

Halliday WD, Insley SJ, Hilliard RC, de Jong T, Pine MK (2017) Potential impacts of shipping noise on marine mammals in the western Canadian Arctic. Marine Pollution Bulletin 123: 73-82.

What is the research about?

- Sea ice is present throughout much of the Arctic Ocean for most of the year and helps keep the underwater marine environment quiet, while restricting marine shipping to the open ice season between August and October.
- We wanted to know what the current underwater noise levels are from ships in the region and how these could impact marine mammals, specifically in the proposed shipping corridor through the eastern Beaufort Sea and Amundsen Gulf.
- We also wanted to know how the noise levels might affect marine mammals in two marine protected areas (MPAs) near the corridor: Tarium Niryutait (TN), intended to protect habitat for beluga whales; and Anguni-aqvia Niqiqyuam (AN), intended to protect biodiversity including cultural keystone species.

What we did:

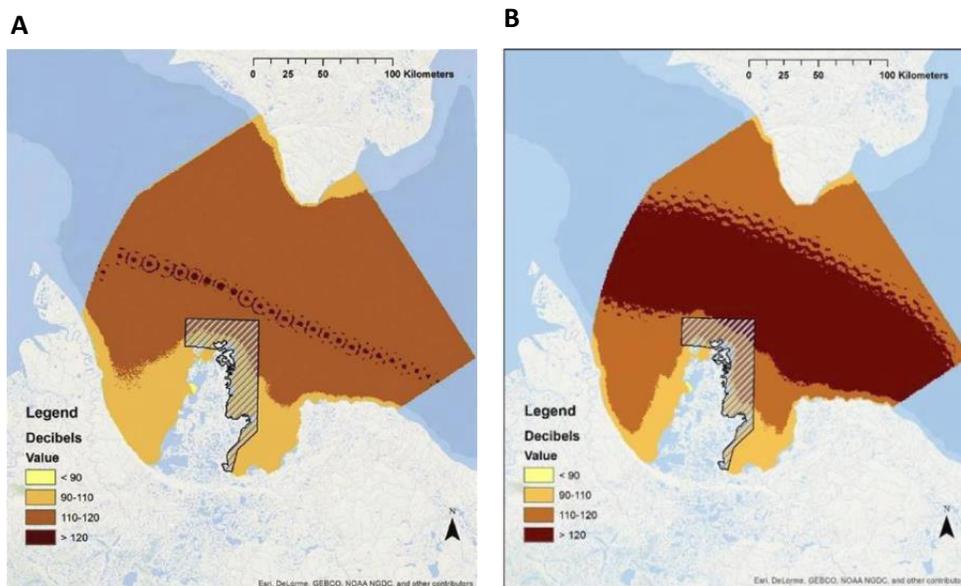
- We recorded underwater noise levels between 2014 and 2016 from acoustic recorders (hydrophones) near Sachs Harbour; we detected ships during August 2015.
- We used Automated Identification System (AIS) vessel data to determine which vessels were within 100 km of the hydrophones, and paired AIS data with our acoustic data to estimate how loud individual ships were.
- We developed sound wave models to describe the “noise footprint” of ships traveling in the corridor under calm and windy conditions, applying the noise levels from a ship recorded at Sachs Harbour and a tanker recorded elsewhere that could represent future traffic through the region.
- We applied the model to see where ship noise exceeded the threshold for behavioural disturbance (120 dB) throughout the south, central, and northern portions of the corridor when the ships were near the two MPAs.
- We considered how this “noise footprint” could impact marine mammal behaviour in the corridor and the two MPAs under calm and windy conditions.

What we found:

- The hydrophones recorded two vessels: a Canadian Coast Guard ice-breaker vessel conducting research, and a Canadian military ship. Six other vessels were recorded on the AIS, but not detected by our equipment.
- The ship noise model predicted that ship noise would be audible beyond 100 km under quiet conditions and that ship noise could change the movement behaviour of beluga and bowhead whales and ringed and bearded seals as far as 52 km from the ship.
- The “noise footprint” affects a large area of the AN MPA under windy and calm conditions, and behavioural disturbance thresholds were exceeded in a small portion of this MPA. Ship noise would only be audible in a small portion of the TN MPA and behavioural disturbance thresholds were never exceeded in this MPA.

Key Result:

In this figure, we show the noise footprint of the coast guard icebreaker (A) and the tanker (B) traveling along the shipping corridor near the AN MPA. The darkest colours show areas where behavioural disturbance threshold (120 dB) is exceeded, the next darkest colour shows audibility under windy conditions (ambient noise = 110 dB), and the next lightest colour shows audibility under calm conditions (ambient noise = 90 dB).



Our recommendations:

- Detailed acoustic modeling should be undertaken to address noise impacts in the proposed shipping corridor and inform the AN MPA management plan.
- Ensure that noise impacts are considered in the development of the AN MPA management plan. Specific actions could include:
 - Shift vessel traffic towards the northern edge of the shipping corridor to reduce behavioural disturbance in the AN MPA.
 - Redirect all vessels that do not need to travel in the MPA.
- Outside of the MPA, include marine mammal observers on ships traveling in areas where marine mammal migrations or congregations parallel ship traffic routes. In addition, ships should reduce speed at these times and locations to reduce their noise footprint.
- Consider shifting the entire shipping corridor further north.

Why is this research relevant to the Inuvialuit people?

- Marine mammals such as bowhead whales, beluga whales, bearded seals and ringed seals live in the region and use sound to communicate, find food, mates, and avoid predators. They are also a critical part of Inuvialuit food sovereignty and have been managed by Indigenous communities for millennia.
- Any increase in marine vessel traffic has implications not only for the conservation of marine mammals, but all the Inuvialuit communities that depend on these mammals for nutrition, cultural, and spiritual values.
- The Inuvialuit will be collaboratively developing the new management plan for the AN MPA and considering various planning options for shipping corridors. These data enable better decision making based on potential impacts to marine mammals.
- Having scientific baseline information at this location will enable the Inuvialuit to make decisions regarding planning and mitigation due to impacts from increased noise and marine traffic on marine mammals in this region.

- Scientific baseline information on marine mammal behaviour could be complementary to Inuvialuit long-term observations and experiences of marine mammals to support conservation and management guidance and best practices in the ISR.

How was the community involved?

- Part of this work was conducted out of Sachs Harbour. We are grateful to the people of Sachs Harbour, particularly the Sachs Harbour Hunters and Trappers Committee, Wayne Gully, Betty Haogak, Terrence Lennie, Joe Kudak, and Jeff Kuptana.

Where can I get more information about this project?

- Stephen Insley, Bill Halliday, and Matt Pine are scientists with Wildlife Conservation Society (WCS) Canada (wccanada.org). You can reach them at sinsley@wcs.org and whalliday@wcs.org.
- Other information:
 - <http://data.nwtresearch.com/Scientific/16330>
 - <http://data.nwtresearch.com/Scientific/15470>
 - www.arcticnoise.ca



Ship traffic is projected to increase with an increasingly ice-free Arctic