WWF
CANADA

REDUCING IMPACTS FROM SHIPPING IN MARINE PROTECTED AREAS: A TOOLKIT FOR CANADA

MITIGATING SHIPPING IMPACTS ON CETACEANS IN CANADA: LESSONS LEARNED AND BEST PRACTICES

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Contents

EXECUTIVE SUMMARY

With rising trends in development, international trade and the opening of shipping routes, seaborn traffic worldwide expanded rapidly since the late 1990s along with an increasing environmental footprint and pressure on marine ecosystems and wildlife. Many of the world's busiest shipping and ferry lanes directly overlap with important habitats for cetaceans – whales, dolphins and porpoises – posing multiple threats to these species.

Canada is known as a maritime trading nation with an important shipping industry, but it is also home to iconic and endangered cetacean species such as the North Atlantic right whale (NARW), the St. Lawrence Estuary beluga whale and the southern resident killer whale (SRKW). Reliable management is required to ensure effective cohabitation and allow the recovery of these species while supporting the country's economy.

This report presents an analysis of high-risk areas in Canadian waters where shipping activity poses an elevated threat to cetaceans, and it is founded in in-depth interviews and a literature review of four working groups developing mitigation measures to manage impacts of shipping on cetaceans in the country:

- Enhancing Cetacean Habitat and Observation (ECHO) program in British Columbia;
- Working Group on Marine Traffic and Protection of Marine Mammals (G2T3M) in the St. Lawrence Estuary;
- North Atlantic Right Whale Advisory Working Group in the Gulf of St. Lawrence;
- Baffinland Iron Mines Corporation Marine Environment Working Group (MEWG) in the Arctic.

Based on these case studies, we summarize best practices and draw the following recommendations:

1. Where possible, separate ships from cetaceans by modifying routes or designing vessel exclusion zones in high-risk areas.
2. Where it is not possible, apply speed restrictions in known sensitive cetacean habitats, such as feeding aggregation or nursing areas.
3. Evaluate the co-benefit of speed restrictions for cetacean conservation and for the environment in general to better quantify benefits versus costs.
4. Consider all endangered, threatened and protected species when designing mitigation measures.
5. Apply best practices to create an effective and collaborative structure to coordinate communication between relevant stakeholders, and base management decisions on the best available knowledge (scientific, local and Indigenous).
6. In areas where place-based measures are not enough, encourage certification or port-led incentive schemes and the development of quantifiable noise-reduction targets and/or noise thresholds to regulate shipping.

INTRODUCTION

Worldwide, cetaceans – whales, dolphins and porpoises – share their habitats with an ever-expanding fleet of super-tankers, cargo vessels and high-speed ferries. The volume of shipping traffic worldwide increased more than threefold since the late 1990s,[1] and global seaborne trade is forecast to continue rising by 3.8 per cent between 2018 and 2023.[2] Ship-based travel has also escalated, with fast passenger ferries racing through coastal areas.[3]

Interesting fact: About 90 per cent of the world's goods travel by sea.[4]

In Canada, the transportation and warehousing sector is an integral part of the economy, with a GDP growth rate 1.4 times higher than any other sector.[5] Canada is known as a maritime trading nation, and the shipping industry and ports system have become major entry points for manufactured goods and exit points for Canada's natural resources. In 2018, there was a rise in the value of international seaborne traffic, along with increased volumes handled at major Canadian ports, including Vancouver, Prince Rupert, Montreal, Saint John and Halifax.[6] Transport Canada is investing more than $270 million in new and existing ports to increase overseas trade, which will result in more shipping traffic.[7] In the Arctic, shrinking sea ice cover due to climate change is also allowing more vessels to transit areas that were once impassable, including the Northwest Passage and the Northern Sea Route. This has important implications for potential conflict between economic growth and environmental protection.

Top five Canadian ports in 2018, by traffic:

1) Port of Vancouver – **147.1 million tonnes**
2) Port of Montreal – **38.9 million tonnes**
3) Port of Prince Rupert – **26.7 million tonnes**
4) Port of Saint John – **25.1 million tonnes**
5) Port of Halifax – **4.8 million tonnes**[8]

From discharges – greywater, marine litter and non-native species – to physical impacts – erosion, collision, noise and air emissions – shipping inflicts increasing pressure on marine ecosystems and wildlife.[9] For cetaceans, vessel strikes, underwater noise, disturbance and pollution are leading threats to several at-risk species worldwide,[10] including in Canada.

