

How Narwhals Work

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[Arctic Animals Image Gallery](#) A narwhal surfaces for breath in the Canadian Arctic. See more [pictures of arctic animals](#).
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You might associate unicorns with the doodles on sixth-grade girls' notebooks, but the next time you hear tales of the majestic horned beast, you should look to icy ocean waters and think of a very special creature: the narwhal.

The mythical unicorn belongs to the land of Never Was, but the people of long ago didn't simply believe in the beast on faith. Historians think that the [Vikings](#) brought narwhal tusks back from their sea journeys. Traders peddled the tusk as a unicorn horn, believed to be an antidote to poison, and the wealthy fell for the ploy. Of course, no one had ever seen a unicorn. But it was mentioned in the Bible, so it would be heretical to say it didn't exist. And at one time, there was a belief that land animals had marine counterparts, so even if a tusked whale were found, it wouldn't disprove the existence of the unicorn. The unicorn of the sea has borne the mantle of misconception for quite some time now. Jules Verne bespoke the dangers of the narwhal in "20,000 Leagues Under the Sea," describing how the animal slaughtered [whales](#) with its "ivory sword" and even attacked boats. For centuries, stories have circulated about great jousting battles male narwhals engage in, with only dubious proof to back up these accounts. We know so little about the depths of the ocean, and even less about its more unusual creatures -- the extremophiles that dwell by hydrothermal vents on the ocean floor, the sea serpents sighted by sailors of old, the giants that might lurk in its waters. So what is this strange creature?

For starters, it's a cold-water dwelling, deep-diving, vocalizing, halibut-munching wonder with its very own ivory crown. It's also one of the toothed whales, or **odontoceti**, which includes dolphins and sperm whales. Odontocetes aren't the giants of the deep -- that honor goes to baleen whales, such as the blue whale. Toothed whales have the signature teeth, one blowhole and a fatty organ called a **melon** packed into their foreheads, which is used in **echolocation** (which we'll talk about later). Narwhals and white whales belong to the **Monodontidae** group of odontocetes, which means that the narwhal's head is very flat and its neck is very flexible.

Meet the Narwhal



A pod of male narwhals gather at the Arctic ice edge to eat cod in Lancaster Sound.

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If you wanted to find our unicorn of the sea, your best bet might be to start in the Arctic Ocean off Canada, perhaps in Baffin or Hudson Bay. If you struck out there, you could venture to Greenland or Svalbard. Narwhals navigate **polynyas**, which are pools of open water in otherwise iced-over environments. They're the arctic equivalent of an oasis. That's not the only reason polynyas are interesting -- they're biodiverse marine environments, rich in organisms like phytoplankton and **copepods** (little [crustaceans](#)) that serve as feeding grounds for birds, [walruses](#) and [whales](#).

You could spot the male whale (and a few female whales) by its long, spiral tusk, but what else could you look for? Besides "unicorn of the sea," the narwhal is known by another name: **corpse whale**. An adult narwhal has a mottled dark gray or black and white color, and some morbid observer must have decided that the patchy discoloration resembled **livor mortis**, what happens to a body after death when blood settles underneath the skin. If you see a little gray narwhal with no white patches, that's a baby, whereas a completely white narwhal is probably an old whale.



From top to bottom: humpback whale, killer whale, Pacific white-sided dolphin, beluga, narwhal and Ganges River dolphin.

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Still not sure it's a narwhal? Don't look for a dorsal fin, because it only has a dorsal ridge, which makes it easier to swim under ice. Narwhals travel in groups -- usually 20 or 30 at a time, although during [migration](#), you might see thousands of them together. A female narwhal weighs in at around 2,200 pounds (998 kg), with males at 3,500 pounds (1,588 kg). An adult female will be about 13 feet (400 cm) long, a male about 15 feet (457 cm).

Your tip-off that's it a narwhal and not a beluga? The tusk, which is usually covered in algae. The scientific name for the narwhal is ***Monodon monoceros***, but it's completely wrong. It means "one tooth, one horn," but the narwhal actually has zero horns and two teeth -- that tusk is a tooth that's simply grown upwards and pierced the lip. (We'll talk more about this truly amazing tooth in another section.)

If you wanted to take your new pal out to lunch, HowStuffWorks recommends the [fish](#) you can find in cold waters -- cod, salmon, herring and halibut. Narwhals also like a good shrimp or [squid](#) feast. But if you're trying to make a reservation, you're out of luck -- no one is sure just how many narwhals there are. In parts of Baffin Bay, where narwhals are most populous, the number has

been recorded at 34,000 [source: [Culik](#)]. And you won't be able to tell if the narwhals really enjoyed your company -- like dolphins, they have permasmiles.

