

Halliday WD, Scharffenberg K, Whalen D, MacPhee S, Loseto LL, Insley SJ (2020) The summer soundscape of a shallow-water estuary used by beluga whales in the western Canadian Arctic. *Arctic Science* 6: 361-383.

What is the research about?

- Ship traffic is increasing throughout the Arctic and may impact marine life, such as beluga whales.
- The underwater soundscape is a critical component of marine mammal habitat, as marine mammals such as beluga use sounds for many aspects of their lives, including for communication and hunting.
- The Tarniutait Marine Protected Area (TN MPA) represents important habitat for beluga whales, and understanding the influences of both natural and human activities on underwater sound levels is an important aspect of conservation planning and understanding the influence of underwater noise on belugas within the TN MPA.

What we did:

- We recorded underwater acoustic data within the TN MPA in Kugmallit Bay of the Mackenzie River estuary each summer, between 2015 and 2018, at multiple sites.
- We measured underwater sound levels in all of the acoustic data, and then used statistical models to examine the influence of environmental variables (wind speed, water current, wave height), beluga vocalizations, and passing ships on underwater sound levels.

What we found:

- Wind speed and associated changes in wave height were very important drivers of natural underwater sound levels in low (200 Hz to 1 kHz) and medium (1 to 10 kHz) frequency bands
- Beluga whale vocalizations caused large increases to underwater sound levels in the high frequency band (10 to 48 kHz)
- Boat noise also added to underwater sound levels, particularly in the low and medium frequency bands, although only for relatively short periods of time. For example, boat noise was detected in between 0 and 5.2% of the acoustic data collected in 2017.

Our recommendations:

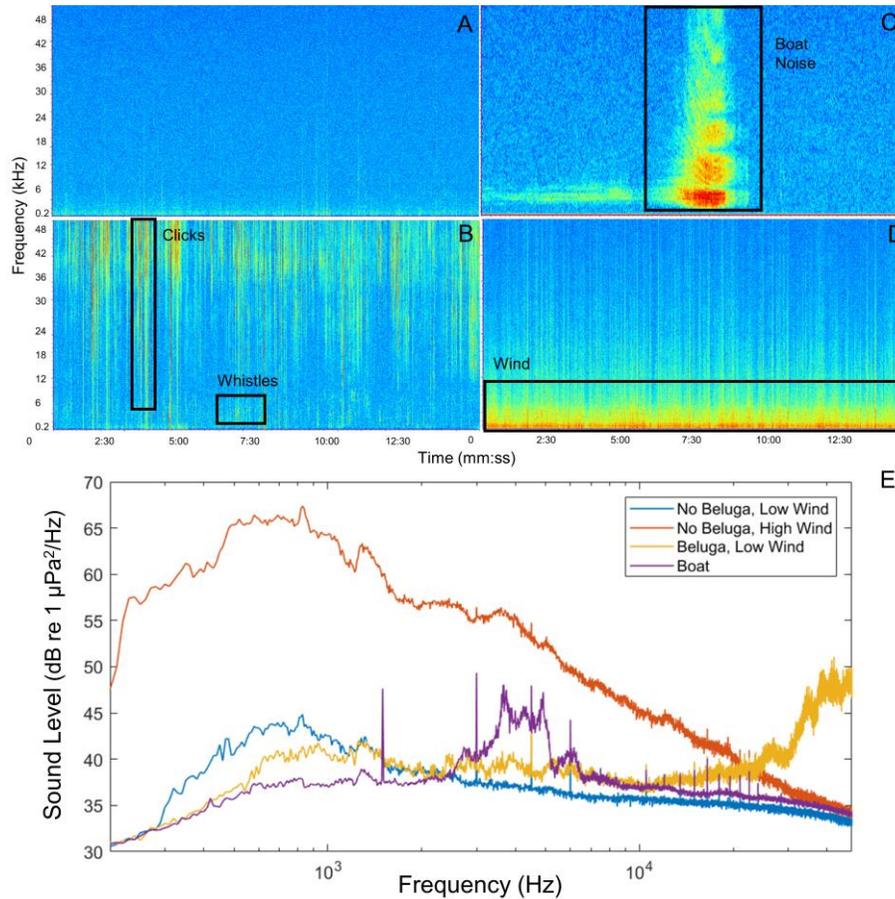
- Maintain acoustic monitoring sites (e.g., WCS Canada, DFO) to continue monitoring underwater sound levels, and in particular, the influence of boat noise on the soundscape.
- Continue monitoring beluga whales using acoustics within the TN MPA to examine changes in occupancy patterns.

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.
- The soundscape is a critical aspect of beluga habitat based on their high reliance on vocalizations for communication and hunting. Understanding the soundscape and the influence of human activity on the soundscape is important for the conservation of belugas.

Key result:

This figure shows the influence of beluga vocalizations (B), boat noise (C), and wind (D) on underwater sound levels. Wind has by comparison the highest impact on underwater sound levels, particularly at low and medium frequencies, whereas beluga vocalizations have a large influence on high frequencies. Boat noise can have a strong signal in low to medium frequencies, but can easily be overpowered by wind noise. Listen to some of the sounds that we recorded at <http://www.arcticnoise.ca/arctic-sounds.html>.



Was the community involved?

- Yes. The acoustic data was collected by DFO and NRCan out of Tuktoyaktuk. We are grateful to assistance in the field by E. Way-Nee, J. Pascal, D. Swainson, K. Tingmiak, A. Gordon Jr., E. Amos, J. Pokiak, A. Robertson, P. Lennie, and our camp hosts, C. Day, B. Joe, and F. Angasuk.