In 2018, the Government of Canada announced Canada's Whales Initiative[11] to protect and support the recovery of three iconic and endangered cetacean species: the NARW, the St. Lawrence Estuary beluga whale and the SRKW.[12] This initiative channeled support to numerous research projects focused on passive acoustic monitoring with the aim to better

1 Tournadre, 2014.
2 United Nations Conference on Trade and Development (UNCTAD), 2018; Transport Canada, 2018.
3 Tournadre, 2014.
4 United Nations Conference on Trade and Development (UNCTAD), 2018.
5 Transport Canada, 2018.
6 Ibid.
7 This investment is part of the 11-year National Trade Corridors Fund launched in 2017.
8 Transport Canada, 2018.
9 Jägerbrand, et al., 2019.
10 Weilgart 2007; Nichol, et al., 2017; Blair, et al., 2016; Pirotta, et al., 2019.
11 Canada's Whales Initiative was part of the 2016 $1.5 billion Oceans Protection Plan, the largest investment ever made in Canada's coasts and waterways.
12 DFO, 2018.

understand the impact of underwater noise and other anthropogenic disturbances on cetaceans, as well as their location and movements in support of management. Other applications included ocean noise modelling and acoustic data management.[13]

A dedicated portion of this initiative supported the work of several active working groups addressing the issues of shipping in important cetacean habitats in the country. The aim of this report is to synthesize select efforts of various groups and initiatives to address shipping impacts in important cetacean habitats in Canadian waters with lessons learned, and to provide advice on best practices and clear recommendations and guidance for future work.

13 Fisheries and Oceans Canada (DFO), 2019c.

IMPACTS OF SHIPPING ON CETACEANS

In Canada, 30 cetacean populations are designated by the Committee on the Status of Endangered Wildlife (COSEWIC) as species at risk; 19 of these populations are also listed under the Species at Risk Act (SARA). As of 2020, shipping-related impacts are explicitly listed as threats to the survival and recovery of 12 at-risk cetacean populations, including the NARW, SRKW and northern resident killer whale, blue whale (Atlantic and Pacific populations), fin whale (Atlantic and Pacific populations), humpback whale (Pacific population), beluga whale (St. Lawrence Estuary and Arctic populations), Sowerby's beaked whale and northern bottlenose whale.[14]

VESSEL STRIKES

All vessel types can collide with cetaceans and pose a threat to seriously injure or kill the animal.[15] Studies have shown that large ships (greater than 20 meters in length) travelling slower than 10 knots (kt) greatly decreases the likelihood of fatal vessel strikes for large whales.[16] However, risk is influenced by surfacing behaviour, body shape/size and age of the species, among other factors. New analysis based on vessel speed and mass, impact area and biomechanical properties of whale tissue are showing that lethality remains high at any transiting speed for large ships.[17] For example, when large vessels travel at typical speeds (e.g., 17kt), there is nearly 100 per cent chance they will kill a whale if they strike one, whereas at 10kt this chance is only reduced to 86 per cent. In other words, reducing vessel speeds to 10kt will save one whale of every eight collisions with large vessels.[18]

Interesting fact: Between 2017 and 2019, 21 endangered NARWs died in the Gulf of St. Lawrence in Canada. Thirteen necropsies were conducted, and seven of the deaths were attributed to vessel collision with four with results still pending.[19]

14 Government of Canada, 2011.
15 Kelley, et al., 2020.
16 Conn and Silber, 2013; Vanderlann and Taggart, 2007.
17 Kelley, et al., 2020.
18 Ibid.
19 National Oceanic and Atmospheric Administration (NOAA), 2020.

UNDERWATER NOISE AND DISTURBANCE

Vessel noise, primarily from propeller cavitation, overlaps with the hearing range and communication sounds of cetaceans. This can result in "masking," which reduces their ability to communicate and sense their environment effectively.[20] Underwater noise can alter daily activities of cetaceans, including foraging, surfacing, resting, avoiding predators, communicating, socializing, mating and nurturing calves. Ultimately, this can lead to fewer offspring and higher death rates,[21] and put their long-term survival at risk.

POLLUTION

Harmful materials may be released into the water and air by vessels both accidentally and intentionally as part of daily operations. These include blackwater (sewage), greywater (wastewater that has not come into contact with sewage), oil, ballast water (water used to stabilize ships), scrubber wash water and solid waste.[22] Pollution can impact cetaceans through their food web in the form of contamination and bioaccumulation of heavy metals, which may result in cancers.[23] Pollution from oil spills can also cause cetacean mortality through the inhalation of fumes, contact with skin or ingestion of contaminated prey.[24]