We're still in the getting-to-know-you phase with narwhals. How old do they get? One study on narwhal eyes put the oldest subject at 115 years [source: [Garde et al.](#)]. Is that unusual? We don't know. Why do they have that tusk? We're not positive, but we have some ideas. Why do they dive so deeply? Let's take a look at narwhal behavior.

Narwhal Behavior



Whales of a tusk swim together.
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- Narwhals, like other toothed [whales](#), have big brains in relation to their body size. In fact, the size of an odontocete's brain is second only to yours [source: [National Science Foundation](#)].
- Toothed whales such as the narwhal display humanlike behavior we associate only with [apes](#), like recognizing themselves in the mirror and understanding abstract ideas [source: [National Science Foundation](#)]. The narwhal is one smart cookie.
- Interestingly, the first big jump in whale brain size seems to have happened when cetaceans first started using **echolocation**, the ability to locate objects with sound. The narwhal swims through deep waters in search of its prey, and as you might imagine, it's a bit murky down there. [Bats](#), who hunt at night, use echolocation to find their prey, too.
- First, the whale has to produce a sound. Toothed whales don't have anything exactly like our vocal cords, although they have similar structures.
- It's thought that they produce their sounds in their nasal passages [source: [Hebridean Whale and Dolphin Trust](#)].
- The **melon**, the fatty structure we mentioned before, then focuses these sounds into a beam before sending them out. The sound waves then travel until they hit something, at which point the echoes bounce back to the whale. The whale receives these echoes either in the lower jaw or directly in the skull, depending on the frequency of the sound [source: [Hebridean Whale and Dolphin Trust](#)].
- Each species has a different range of frequencies, depending on what they need echolocation for -
- low-frequency sounds go farther, while high-frequency sounds are suited to short distances. From the echoes, the whales can determine where their food is, among other things.



How low can you go? A mile, actually.

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Odontocetes don't make whale songs -- you've probably heard a dolphin's clicks and whistles before. Narwhals whistle and produce a combined pulsed/tonal sound [source: [ScienceDaily](#)].

Researchers think the narwhals use echolocation to communicate as well as hunt.

The diving patterns of narwhals aren't completely understood. They're recognized as one of the deepest-diving cetaceans, descending more than a mile (1.6 km) into the ocean, but a mile isn't the norm.

- A study recorded one narwhal making regular deep dives, with long breaks at the surface, while the other subject made lots of shallow dives with less time at the surface [source: [Laidre](#)].
- The same study, conducted in Tremblay Sound and Creswell Bay, reported a dive pattern: a steep descent with a short stop at the bottom, then a slower ascent to the surface [source: [Laidre](#)].
- But diving behavior depends on what time of year it is and therefore the whale's location due to [migration](#) -- during the winter in a place like Baffin Bay, the narwhals dive deeper and longer in search of polar [cod](#) and other fish that don't like to hang out near the surface. In the summer when narwhals migrate to a more hospitable climate, it's not necessary to go so deep.

And now let's look at the narwhal's distinguishing feature: its tusk.

The Narwhal Tusk

Closer look at the narwhal tusk
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The narwhal's tusk isn't unique at first glance. Elephants, rhinos and [walruses](#) all have these long, protruding teeth.

But this one is different from any other tooth you've ever seen. Contemplate your own teeth for a second. We usually only think about them when there's something wrong - a chip, a cavity, discoloration. But teeth themselves are incredibly durable, able to survive [fire](#) and outlast the rest of your body after



teeth themselves are incredibly durable, able to survive [fire](#) and outlast the rest of your body after

death. Teeth are hard, which makes them useful for their main purpose in humans: chewing [food](#). On the outside of the tooth, there's **enamel**, with hard materials called **dentin** and **cementum** below that. At the very center of the tooth is the **pulp**, where the blood and nerves are. (You might realize you have a cavity once the pulp is infected and hurts.) The hard outer layers protect the sensitive inner layers of the tooth.

- A narwhal tusk is the exact opposite. The soft, sensitive part is on the outside, while the dense, hard part makes up the middle. Ten million tiny holes lie right on the surface on the tusk. Human teeth have these little tubules too, which is why sometimes the cold bothers your teeth, but they're covered with enamel. Imagine having all your nerves exposed in the icy waters of the Arctic. Why would the most sensitive part of a tooth be on the outside?



That doesn't look like a toothy duel.

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Dr. Martin Nweeia, a clinical instructor at the Harvard School of Dental Medicine, has one theory: The narwhal tusk acts like a sensor. Having all those nerves on the outside allows the whale to detect water pressure, temperature and salinity. It might even be able to detect barometric pressure when it's above the water's surface. However, if the tusk is so important to survival, why don't females have one? We don't know.

