

Bowhead whales' migration patterns have shifted in the Arctic

March 21 2023, by Alena Naiden



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With ice declining, bowhead whales of the Pacific Arctic are staying longer in the waters up north. A change in migration patterns could affect the bowheads' health and safety, as well as hunters' access to the

subsistence resource.

Two Oregon State University marine mammal researchers, Angela Szesciorka and Kate Stafford, analyzed 11 years' worth of recordings of whale songs and looked at sea ice information for a study supported by the National Science Foundation Office of Polar Programs and published in the journal *Movement Ecology* in early February. Researchers saw that fluctuations in the sea ice direct changes in [bowhead whales](#)' seasonal migrations.

"When there is less ice in the Bering Sea in late fall, bowheads are more likely to winter north of Bering Strait," Szesciorka said. "When there is more ice in the Bering Sea—and the Chukchi Sea—they are more likely to winter south of Bering Strait."

Now the researchers are wondering whether the ice decline leads to more risks in the bowheads' habitat, such as ship strikes or fishing gear entanglement, Szesciorka said. Access to whaling in some subsistence communities might also change.

"This change is happening very quickly, and it is unclear what the potential impacts might be as the Arctic continues to warm," Szesciorka said. "If the entire population no longer enters the Bering Sea—and there's no evidence of that—then bowheads will no longer be accessible by St. Lawrence Island hunters. But again, they have still been getting whales annually so hopefully, that will continue."

Changing migration

The Bering-Chukchi-Beaufort bowhead population, the largest in the world, appears to be healthy and is growing, nearing 17,000 animals.

In the fall, the whales traditionally travel south, following the new ice in

the Bering Strait, Szesciorka said. New ice is easier to travel and breathe through, compared to thick perennial ice up in the Arctic, she explained. When Bering Strait ice melts in spring, whales usually make their way back north, passing Utqiagvik, Point Hope and other whaling communities in the Arctic and giving whalers a second chance to harvest subsistence food.

The conditions in the Arctic are rapidly changing: The sea ice has decreased about 13% per decade since 1979, covering Arctic waters later and later in fall and building a thinner layer, according to the study. The Bering Strait stays open in winter months more often, the researchers said.

To see how declining ice affects bowheads' behavior, Szesciorka and Stafford looked at the bowheads' songs and calls recorded between 2009 and 2021 in the Chukchi Sea, near the entrance of the Bering Strait, Stafford said.

Each year, passive acoustic monitoring devices—hydrophones—were anchored to the [ocean floor](#), and using a large research vessel, researchers would retrieve them from the ocean and download a year's worth of data. By looking at spectrograms, or visualizations of sounds over time, researchers documented when they heard bowheads passing north and south, Szesciorka said.

In winter and spring, bowhead whales sing songs that can last for hours—perhaps males calling females to mate, according to the study. During the summer and fall, whales also produce simple, low-frequency sounds, unrelated to songs, that likely help animals communicate during their migrations.

Up to 2013, the recordings showed that all bowheads had passed south through Bering Strait in late fall and did not move back north until

March, Szesciorka said. After about 2013, the time period with no bowheads north of Bering Strait in the winter got shorter and shorter.

"In 2018 in particular, we heard bowheads almost 24 hours a day north of Bering Strait throughout the winter," she said. "This pattern has continued to the present day."

Indigenous knowledge suggests that less ice and more open water have shifted the timing of the spring migration by about a month. The hunters on St. Lawrence Island are taking bowheads more often now in the late fall and early winter than in spring, but they've still seen much success hunting the whales.

"To live and thrive in the Arctic for millennia, people have had—and continue—to be incredibly adaptable and innovative in solving problems posed by an always-challenging environment, including now climate change," Stafford said.

The safety of ice

When bowheads travel, they move slowly. Under the layer of ice, predators can't reach them, and the frozen cover helps keep conditions still and quiet, making it easier for the whales to hear one another.

"When there are no winds and the ice is heavy and still, the Arctic can have very low noise levels, so less background noise, which means they can be heard further away," Stafford said. "Think of humans in a city with lots of noise and trucks and cars versus being out on the tundra. There's less noise to compete with, so you can be heard further away—and therefore communicate more clearly."

Killer whales, the only predators of bowhead whales besides humans, usually avoid heavy ice that can injure their dorsal fins. They're now

moving farther north into the ice-free Arctic, staying longer and sometimes posing a threat to bowheads. A 2020 study found that 18 bowhead whales were killed by killer whales between 2009 and 2018.

"We are starting to see evidence of killer whale predation on bowhead whales for the first time," Stafford said.

If ice continues to diminish, researchers are wondering how increased ship traffic—for example, along the Northern Sea Route, Northwest Passage and Transpolar Routes—would affect bowheads.

In waters that are traditionally not covered by ice and have higher ship traffic, "ships can be extremely harmful to whales ... slow-moving animals that spend a lot of time at the surface," Szesciorka said. North Atlantic right whales, "cousins" to the bowheads, "are being driven to extinction by ship strikes and fishing entanglements," she said.

"With increases in shipping, especially in the winter in the Bering Strait region, it is increasingly likely that bowheads will be struck by ships," Szesciorka said.

Overwintering up north might actually help the whales: If the animals stay under the ice north of Bering Strait, it would reduce the risk of predation from [killer whales](#) and move them north of shipping lanes in the winter, Szesciorka said.

"Bowheads are ice whales, and while they are in the ice, they should be safer from non-human predators. And, in principle, ships should have to slow down when they move through the ice so ship traffic might be less of an issue in ice," Szesciorka said. "But if there is something critical to their survival—like a food source—in the Northern Bering that they no longer have access to, that could be a problem. Right now, we just don't know."

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Citation: Bowhead whales' migration patterns have shifted in the Arctic (2023, March 21)
retrieved 26 June 2024 from <https://phys.org/news/2023-03-bowhead-whales-migration-patterns-shifted.html>

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