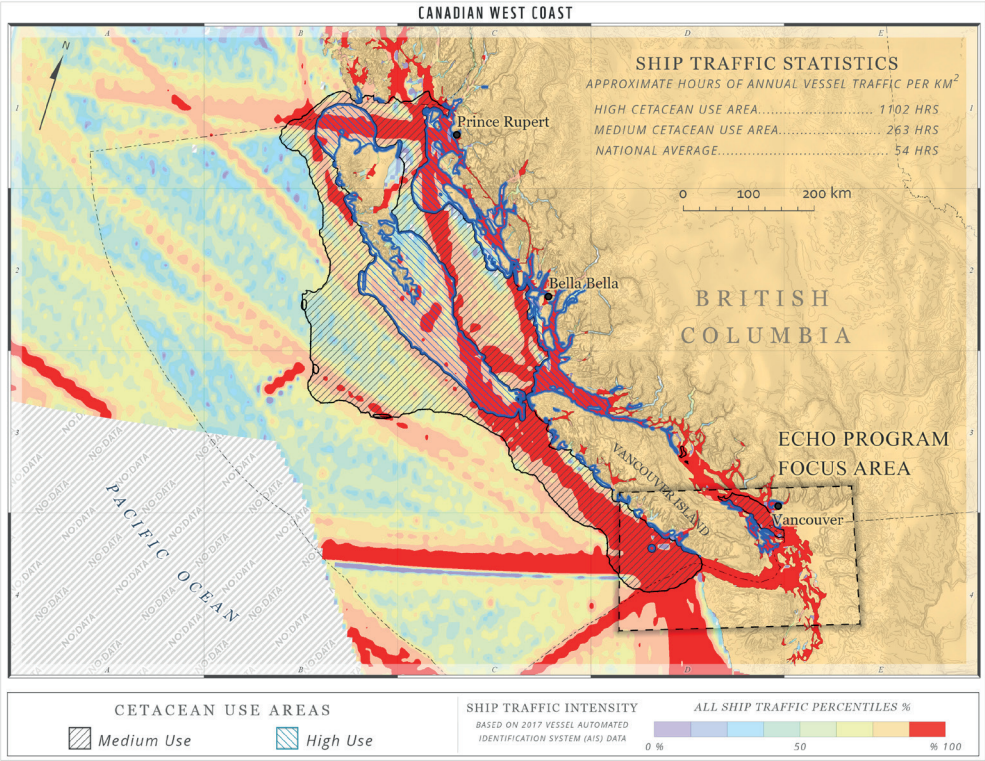
20 Weilgart, 2007; Erbe, et al., 2016.
21 Blair, et al., 2016; Weilgart, 2007.
22 Georgeff, Mao and Comer, 2019; Pirotta, et al., 2019.
23 Georgeff, Mao and Comer, 2019.
24 Pirotta, et al., 2019.

HIGH-RISK AREAS

High-risk areas are areas with a high density of whales and ships that yield high probabilities of encounters, where shipping activity poses an elevated threat to cetaceans. In Canadian waters, these areas include, among others: the Port of Prince Rupert, the inside passage and the Strait of Georgia in British Columbia (Figure 1); the Port of St. John's, the region of Southeastern Newfoundland, the Port of Halifax, the southwestern Gulf of St. Lawrence and the St. Lawrence Estuary (Figure 2); and the Hudson Strait in the Arctic (Figure 3).[25] Figures 1, 2 and 3 illustrate where shipping activity and cetaceans overlap the most in these areas, which may warrant proactive actions. The figures also identify the four active working groups within these areas that are addressing shipping threats to cetaceans.

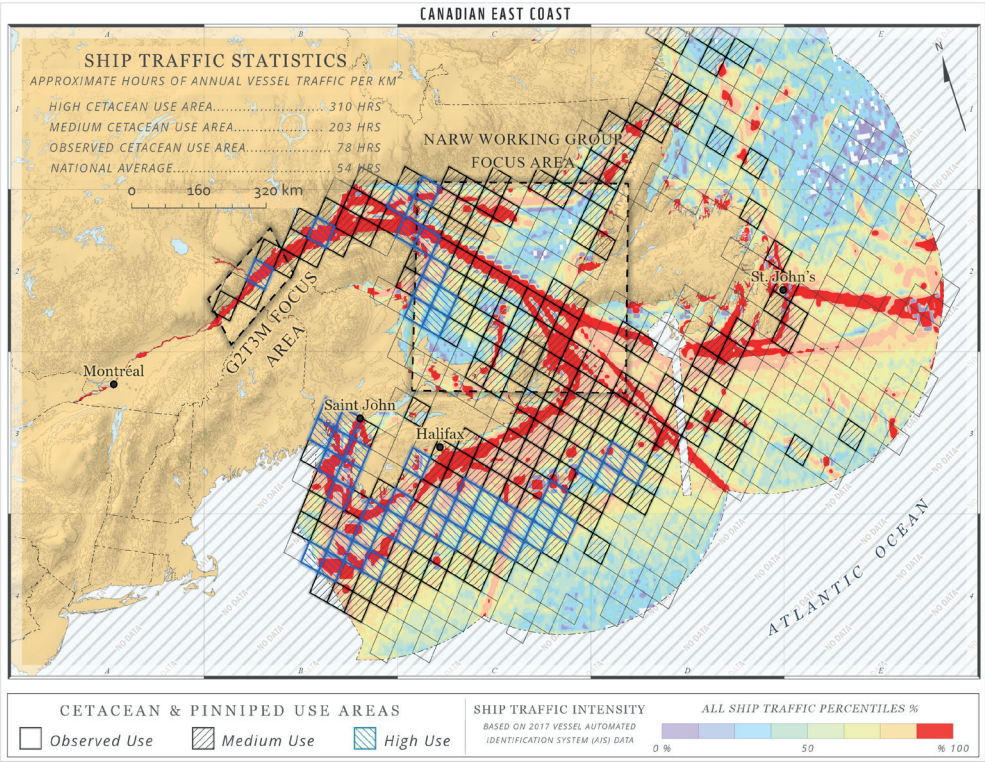
25 Methodology is outlined in the ***Appendix***.