This sensitive quality does seem to cancel out some of the ruling theories about the tusk, such as the idea that male narwhals use them to duel, although some scientists still argue that the tusk is a way of establishing dominance. With nerves on the outside, it would seem such a battle would be painful for the whale. Narwhals do touch tusks, but observers have reported that it's not in a violent way. Researchers aren't sure why but suggest that perhaps it's a way of communicating. In the past, people also suggested that the tusk was used for breaking through ice or spearing prey, but no such evidence exists.

One theory still holds, which is that the tusk has something to do with mating, perhaps acting as a flashy sex characteristic. Almost all male narwhals have a tusk, but only about

15 percent of female narwhals do. There's still so much we don't know, and the narwhal isn't the easiest animal to study.

The narwhal tooth is the only straight tusk in the world -- all other known tusks are curved. It's also one of the only spiral teeth. The left tooth comes up through the jaw and corkscrews through the lip. Occasionally, someone spots a double-tusked narwhal, which happens when the whale's right tooth grows into a tusk too. But disdaining nature's liking for symmetry, this second tusk doesn't mirror the first - it spirals in the exact same way as the other one, to the left. The tusk is flexible, able to bend about a foot in any direction without breaking. The tusk can grow up to 9 feet (2.7 meters) or more, which is amazing when you consider that the male is only about 15 feet (4.6 m) long at maturity.

Threats to Narwhals



Sealer Aron Aqqaluk Kristiansen from the settlement Kangersuatsiaq in Greenland poses with the head of a rare, double-tusked narwhal. NIKOLAJ SVENDSEN/AFP/[GETTY IMAGES](#)

Now that we've become acquainted with this arctic [whale](#), you might be sad to know that, like many animals, it's under threat. Let's take a look at the culprits. Inuit hunters are allowed to hunt a certain number of narwhals a year, in

accordance with their traditions and culture. Some modern hunters use the traditional harpoon, but many hunters in the younger generations carry rifles. Often, hunters shoot a narwhal only to have it sink dead to the ocean floor or escape wounded. Some countries have rules against the import and sale of items like narwhal ivory, but many more nations are happy to encourage the trade. Inuit hunters can make a pretty penny off a narwhal tusk -- in August 2007, about \$125 per foot [source: [Nicklen](#)]. Double tusks go for even more, sometimes several thousands of dollars. In an area where there aren't many jobs, this money is important.

But the narwhal isn't important just because of its tusk. Inuits dine on the top layer of skin and blubber, called **muktuk** or **maktaaq**, for [vitamin C](#), a scarce commodity in those parts. Eating the marine mammals has become dangerous for the Inuit peoples, however -- levels of PCBs and mercury in animals around the ice cap have been found to be very high [source: [Cone](#)].

Inuits aren't the only hunters, of course -- [orcas](#) are more than happy to snap up a narwhal or two, and [polar bears](#) and [walruses](#) wouldn't mind a taste, either.

Another factor worrying scientists who study the whale is climate change. Because narwhals are so wedded to their pack ice environment, changes in sea ice have a huge impact on their [migration](#) patterns and survival. If the ice is too thick, narwhals can get trapped under it. And if they can't surface, the whales can't breathe. If the ice is too thin, predators may find it easier to hunt them, and the narwhals' fishy prey might move elsewhere. One scientist labeled the narwhal "the marine mammal least likely to survive melting ice floes" [source: [NPR](#)].

We don't even know how many narwhals there are in the world. Aerial surveys can only tell us so much. Not knowing how many narwhals there are makes it harder to figure out how many we have left and how many are disappearing. Environmentalists decry hunting quotas imposed by the government as too high. Even with the numbers we do have, the number of narwhals that are killed only to sink don't factor in. And by the time we figure out whether or not climate change is killing them, it might be too late to do anything but watch.

