Underwater Noise

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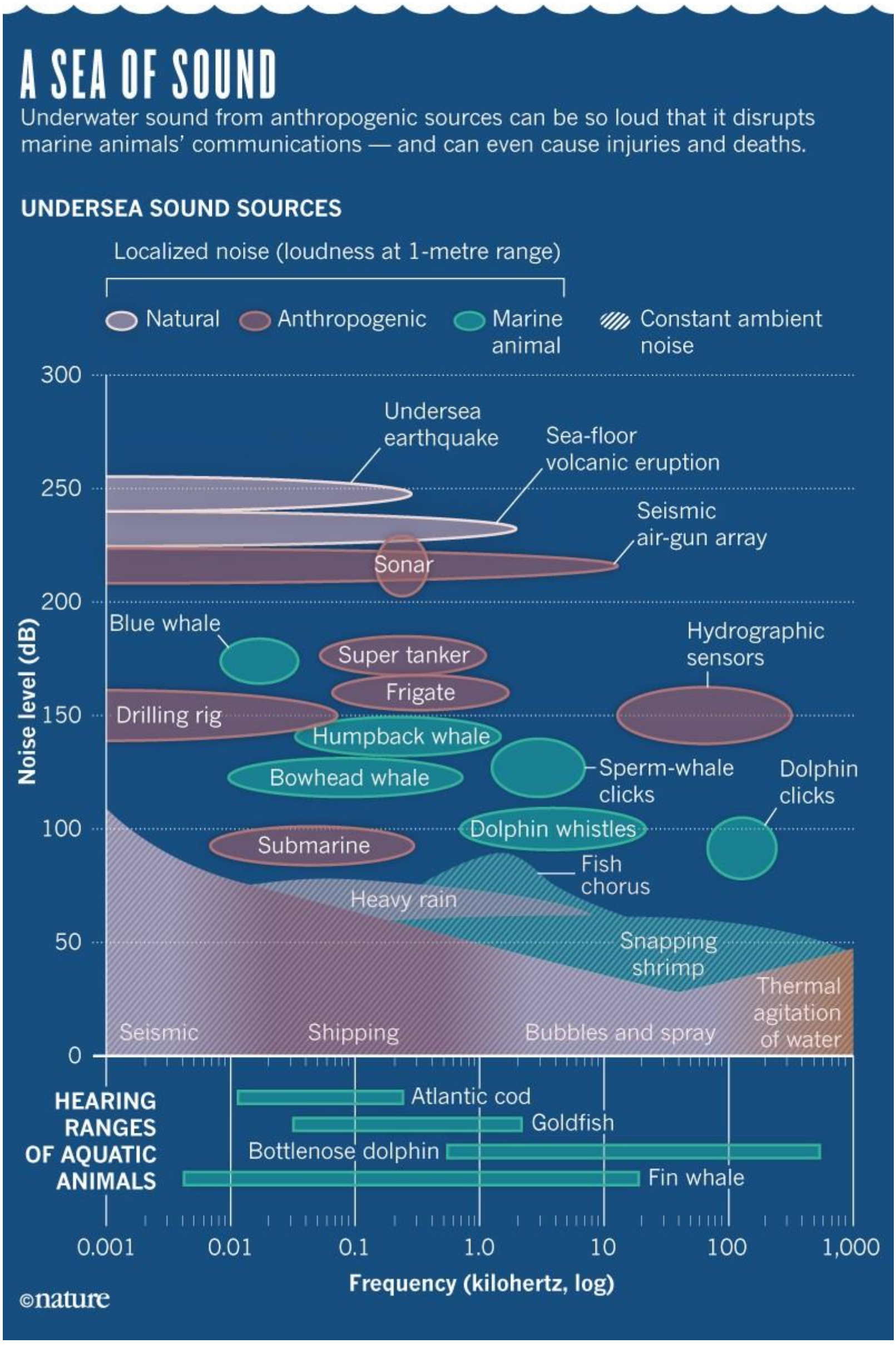

The graphic above sourced from Nature.com

Tenants and Construction Activities

The graphic above compares the noise level and frequency of human activities, natural events, and marine mammals. As shown, human activities create some of the loudest noise in the ocean. It is crucial that the underwater noise emitted by construction activities and operations is monitored in order to mitigate the negative impacts on marine life. Underwater noise factor needs to be considered during the planning, design, and construction phases of projects as an environmental concern and potential issue.

Impacts of Underwater Noise on Marine Animals

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Ship Owners

Studies have found that ships traveling at 13 knots produced cumulative Sound Exposure Levels three times lower than those traveling at 20 knots. ***Shipowners can significantly reduce their impact on marine animals caused by underwater noise by lowering their speed to 13 Knots or lower***. This would result in a noise reduction of 2.5 dB, equivalent to a 44% reduction in acoustic intensity or a 16% reduction in perceived loudness. The table below shows how loudness affects species in this area. (Source)

	Threshold	Peak (dB)	RMS (dB)	SEL (dB)
Fish	Behavioral	-	150	-
	Physiological (>2g)	206	-	187
	Physiological (<2g)	206	-	183
Sea turtle	Behavioral	-	175	-
	Physiological (Temporary)	226	-	189
	Physiological (Temporary)	232	-	204
Cetacean	Behavioral - Impulsive	-	160	-
	Physiological - Impulsive (Temporary)	196-226	-	140-188
	Physiological - Impulsive (Permanent)	202-232	-	155-203
	Behavioral - Non-Impulsive	-	120	-
	Physiological - Non-Impulsive (Temporary)	-	-	153-199
	Physiological - Non-Impulsive (Permanent)	-	-	173-219