Figure 1. Cetacean-use areas and shipping intensity off the Canadian west coast.



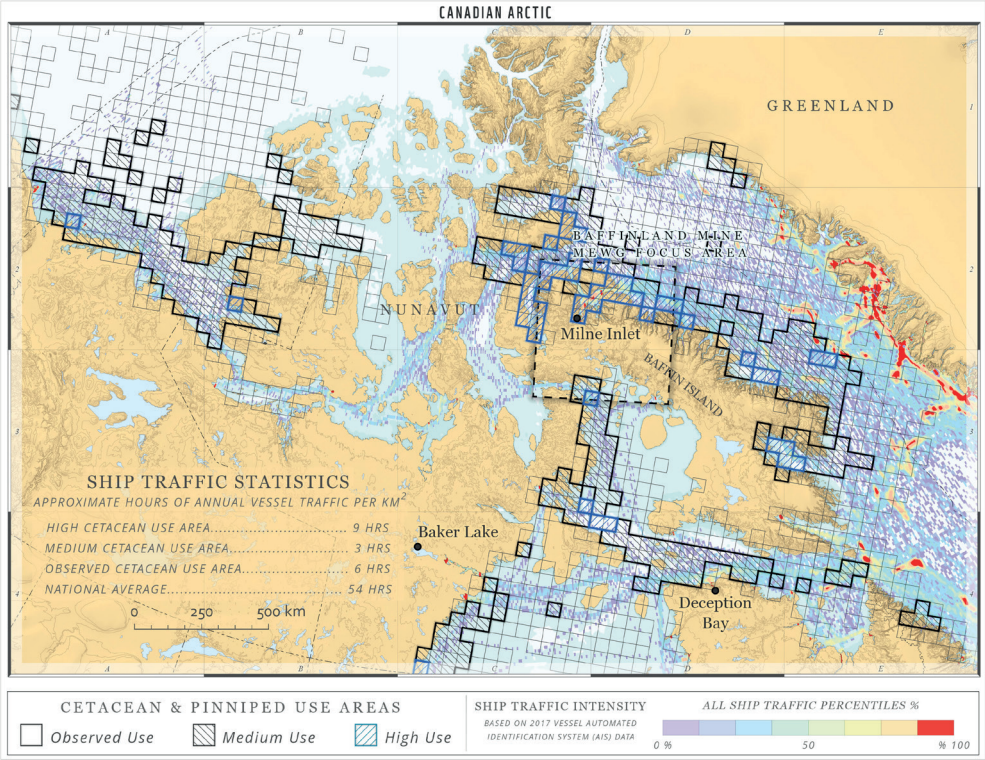
The ECHO program focuses on the cumulative effects of commercial shipping activity on at-risk whales along the southern coast of British Columbia (see the section titled “Enhancing Cetacean Habitat and Observation (ECHO) program” below).

Figure 2. Cetacean-use areas and shipping intensity off the Canadian east coast.



The G2T3M aims to reduce shipping impacts on cetaceans in the St. Lawrence Estuary (see the section titled “Working Group on Marine Traffic and Protection of Marine Mammals (G2T3M) in the St. Lawrence Estuary” below), while the North Atlantic Right Whale Advisory Working Group focuses on NARW in the Gulf of St. Lawrence (see the section titled “North Atlantic Right Whale Advisory Working Group in the Gulf of St. Lawrence” below).

Figure 3. Cetacean-use areas and shipping intensity in the Canadian Arctic.



The Baffinland MEWG acts as an advisory group for the Baffinland corporation to establish cooperative environmental agreements for the Mary River Project with MEWG members and Inuit communities (see the section titled "Baffinland Iron Mines Corporation Marine Environment Working Group (MEWG)" below).

