean noise like naval anti-warfare sonar can also directly injure whales and dolphins. If the animals panic and try to escape the sonar noise too quickly, they can become stranded or suffer from decompression sickness by surfacing too quickly. Haemorrhaging to the heart and brain can also occur within **four hours** of being exposed to this kind of sonar.

Fish, squid, crustaceans, and **sea turtles** are affected by ocean noise pollution, too. It can trigger stress responses in fish, disturb nesting habits, affect coordination and navigation, and damage their hearing. Seismic surveys—used to map offshore oil and natural gas fields by blasting the seas with powerful airguns at 10-second intervals and measuring the echoes off the seafloor—are known to severely damage the internal organs of giant squid, for example. This process can also kill zooplankton within a radius of **1.2 kilometres** of each shot. The response of sea turtles to ocean noise pollution has not been extensively studied, but we know that airgun surveys have caused temporary hearing damage in these animals.

Words	Meanings
1. culprit	a. confusion about direction or location
2. cavitation	b. injury caused by pressure changes
3. echolocation	c. the main person or thing responsible for a problem
4. disorientation	d. using sound waves to locate objects

5. decompression sickness e. formation and collapse of bubbles in water

True / False

Write **T** (True) or **F** (False).

1. Marine animals evolved in a naturally noisy underwater environment.
2. Shipping noise has increased more than 30 times over the last 50 years.
3. Propeller noise is quieter than machinery noise.
4. Noise travels slower in water than in air.
5. Dolphins use vocalisations to communicate.
6. Ocean noise can make animals unable to hunt effectively.
7. Military sonar may indirectly injure marine animals.
8. Whale carcasses on the seafloor help support marine ecosystems.
9. Noise pollution only affects whales and dolphins.
10. Seismic surveys can damage giant squid's internal organs.

Multiple Choice Questions

1. According to the passage, the shipping industry is:
 - A. a minor source of ocean noise
 - B. the biggest cause of ocean pollution
 - C. a major cause of underwater noise
 - D. responsible for whale extinction
2. What mainly causes underwater radiated noise (URN) from ships?
 - A. Rainfall
 - B. Cavitation on propellers

- C. Whale songs
- D. Fish communication
- 3. A cargo vessel can emit noise that is:
 - A. softer than human speech
 - B. equal to rainfall
 - C. louder than a jet engine at takeoff
 - D. impossible to hear underwater
- 4. Why is ocean noise dangerous for dolphins?
 - A. It changes the ocean temperature
 - B. It disrupts echolocation
 - C. It reduces oxygen levels
 - D. It attracts predators directly
- 5. Which activity can cause decompression sickness in marine animals?
 - A. Slow swimming
 - B. Sudden escape from loud sonar
 - C. Nesting on beaches
 - D. Seasonal migration
- 6. Why are ecosystems affected by whale strandings?
 - A. Sharks lose their habitat
 - B. Beaches become polluted
 - C. Seafloor animals lose a food source
 - D. Fish stop reproducing
- 7. Dolphins may struggle to find mates because:
 - A. they migrate too often
 - B. their new calls are difficult to recognise
 - C. they stop communicating entirely
 - D. predators interrupt them
- 8. Which animals are mentioned as being affected by seismic surveys?
 - A. Polar bears
 - B. Giant squid

- C. Penguins
- D. Coral reefs

Gap Fill

Complete the sentences using words from the passage.

1. Ships create underwater noise through engines, generators, and _____.
2. Dolphins and toothed whales rely on _____ to hunt and navigate.
3. Loud sonar may cause animals to become _____ and panic.
4. Noise pollution can interrupt animals' ability to _____ with each other.
5. Some whales change their _____ in order to be heard over human noise.
6. Sea turtles may experience temporary _____ damage from airgun surveys.
7. Zooplankton can be killed within a _____ of 1.2 kilometres from seismic shots.
8. Marine mammals may alter their migration _____ because of ocean noise.

Short Answer Questions

1. What are the two main types of ship noise mentioned in the passage?
2. Why does ocean noise make hunting more difficult for dolphins?
3. How can loud sonar indirectly lead to the death of whales?
4. Why is the death of a whale on land harmful to seafloor ecosystems?
5. Name two marine animals besides whales and dolphins that are affected by ocean noise pollution.

Discussion Questions

1. Do you think governments should limit shipping noise? Why or why not?

2. Which effect of ocean noise pollution do you think is the most serious?
3. What solutions could reduce underwater noise pollution?
4. Should military sonar use be more strictly controlled? Explain your opinion.