

Melting sea ice is stressing out narwhals

By [Elizabeth Pennisi](#) Dec. 7, 2017 , 2:00 PM

1 The narwhal is among the more introverted of marine mammals. It lives in polar regions where life is quiet. But the species is in for a rude awakening. As climate change causes sea ice to shrink—and new waters open to human exploration—this single-tusked cetacean will likely be exposed to new noises and new threats. Now, a study suggests they might handle the stress poorly: They experience possibly one of the most physiologically extreme fright responses ever discovered.

2 Worldwide, there are an estimated 175,000 narwhals; yet because these whales are concentrated in northern waters between Greenland, Canada, and Russia, few people have ever seen them, save Canada's Inuit. That includes scientists, who still know relatively little about the so-called unicorn of the sea. Now that human interlopers are growing in number—a recent survey showed that ship traffic in a key summering area for narwhals near Canada **jumped almost 300% from 2015 to 2016**—researchers aren't sure how narwhals will react.

3 Mads Peter Heide-Jørgensen, a marine biologist from the Greenland Institute of Natural Resources in Nuuk, wondered what happens when narwhals get stressed. Some researchers have taken blood samples from temporarily captured narwhals, but Heide-Jørgensen wanted more than just a snapshot of stress responses. He reached out to Terrie Williams, an ecophysiologicalist from the University of California, Santa Cruz, who had developed a way to measure the heart rate of diving dolphins. In 2014, she traveled to Greenland to meet Heide-Jørgensen. She was so uncertain her technology would work on the whales that she packed 20 kinds of the suction cups used to attach heart-monitoring electrodes, hoping that one would do the trick. But the first attempt to attach them succeeded. "There were high-fives all around," Williams says.

4 The instruments also recorded depth and acceleration, which reveals how fast the whales beat their fins. Over the several days that the devices stayed on, the researchers discovered that the five narwhals, like other diving marine mammals, lower their heart rate as they swim down—the slower beat extends their oxygen supply. They can also increase that rate if they're swimming

quickly. Overall, the slowdown is gradual and bottoms out at about 10 beats per minute.

5 The data also revealed something quite puzzling. For sometimes more than an hour after their tagging and release, narwhals—which fled the scene—**also immediately lowered their heart rates** to as few as three beats per minute, Williams, Heide-Jørgensen, and their colleagues report today in *Science*. “That doesn’t make any sense,” because its muscles need a lot more oxygen to get away fast, says Greg Breed, an ecologist at the University of Alaska in Fairbanks.

6 Williams thinks the animal’s heart is getting two conflicting signals at once: the usual “slow down for diving” one and one that says, “Speed up, I need oxygen,” from the muscles. The former seems to win out, putting the narwhal at risk. In lab rats, a low heart rate and a sudden fright and flight reaction can lead to cardiac arrest. And some researchers think an inappropriate drop in heart rate may explain why the heart stops in some people when they are frightened, sometimes killing them.

7 It’s not known whether chronic stress will harm the narwhals, but researchers are concerned. “The results are disturbing because they suggest narwhals aren’t physiologically equipped to sustain, in good health, repeated exposure to stressful events,” says Randall Reeves, a marine mammal expert in Hudson, Canada, who chairs the International Union for Conservation of Nature Species Survival Commission’s Cetacean Specialist Group. “It makes me worry that narwhals are even more specialized than was previously thought, and that they are thus less resilient to rapid environmental change.”

8 “The findings reinforce the need for a cautious approach to develop in the arctic,” says Melanie Lancaster, a conservation biologist with the World Wildlife Fund’s Arctic Programme in Ottawa.

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