CASE STUDIES

As part of a broader project, WWF-Canada commissioned in-depth interviews with nine working groups focused on marine safety and environmental protection in Canadian and American waters,[26] and from these selected as case studies the four for which addressing shipping and cetaceans issues was a mandate or a central objective. In-depth telephone interviews were conducted with representatives of each working group from across different sectors (non-governmental organizations, industry, academia and government) to gather perspectives, lessons learned and best practices. Interviewees were asked questions about their group's structure and purpose, management measures, emerging issues and recommendations.[27] A literature review was also conducted for supplementary information about each case study group. The work done by these groups includes implementing a range of voluntary and mandatory measures for shipping activities, as well as monitoring programs. While this initiative encompasses a large amount of the effort dedicated to cetacean conservation in Canada for the shipping sector, it is not an exhaustive review of all policies or measures for all seaborn traffic. For example, issues with pleasure crafts are not addressed by these working groups and so are not in this report. Pollution of the water and air from shipping can also impact the quality of cetacean habitat, but it is often overlooked and not a priority issue. Moreover, these shipping mitigation measures are part of a larger suite of both voluntary and mandatory management measures to protect cetaceans in Canada (for example, SARA critical habitat), which are not included in this report.

Case studies:

- ECHO program in British Columbia;
- G2T3M in the St. Lawrence Estuary;
- North Atlantic Right Whale Advisory Working Group in the Gulf of St. Lawrence;
- Baffinland Iron Mines Corporation MEWG in the Arctic.

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26 BIP Recherche for WWF-Canada, 2019.
27 Ibid.

ENHANCING CETACEAN HABITAT AND OBSERVATION (ECHO) PROGRAM

Summary

- Established: November 2014
- Trigger: Listing under the SARA (2009) and SARA Recovery Strategy (2011) as well as projected increases to shipping in SRKW critical habitat from port and terminal development and concerted efforts from non-governmental organizations, including WWF-Canada and the Vancouver Aquarium, to raise awareness of underwater noise impacts.
- Goal: To better understand and manage the potential impacts of shipping activities on at-risk whales, including acoustic and physical disturbances and environmental contaminants. The primary focus has been the acoustic impacts to SRKW.
- Working group structure: Managed by the Vancouver Fraser Port Authority with an independent facilitator (the Fraser Basin Council). The ECHO program has an advisory working group of 17 members and two technical committees: acoustic committee (16 members) and vessel operations committee (18 members).
- Management measures: voluntary

Figure 4. Voluntary management measures in SRKW critical habitat established by the ECHO program.