Impacts of Frequency on Marine Mammals

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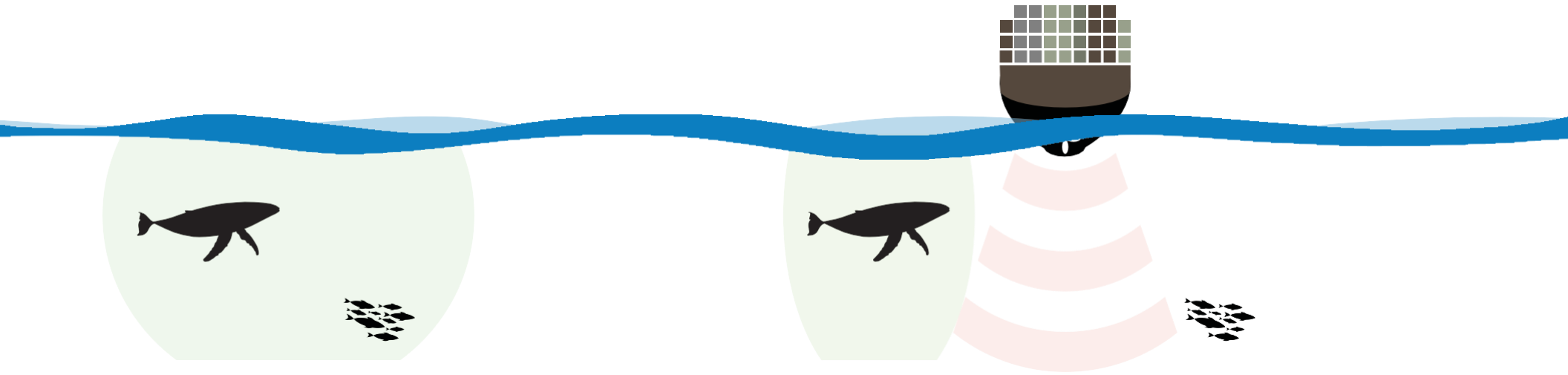
Sound travels more than 4 times faster in the water than in the air.

Acoustical Factors

Maritime commerce activities that create underwater noise include marine construction (pile driving, underwater drilling, etc.) and vessel noise. These activities can impact marine mammals. The presence of ships can be difficult to detect, even with the noise they create. ***Because one of the main sources of noise on a ship comes from the propeller, which is located at the rear of the vessel***, which can be difficult to notice if the animal is at the front of the ship. ***The hull acts as a physical barrier that prevents the noise from reaching the front of the ship,*** where the danger of collision is the greatest. Also, marine mammals that are regularly exposed to ship noise and have not had any negative encounters may learn to tolerate the noise and stop trying to avoid the vessels. Both problems can be compounded in areas with a high density of marine traffic where the marine mammals might be commonly receiving noise from several sources and directions.

Acoustic Masking

The phenomenon of acoustic masking is described as the presence of an external noise that keeps an animal from noticing another sound. In such cases, the loud noise masks the sound of interest to the animals (such as social communication calls from another individual), which causes partial or total loss of information. ***Acoustic masking makes it difficult for marine animals to hear one another, impacting their ability to communicate about food, danger, and other important topics like finding a mate***, which further exacerbates the challenges faced by marine mammal species at risk.



A whale's listening space under natural ambient sound conditions. Oncoming vessels, prey, and other whales inside this space can be heard by the whale.

A whale's listening space is reduced by vessel noise , which can inhibit the acoustic detection of oncoming vessels, prey, and other whales. Masking of sounds by ambient noise, hearing impairment due to long-term exposure, and the whale's position with respect to the propeller (the main source of ship noise) all make it more difficult for whales to detect ships. The extent to which masking occurs depends on the vessel (including its sound frequencies, speed, size, weight, and fouling) and the marine mammal (including its age, sex, and species-specific behavior).

Information and graphics sourced from A Mariner's Guide to Whales in the Northwest Atlantic

What You Can Do

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Be Aware

- Utilize resources like subscribing to Whale Alert, using WhaleMap, the TURT APP, and Manatee Alert APP to communicate marine animal sightings
- Promote marine animal and underwater noise educational resources, best management practices, and training programs within your organization.

Stay Vigilant

- ***Keep watch for marine animals near the path of the vessel***. Spotting marine animals at a greater distance allots time to make educated decisions, reducing the risk of strike.

Reduce Speed

- Reduce speed to ***13 knots or less***, when safe and practicable in areas where there is a high probability of marine animal habitat, or if a marine animal is spotted on the route.
- ***Do not assume that marine mammals will move out of the way.***
- Benefits of reducing ship speed: reduce noise levels, air emissions, and the risk of vessel strikes.

Report Sightings & Incidents

DOWNLOAD
WHALE ALERT APP

DOWNLOAD THE
MANATEE ALERT APP

DOWNLOAD THE
TURT APP

Vessel Maintenance

- Review the International Maritime Organization's guidelines for vessel noise reduction to learn how vessel maintenance and monitoring can contribute to a quieter vessel.

Design for Quieter Waters

- Design ships that create less noise is the most efficient and inexpensive way to address underwater noise impacts. Incorporating new technologies on ships can also lead to energy efficiency and other environmental benefits.
- ***Some noise mitigating technologies can be installed (e.g. articulated paddle wheels, ducted propellers, and cavitation indication technology).***
- Review the International Maritime Organization's guidelines for vessel noise reduction to learn more about how design and mitigation can contribute to a quieter vessel.
- Consider certifying vessels through a classification society or certification body