



## Ocean Noise Strategy for Canada: Discussion Document

### Input from Wildlife Conservation Society (WCS) Canada

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#### **About WCS Canada and the Arctic program**

The mission of Wildlife Conservation Society Canada (WCS Canada) is to conserve wildlife and wild places in Canada through science, conservation action, and inspiring people to value nature. Our trademark is “muddy boots” biology, which we do by getting in the field and conducting the necessary research to fill key information gaps on Canada’s fish, wildlife, and ecosystems. We then use relevant information and our expertise, working with Government and regulatory agencies, conservation groups, indigenous communities and industry, to resolve key conservation issues.

WCS Canada is a national affiliate of the Wildlife Conservation Society, which has been working in the Arctic since 2002. Since 2014, our work in the western Canadian Arctic has focused on: applying passive acoustic monitoring in Arctic marine environments to gather information on the activities of marine mammals, fish, and ships; modeling and measuring the impact of ship traffic on the behaviour of the wildlife; and using that knowledge to assess and recommend mitigation and protection measures. We carry out our work in close partnership with Fisheries and Oceans Canada, the local Inuvialuit, and other scientists conducting marine acoustic studies across the Canadian Arctic. To date we have deployed over two dozen long-term acoustic moorings in the western Arctic, published our findings in multiple peer review scientific reports, and have been instrumental in the design of solutions such as the Canadian Coast Guard’s Notice to Mariners recently implemented in the western Arctic for whale avoidance by ships.

At the end of this submission we provide a partial list of relevant publications that WCS Canada scientists have authored or contributed to, and that are particularly relevant to the issue of ocean noise, in particular underwater anthropogenic noise in Canadian Arctic waters. For more information, please see <https://www.wcscanada.org/Wild-Places/Western-Arctic.aspx> and <http://www.arcticnoise.ca/arctic-sounds.html>.

## **Ocean Noise Strategy for Canada: Discussion Document**

We welcome the efforts being undertaken by the Marine Planning and Conservation Directorate to initiate discussions aimed at developing strategies or measures to understand and mitigate the effects of ocean noise. Our comments and recommendations are organized around three themes:

1. The unique characteristics of the Arctic marine environment and soundscape;
2. The management responses called for in the Arctic marine environment; and
3. Further research and monitoring needs.

### **1. The unique characteristics of the Arctic marine environment and soundscape**

The Discussion Document includes an important sidebar noting some of the reasons that the Arctic is a unique situation: the limited research; the unique biophysical and chemical characteristics of Arctic waters and their effect on noise transmission; and the reliance of Inuit communities on marine animals for subsistence. Although these are important considerations we wish to highlight a number of additional relevant factors that make the Arctic unique relative other Canadian marine areas.

- The Arctic has low ship traffic compared with Canada's other coastlines. Most parts of the Canadian Arctic get less than one ship per day during the July to October shipping season, which means that for the majority of the time during the shipping season, underwater sound levels are dominated by natural factors, and are therefore much quieter than the non-Arctic waters of Canada.
- Sea ice is present much of the year in most parts of the Canadian Arctic. This influences the aforementioned unique oceanographic characteristics that affect the propagation of sound in Arctic waters. Sea ice also directly contributes to underwater sound levels by limiting the influence of wind on sound levels, but also by creating many noises when ice forms, breaks, and is under stress. Finally, ice impacts sound propagation. Higher frequency sounds lose energy when they come into contact with the ice, thereby limiting their propagation under the ice. These diverse factors interact with the additional noise produced by vessels in a variety of ways.
- Climate change is causing the Arctic acoustic environment to change. Loss of sea ice means that sea ice could be having less influence on the acoustic properties of the Arctic, particularly during the open water shipping season. Sea ice loss is also allowing for more ship traffic to enter the Arctic, which could therefore cause large increases to underwater noise in the future. Climate change may cause a shift in how sound propagates in the Arctic, such as changes in freshwater inputs and temperatures causing shifts in the sound speed profiles. Finally, there is a shift occurring in the animals living in the Arctic, where southern species are beginning to invade Arctic waters. These species would need to be considered in any assessments on the impact of noise on species in the Arctic. The species may also be creating sounds that would change patterns in sound levels within the Arctic.