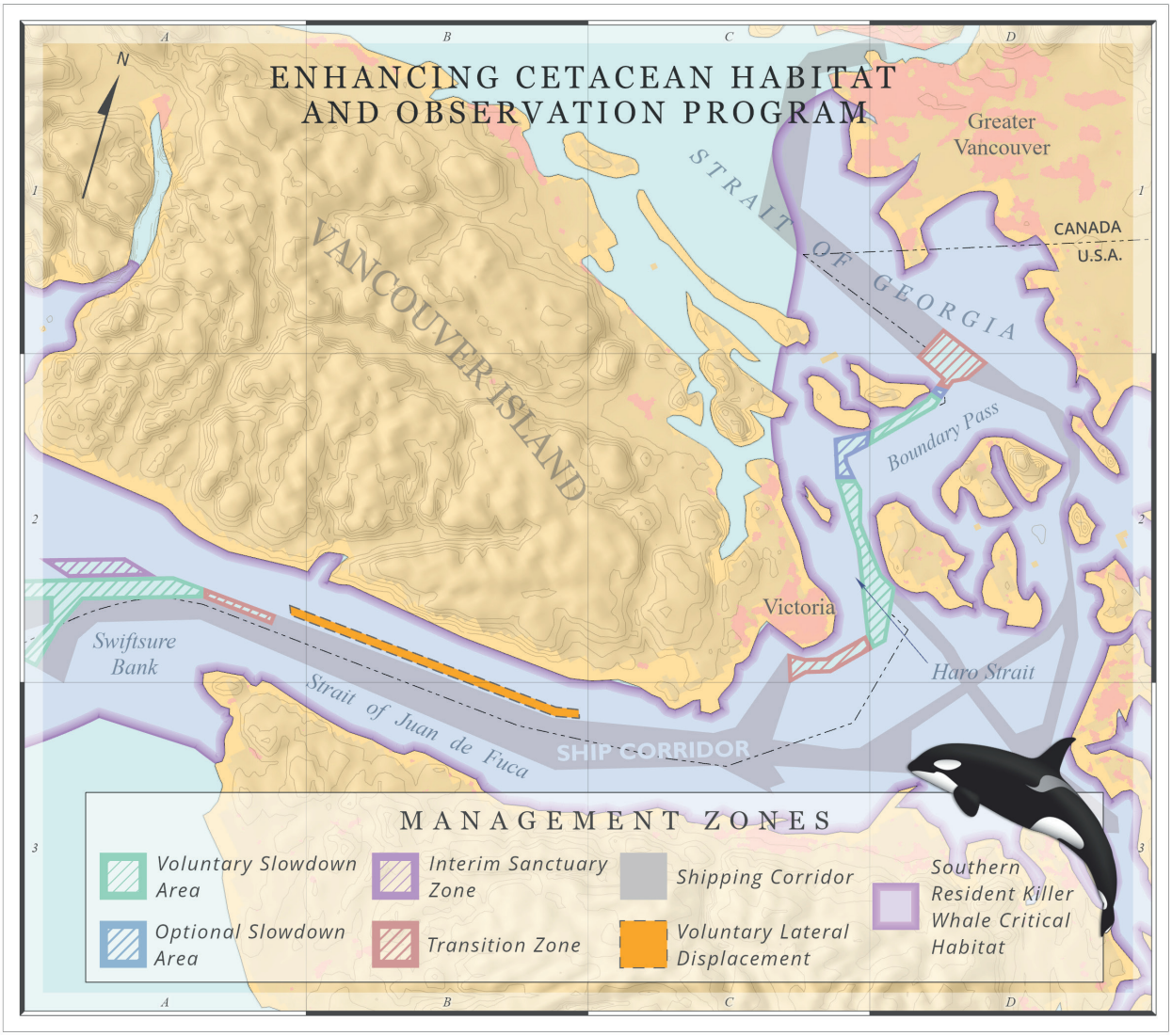

Table 1. Management measures for the SRKW established by the ECHO program from 2017 to 2020.

Year of establishment	Management measures[28]	Description
2020	Swiftsure Bank voluntary ship slowdown trial	Voluntary slowdown trial off the southwest coast of Vancouver Island, a known area of importance for SRKWs and other marine mammals.
2019 and 2020	Haro Strait and Boundary Pass (extended) voluntary vessel slowdown trial (July 6 to October 15)	Increased the geographic area of the voluntary slowdown trial of Haro Strait to include Boundary Pass, which was identified by DFO as a key foraging area.
2018, 2019 and 2020	Inshore vessel lateral displacement trial (August 20 to October 31, 2018 and June 17 to October 31, 2019)	Voluntary annual trial in the Strait of Juan de Fuca to minimize shipping traffic overlaps with feeding areas and assess if the displacement of ships reduces underwater noise levels. This trial included large commercial vessels as well as tugs and barges in 2018. In 2019 and 2020 it only included tugs and barges.
2017 and 2018	Annual Haro Strait vessel slowdown trial (August 7 to October 6, 2017, and July 12 to October 31, 2018)	First-of-its-kind voluntary vessel slowdown trial in Haro Strait to better understand and measure the level of noise reduction achieved through reduced vessel speed in 2017. The trail repeated in 2018 with an adapted regime of speed reduction to increase participation rates.
2017	Port Authority EcoAction Program gives incentives for vessels to reduce underwater noise	As of January 1, 2017, ships that call on the Port of Vancouver and reduce their underwater noise are eligible for a discount on harbour dues. Shipping lines may classify for gold, silver or bronze level discounts by meeting voluntary measures that reduce underwater noise and air emissions.

Effectiveness of measures

The voluntary measures put into place through the ECHO program are an important piece of a larger suite of both voluntary and mandatory measures to protect SRKW and need to be considered within that context. Whereas ECHO focuses on shipping, other measures focus on commercial fishing, whale-watching and recreational watercraft, all of which are active within the SRKWs' critical habitat. Mandatory measures include interim sanctuary areas where vessels are prohibited during certain dates, fisheries closures and minimum approach distances, which prohibit vessels as small as kayaks from coming too close. Other notable initiatives include the Vancouver Fraser Port Authority's EcoAction Program, launched in 2007, that offers discounts on harbour fees for vessels that can demonstrate the application of noise-reduction measures, and the BC Ferries' long-term mitigation plan to reduce underwater radiated noise.

The Haro Strait vessel slowdown trial proved to be an effective method for reducing mean underwater radiated noise for containerships, cruise vessels, vehicle carriers, tankers and bulkers. In 2017 the voluntary slowdown trial achieved a 22 per cent reduction in potential lost foraging time for SRKW, while in 2018 the slowdown achieved a 15 per cent reduction in affected foraging time for an average traffic day. The slowdown trial has since been modified to increase participation. For example, speed targets were assigned accordingly to different vessel types, and speed targets were raised to reduce the transit time delay associated with the slowdown.