Lots More Information

- "Arctic Marine Mammals on Thin Ice." ScienceDaily. April 26, 2008. <http://www.sciencedaily.com/releases/2008/04/080423154558.htm>
- Bobeckho, Liann and Steve Stockton. "Mystery of the Narwhal Tusk." Alternatives Journal. 2006. Vol. 32, Issue 1. page 4.
- Bruemmer, Fred. "Northern Oases: Polynyas, Where Arctic Waters Teem with Wildlife." Canadian Geographic. Jan./Feb. 1994.
- "Communication and Echolocation." SeaWorld. <http://www.seaworld.org/infobooks/Bottlenose/echodol.html>
- Cone, Marla. "Dozens of Words for Snow, None for Pollution." Mother Jones. Jan./Feb. 2005, Vol. 30, No.1, pp. 60-67. http://www.motherjones.com/news/feature/2005/01/12_402.html
- Culik, Boris. "Monodon monoceros (Linnaeus, 1756)." Whales & Dolphins. Convention on Migratory Species. http://www.cms.int/reports/small_cetaceans/data/M_monoceros/m_monoceros.htm
- Eilperin, Juliet. "Scientists Enlist Nature's Divers to Sample Icy Sea." The Washington Post. April 16, 2007.
- Ferdinand, Pamela. "A Flexible, 9-Ft. Whale Tooth With Super-Sensing Power?" National Geographic. Dec. 13, 2005. http://news.nationalgeographic.com/news/2005/12/1213_051213_narwhal_tooth.html
- Garde, Eva et al. "Age-specific Growth and Remarkable Longevity in Narwhals (*Monodon monoceros*) from West Greenland as Estimated by Aspartic Acid Racemization." Abstract. Journal of Mammalogy. February 2007. Volume 88, Issue 1.
- Geddes, Linda. "What's the point of the narwhal's tusk?" New Scientist. Dec. 24, 2005-Jan. 6, 2006. Vol. 188 Issue 2531/2532. page 6.
- Grady, Wayne. "A Natural History of an Arctic Eden." Equinox. Feb./March 1999, pp 68-75.
- Holing, Dwight. "The Sound and the Fury: Debate Gets Louder over Noise Pollution and Marine Mammals." The Amicus Journal. Fall 1994, pp. 18-23.
- "Humans and Dolphins: If Brain Size Is a Measure, We're Not That Different." National Science Foundation. NSF News. Oct. 27, 2004.
- Jefferson, Thomas A. et al. "FAO Species Identification Guide: Marine Mammals of the World." United Nations Environment Programme. Food and Agriculture Organization of the United Nations. 1993. <ftp://ftp.fao.org/docrep/fao/009/t0725e/t0725e10.pdf>
- Johnson, Genevieve. "Seeing with Sound -- Echolocation." Log Transcript. The Voyage of the Odyssey. PBS. http://www.pbs.org/odyssey/odyssey/20011207_log_transcript.html
- Jozefowicz, Chris. "Sensitive Tooth." Current Science. Nov. 3, 2006. Vol. 92, Issue 5, page 4.
- Laidre, Kristin L. et al. "Diving behaviour of narwhals (*Monodon monoceros*) at two coastal localities in the Canadian High Arctic." http://www2.dmu.dk/1_Om_DMU/2_Afdelinger/3_AM/4_Expertise/5_Research/6_marine_mammals/Litterature_pdf/narhval.pdf
- Milius, Susan. "That's One Weird Tooth." Science News. March 25, 2006. Vol. 169, Issue 12. p. 186.
- "Narwhals May Produce Signature Vocalizations for Communications." ScienceDaily. Oct. 2, 2006. <http://www.sciencedaily.com/releases/2006/09/060929094049.htm>
- "Narwhals Aid Climate Change Study." Associated Press. Discovery. Discovery News. April 20, 2007. http://dsc.discovery.com/news/2007/04/20/narwhal_ani.html?category=animals&guid=20070420174530&dcitc=w19-506-ak-0001
- Narwhal Tusk Discoveries Web site. <http://www.narwhal.org/index.html>
- Nicklen, Paul. "Arctic Ivory: Hunting the Narwhal." National Geographic. August 2007. Vol. 212, Issue 2.
- Nielsen, John. "Scientists Plumbs Purpose of Narwhal's Horn." NPR. Dec. 13, 2005. <http://www.npr.org/templates/story/story.php?storyId=5050264>
- Nielsen, John. "Warming Waters Threaten 'Unicorns of the Sea.' NPR. May 11, 2008. <http://www.npr.org/templates/story/story.php?storyId=90359659>
- "Odontocetes -- Toothed Cetaceans." The Hebridean Whale and Dolphin Trust. (July 31, 2008) http://www.whaledolphintrust.co.uk/whales_dolphins/odontocetes-toothed-cetaceans.asp
- O'Meara, Stephen James. "A Tooth with a Twist." Odyssey. November 2007. Vol. 16, Issue 8. p. 49.
- Pfeiff, Margo. "Narwhal hunters." Canadian Geographic. Sept./Oct. 2006. Vol. 126, Issue 5.
- Stewart, D. Bruce. "Assessment and Update Status Report on the Narwhal *Monodon monoceros* in Canada." Committee of the Status of Endangered Wildlife in Canada. Canadian Wildlife Service. 2004. <http://dsp-psd.pwgsc.gc.ca/Collection/CW69-14-420-2005E.pdf>
- "The Review of Significant Trade in the Narwhal (*Monodon monoceros*): A briefing by WDCCS for the 20th meeting of CITES Animals Committee." CITES. <http://www.cites.org/common/com/ac/20/E20-inf-09.pdf>
<https://animals.howstuffworks.com/mammals/narwhal.htm>