## **2. The management responses called for in the Arctic marine environment**

If an Ocean Noise Strategy is to be guided by the “precautionary approach based on risk”, as indicated in the discussion document, it will be important to interpret this risk management approach appropriately in the arctic context. In particular, it would be a serious mistake to presume that the risk of environmental impacts is lower where ship traffic volumes are lighter. In fact, the opposite is arguably the case, since a single ship transit through a region that only sees a handful of ships a year will likely have a greater impact than the same ship transiting a region that sees dozens of ships per day. For examples, beluga and narwhal in Nunavut have been shown to react to noise from an icebreaking ship from 50 km away when underwater noise from the ship was barely above ambient sound levels. Such an extreme response likely would not happen in temperate waters where most whales encounter ships every day. As a result, ship traffic increases should be assessed in relative rather than absolute terms, and compared against baseline traffic in that region, rather than by setting ship traffic thresholds derived from other regions. Furthermore, different types of impacts (e.g. masking vs. disturbance displacement vs. physical impacts such as stress or hearing loss) need to be taken into account as some are more a function of absolute sound level exposure while others are not and each can be quite species specific.

## **3. Further research and monitoring needs**

In light of the acknowledged paucity of research on the effects of noise on Arctic species, it will be important for an Ocean Noise Strategy to include a commitment to addressing knowledge gaps with an overarching goal of understanding the ultimate biological significance of noise impact on the different Arctic marine species.

Research priorities should include:

- 1) Understanding the impacts (behaviour and physiology) of ship noise on different species under different behavioural conditions (i.e. feeding, traveling, resting). There are a few studies on the impacts of noise to bowheads and belugas, but much more information is needed for narwhal, ringed seal, bearded seal, and walrus.
- 2) Detailed estimates of the source levels of a variety of different ship classes in the Arctic under different operating conditions. This would be extremely valuable for more accurately modeling noise propagation of different vessels and estimating ranges of potential impact on different species.
- 3) Better understanding of propagation of ship noise in Arctic waters, particularly in ice covered and partially ice covered waters.
- 4) Work to examine the exposure of different Arctic species to ship noise.

### **Summary of recommendations**

1. *Any Ocean Noise Strategy applied in the Canadian Arctic should be tailored to the specific and unique conditions present in the Arctic marine environment.*
2. *Vessel noise should be assessed against current baseline noise levels, rather than against thresholds developed for other marine environments.*

3. *Further research is needed to better understand the effects of noise from different vessel classes on different species, under different behavioural and ice conditions in the Arctic marine environment*

#### **WCS Canada publications**

Halliday WD, Pine MK, Citta J, Harwood L, Hauser DDW, Hilliard RC, Lea E, 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*.

<https://doi.org/10.1016/j.ocecoaman.2020.105473>

Halliday WD, Pine MK, Insley SJ (2020) Underwater noise and Arctic marine mammals: review and policy recommendations. *Environmental Reviews* 28: 438-448. <https://doi.org/10.1139/er-2019-0033>

Halliday WD, Pine MK, Mouy X, Kortsalo P, Hilliard RC, Insley SJ (2020) The coastal Arctic marine soundscape near Ulukhaktok, Northwest Territories, Canada. *Polar Biology* 43: 623-636. <https://doi.org/10.1007/s00300-020-02665-8>

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. <https://doi.org/10.1139/AS-2019-0022>

Halliday WD, Scharffenberg K, MacPhee S, Hilliard RC, Mouy X, Whalen D, Loseto L, Insley SJ (2019) Beluga vocalizations decrease in response to vessel traffic in the Mackenzie River estuary. *Arctic* 72: 337-346. <https://doi.org/10.14430/arctic69294>

Halliday WD, Têtu P-L, Dawson J, Insley SJ, Hilliard RC (2018) Tourist vessel traffic in important whale areas in the western Canadian Arctic: risks and possible management solutions. *Marine Policy* 97: 72-81. <https://doi.org/10.1016/j.marpol.2018.08.035>

Pine MK, Hannay DE, Insley SJ, Halliday WD, Juanes F (2018) Assessing vessel slowdown for reducing auditory masking for marine mammals and fish of the western Canadian Arctic. *Marine Pollution Bulletin* 135: 290-302. <https://doi.org/10.1016/j.marpolbul.2018.07.031>

McWhinnie L, Halliday WD, Hilliard C, Insley SJ, Canessa R (2018) Vessel traffic in the Canadian Arctic: management solutions for minimizing impacts on whales in a changing Northern region. *Ocean and Coastal Management* 160: 1-17. <https://doi.org/10.1016/j.ocecoaman.2018.03.042>

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. <https://doi.org/10.1016/j.marpolbul.2017.09.027>

Insley SJ, Halliday WD, de Jong T (2017) Seasonal patterns in ocean ambient noise near Sachs Harbour, Northwest Territories. *Arctic* 70: 239-248. <https://doi.org/10.14430/arctic4662>