Similarly, the lateral displacement trial in the Strait of Juan de Fuca had a high rate of participation in 2018 at 88 per cent and included both large commercial vessels and smaller tugs and barges. This trial achieved nominal reductions in noise levels from large commercial vessels (approximately 1dB) but relatively large and significant reductions in noise levels for tugs (4.3dB and 5.8dB) in SRKW communication band. In 2019 the lateral displacement trial in the Strait of Juan de Fuca only focused on tugs.

In 2019, the voluntary slowdown trial achieved an 82 per cent participation rate, and the voluntary lateral displacement trial in the Strait of Juan de Fuca resulted in 71 per cent of tugs shifting their transit south of the killer whale feeding area.

The ECHO program supports research to build rigorous scientific evidence to inform their proposed

28 Enhancing Cetacean Habitat and Observation (ECHO) Program, 2020b.

management measures. Over the last six years, at least 19 reports and publications supported the work of the program, including underwater noise monitoring, studying the impacts of vessel noise on cetacean behaviour, evaluating options for ship-quieting technology, assessing the risk of ship strikes on whales and tracking pollution along the coast.

Since 2014, educational outreach materials have been created for mariners, such as the "Mariner's Guide to Whales, Dolphins, Porpoises of Western Canada" and "Whales in Our Waters" online tutorial. Results were communicated on the ECHO program website.

This communication was instrumental in increasing transparency and ensuring a broader understanding of the issues and buy-in from all stakeholders involved. The Whale Report Alert System that launched in 2018 is an example of an innovative pilot project led by the Vancouver Aquarium/Ocean Wise's BC Cetacean Sightings Network, the ECHO program and the Prince Rupert Port Authority. They have seen success and are continuing to improve the mobile application to further engage mariners in slowing down or rerouting when whales are present in the area.

WHAT'S WORKING WELL ✓	WHAT COULD BE IMPROVED ✗
• Strong leadership roles and work conducted in a transparent manner. • Use of an independent neutral facilitator. • High participation rates in the meetings, and trust established among stakeholders. • Alignment among stakeholders with agreement on the assumptions of the species' health and shipping impacts. • An adaptive approach to trialling measures and willingness to identify knowledge gaps and find solutions. Uncertainty has not paralyzed action. • Measures established through the support of research and monitoring. • Decisions based on consensus and seeking recommendations and feedback from the group. • Program team that annually evaluates what's working well and what's not. • Transparent and well-communicated initiatives and research online.	• With large investments from the federal government to protect SRKW, the group has been under pressure since 2017 to accomplish more. There have been parallel processes and initiatives led by the federal government, which created confusion on the shared role of government and the ECHO program. • Internal connections and communication between the two Technical Committees and the Advisory Working Group were identified as having challenges. The ECHO program has made recent efforts to improve these. • The program is heavily weighted toward industry, but the program is exploring how to involve more local First Nations and additional ENGO representation to improve the composition of the working group.

WORKING GROUP ON MARINE TRAFFIC AND PROTECTION OF MARINE MAMMALS (G2T3M) IN THE ST. LAWRENCE ESTUARY

Summary

- Established: 2011
  - In 2013, G2T3M became an independent subcommittee of the Comité Concertation Navigation (CCN). CCN was founded in 1998 under the St. Lawrence Action Plan – a Canada-Quebec agreement for the conservation and development of the St. Lawrence River, with the objective to harmonize shipping and recreational boating practices with the protection of ecosystems.
- Trigger: Parks Canada identified the need to address the impacts of commercial shipping traffic on whales in the Saguenay-St. Lawrence Marine Park without compromising shipping activities.
- Goals: to reduce the risk of collisions and shipping disturbances (primary) and underwater noise impacts on whales (secondary).
- Primary species of concern: St. Lawrence Estuary beluga whale, humpback whale, fin whale, minke whale and blue whale.
- Working group structure: Co-chaired by DFO and Parks Canada. The working group has approximately 15 to 20 members, including representatives from the federal government, shipping industry, pilots, academia and economic and environmental non-governmental organizations. In 2019, it created a multi-stakeholder sub-committee focused on communication.
- Management measures: voluntary

Figure 5. Voluntary protection measures established by the G2T3M around the St. Lawrence Estuary beluga critical habitat and the Saguenay-St. Lawrence Marine Park.

