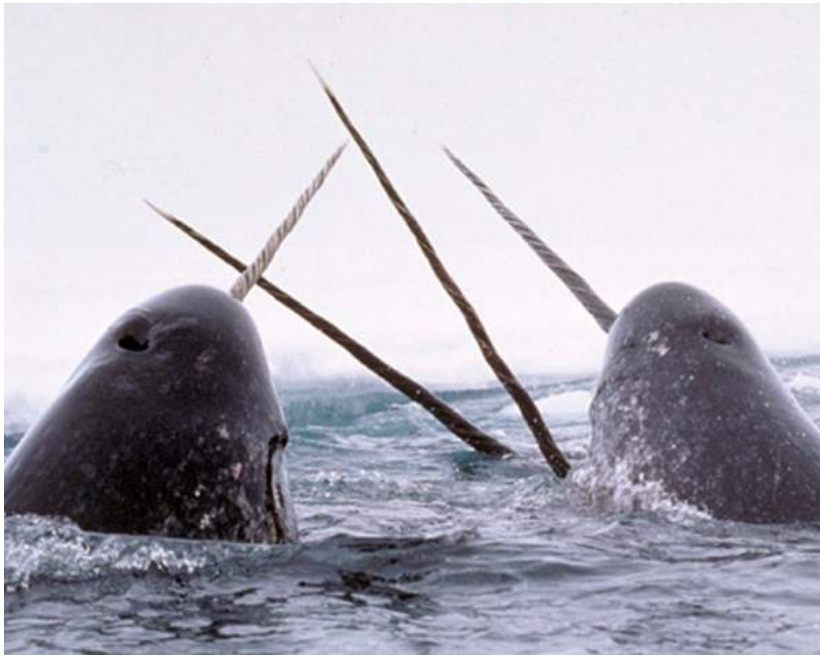
# Narwhals recruited as climate monitors in deep Arctic waters



Scientists seek to monitor climate trends everywhere on Earth, but hostile environments and inaccessible locations challenge them. In the Arctic, they enlisted mammals that thrive in conditions that would kill a human. In the winter, the deep waters of Baffin Bay, between Greenland and Canada, are cold, dark, and practically impossible to monitor under the extensive polar ice pack. For some 70,000 marine mammals collectively known as narwhals (scientific name *Monodon monoceros* – "one-toothed unicorn"), these waters are the perfect hunting ground. Related to porpoises but larger, narwhals repeatedly dive to the bottom of Baffin Bay to feed on halibut, a bottom-dwelling fish, and return to the surface to breathe. When pack ice covers the sea in the six months of winter, narwhals dive from 10 to 25 times per day, as deep as 1800 meters below the ice. Narwhals are best known for their single long, straight tusk, which is actually a tooth that grows through the lip.

Why do scientists care what goes on deep down? Water from Baffin Bay flows south into the Labrador Sea, one of only three regions in the Northern Hemisphere where cold ocean water sinks from the surface more than halfway to the bottom – stirring the ocean like boiling water in a tea pot does – except that in Arctic seas, cold water drives the circulation downward, unlike hot water that rises up in a tea pot. These three regions play a key role in forcing the circulation of the entire global Ocean, a circulation sometimes described as an ocean "conveyor belt," and formally known as the *meridional overturning circulation*. Oceanographers use the term "ventilation" to describe the sinking cold water. The process is key to understanding the ocean's overall circulation and its "climate."

Although Baffin Bay and the Davis Strait are critically important to the circulation of the Atlantic Ocean, oceanographers have collected most of their data in summer and fall when the region is free of ice. To get data in the winter, K. Laidre and colleagues at the Polar Science Center of the University of Washington, and M. Heide-Jorgensen of the Greenland Institute of Natural Resources, recruited 14 narwhals to take the observations for them. *"Recruit"* may not be the best word to use here, as the narwhals were given no choice in their assignment. The mammals were caught and held in large nets between two boats while sensors were clipped to their dorsal fins.

The whales brought back the first wintertime observations of the temperature of Baffin Bay water, not only at the surface but all the way to the bottom. Temperatures ranged from 0.4°C to 1.5°C higher than the climatological values estimated more than a decade earlier, so Baffin Bay has warmed at all depths in those years. This is significant for three reasons. If the water flowing from Baffin Bay to the Labrador Sea is warmer than it has been, it may make the "ventilation" of the ocean more difficult in the all-important sinking zone. Secondly, warmer surface water favors further melting of the Arctic ice pack, already in decline over the past decade; and finally, warmer water may change the marine ecosystem at all depths, including the cold-loving, bottom-feeding halibut, the main prey of narwhals.

The authors conclude that whales present a unique opportunity to sample regions at low cost in locations where traditional measurements are otherwise impossible.

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CITATION:

"Narwhals document continued warming of southern Baffin Bay" by K. L. Laidre, M. P. Heide-Jørgensen, W. Ermold, and M. Steele. *Journal Of Geophysical Research*, Vol. 115, C10049, doi:10.1029/2009JC005820, 23 Oct. 2010.