

Pine MK, Hannay DE, Insley SJ, Halliday WD, Juanes J (2018) Assessing vessel slowdown for reducing auditory masking for marine mammals and fish of the western Canadian Arctic. Marine Pollution Bulletin 135: 290-302.

What is the research about?

- Underwater noise from vessels can cause hearing damage, stress, habitat avoidance, shifts in migration routes and behavioural changes in marine mammals and fishes.
- One of main impacts of underwater noise from vessels is acoustic masking. Acoustic masking is when noise “drowns out” an animal’s ability to hear, reducing its detection of sounds and vocalizations used for critical life processes.
- Because vessel noise can travel underwater over large distances (more than 100 km), vessel noise can potentially mask hearing and vocalisations of marine animals over large areas.
- Scientific methods for assessing acoustic masking usually require detailed information on the hearing capabilities of marine animals, which is not available for most Arctic marine animals.
- We wanted to examine vessel slowdown as a tool to reduce vessel noise and, consequently, masking. Vessel slowdown also reduces the risk of ship strikes with marine mammals.

What we did:

- We applied a method called the “listening space” to model acoustic masking caused by vessel traffic for marine mammals and fish in the Inuvialuit Settlement Region.
- This method assesses how sound travels through the water from a noisy ship, and compares this information to the basic hearing capabilities of the animal of interest.
- We simulated listening space reductions at four sites: north of the Mackenzie Delta, near Ulukhaktok, through the centre of the Prince of Wales Strait, and in Viscount Melville Sound.
- We assessed masking from both container and cruise ships traveling at 25 knots (normal) and 15 knots (reduced speed) on bowhead whales, belugas, ringed and bearded seals, and Arctic cod, and assessed how the slower speed might reduce masking.

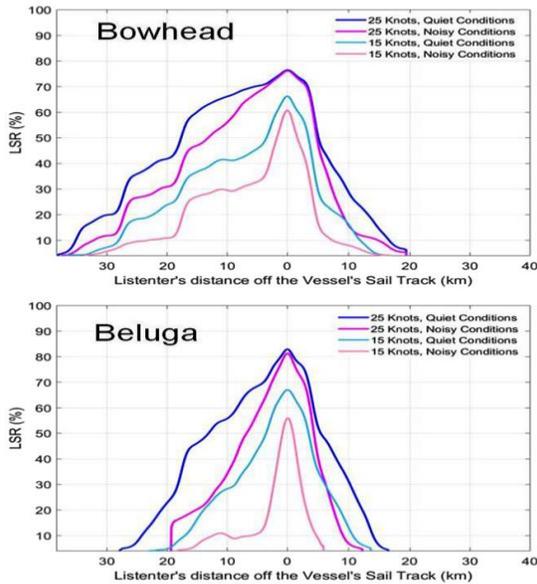
What we found:

- Vessels traveling 15 knots caused less acoustic masking than vessels traveling at 25 knots.
- Seals were susceptible to greater masking impacts at greater distances from the vessels than whales. Fish were the least susceptible to masking. Differences were due to species-specific hearing sensitivities.
- The extent of masking also varied between the different sites, depending on the depth contours and position of the vessel as well as natural sound conditions such as wind and wave action.

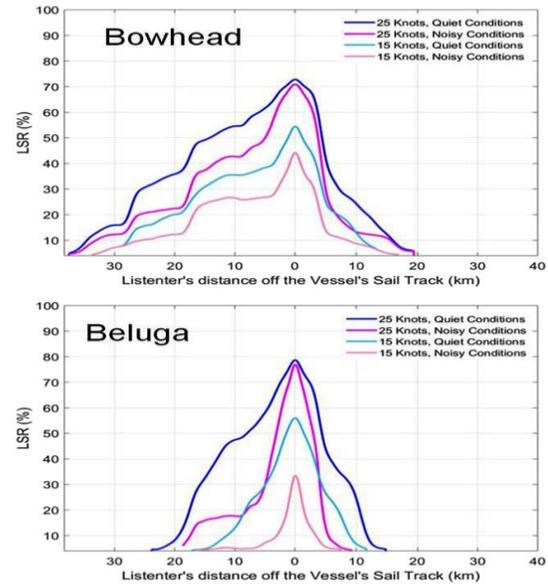
Key Result:

In the figure on page 15, we show the listening space reduction (LSR, or degree of masking) that either a container ship (left) or cruise ship (right) would cause for bowhead whales when traveling 25 knots (dark blue and purple lines) or 15 knots (light blue and orange lines) under windy (purple and orange lines) or calm (dark and light blue lines) conditions. The horizontal axis shows how far away the vessel is from the bowhead whale, with greatest impact when the vessel is close. Generally, LSR is greater when vessels travel fast and LSR is greater under calm conditions. Container ships are generally noisier than cruise ships, so LSR is generally greater.

Container Ship



Cruise Ship



Our recommendations:

- Masking assessments can inform species-specific guidelines such as determining the distances away from a vessel when masking occurs or the impact of vessel speed on the zone of masking around a vessel in order to set shipping corridor boundaries and speed restrictions.
- Masking assessments can inform specific vessel management tools such as slow down schemes within new and existing management plans for MPAs (e.g., AN MPA, TN MPA), near marine mammal concentration areas, and other sensitive areas in the ISR where shipping routes may be difficult to move given geographical and navigational issues.
- We show that even with slow down regimes, relief in masking will vary by species and vessel as well as external conditions so monitoring is important.

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.
- It is important to understand how different mitigation approaches, such as slow down regimes, can reduce the impacts of acoustic masking that could cause marine mammals to leave the area or affect their populations.

How was the community involved?

- Data for this paper came from work conducted out of Sachs Harbour. We are grateful to 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?

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