

Halliday WD, Pine MK, Citta JJ, Harwood L, Hauser DDW, Hilliard RC, Lea EV, Loseto LL, Quakenbush L, Insley SJ (in press) Potential exposure of beluga and bowhead whales to underwater noise from ship traffic in the Beaufort and Chukchi Seas. *Ocean and Coastal Management*.

What is the research about?

- Ship traffic is increasing throughout the Arctic and underwater noise from these ships will likely impact marine life, such as beluga and bowhead whales.
- How often whales are exposed to ships and ship noise is currently unknown in the Beaufort and Chukchi Seas, yet is important information for understanding and managing potential impacts.

What we did:

- We used satellite tag data to estimate the monthly distribution of bowhead and beluga whales between July and October in the Beaufort and Chukchi Seas.
- We modeled how underwater noise spreads through the ocean around ship tracks throughout the region, and estimated the number of noise exposure events that would happen in each month between 2015 and 2017. We then overlaid these noise exposure data with the beluga and bowhead distribution data to estimate potential noise exposure to both species in each month.

What we found:

- Belugas and bowheads were distributed in the Inuvialuit Settlement Region (eastern Beaufort Sea and Amundsen Gulf) in July, August, and September, and would potentially be exposed to relatively low ship noise in July, with a maximum of 2-3 ships transiting this region during July. However, noise exposure would increase more during August, and even more in September, as more ships transit the region in those months.
- As bowheads and belugas migrate west into Alaskan and Russian waters, particularly in the western Beaufort Sea near Utqiagvik and into the Chukchi Sea in September and October, both species would potentially be exposed to much higher levels of ship noise. More ships travel along the Alaskan and Russian coastlines from Bering Strait, and this leads to the highest levels of potential noise exposure events in the region.

Our recommendations:

- Further research is needed on the impact of noise on belugas and bowheads when they are actually exposed to noise, including developing noise threshold guidelines. Research is also needed on how often individual whales are exposed to ship noise.
- Management measures can focus on limiting ship noise in important areas for these species. The Notice to Mariners in the Inuvialuit Settlement Region is a good example of how to limit underwater noise exposure to these species.

Why is this research relevant to the Inuvialuit people?

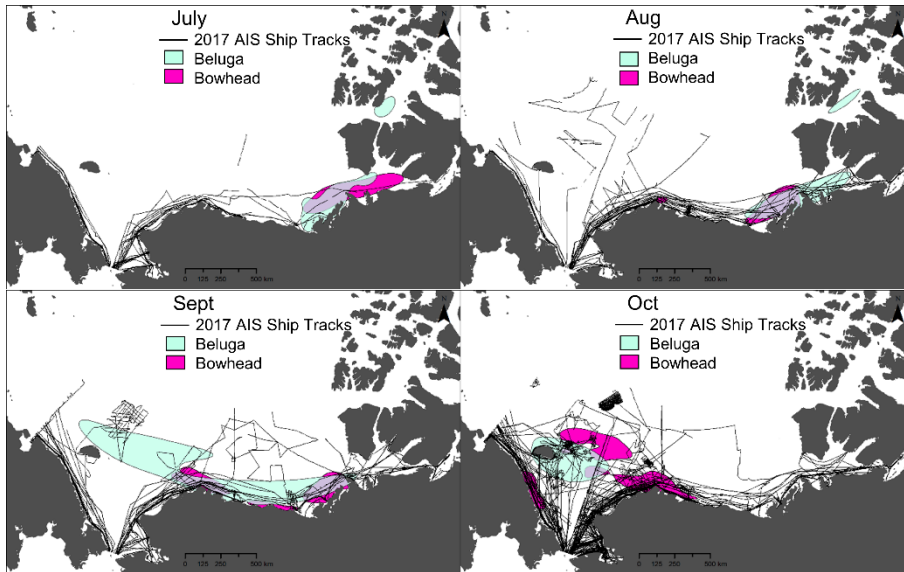
- Beluga whales and other marine mammals in the region are a critical part of Inuvialuit food sovereignty and have been managed by Indigenous communities for millennia.
- Understanding the exposure of these species to underwater noise from ships is an important aspect of managing these species.

Was the community involved?

- Yes. Community members in Tuktoyaktuk and Aklavik were involved in tagging some of the bowhead and beluga whales with DFO.

Key result:

This figure shows the ship tracks throughout the region in each month of 2017, and overlap with the monthly distributions of bowhead and beluga whales.



This next figure shows the average potential ship noise exposure events, which shows clear trends that the most ship noise is occurring in the Chukchi Sea closer to Bering Strait. However, it does highlight that all monthly bowhead and beluga areas experience some ship noise, including in the Inuvialuit Settlement Region, particularly in August and September.