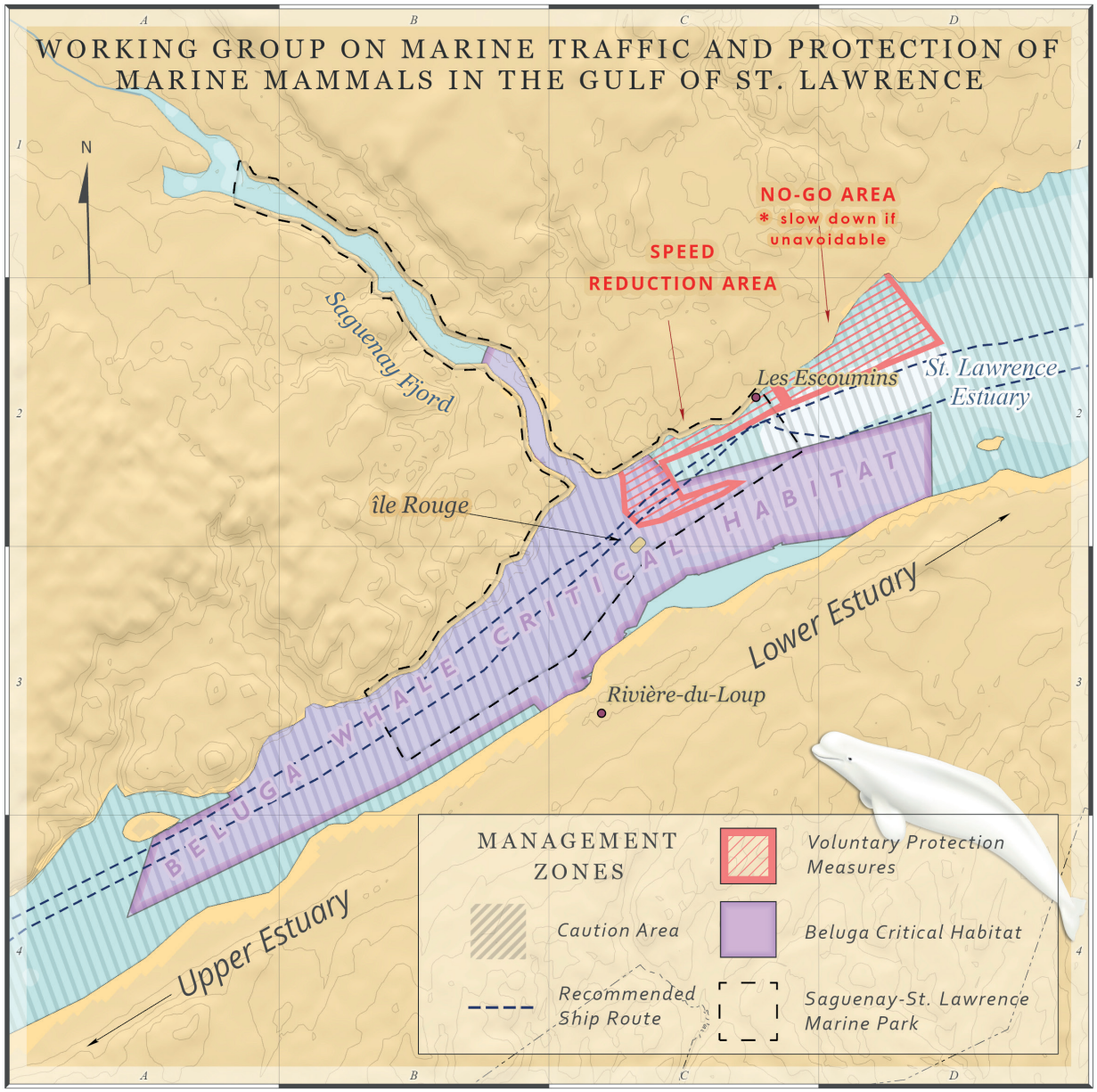

Table 2. Management measures established by the G2T3M from 2013 to 2020. All measures are voluntary.

Year of establishment	Management measures[29]	Description
2014	Recommended navigation route in the Laurentian Channel north of Île Rouge (May 1 to October 31)	A recommended route was established to help minimize the impact of noise on beluga whale habitat highly used by females and their young.
2013	Annual voluntary caution area (May 1 to October 31)	The shipping industry is asked to have heightened vigilance for whales in a caution area. Posting a lookout is recommended to potentially see whales and reduce speed or bypass them to avoid collisions.
2013	Annual speed reduction area (May 1 to October 31)	In a designated speed reduction area, mariners are asked to reduce their speed to 10kt or less through the water and post a lookout to reduce the risk of collisions with whales.
2013	Annual no-go area (May 1 to October 31)	A no-go area was designed to avoid the overlap between commercial shipping and feeding areas, particularly for the endangered blue whale. If unable to avoid the area, ships are asked to slow down to a speed of 10kt or less through the water.

Effectiveness of measures

The Marine Mammal and Maritime Traffic Simulator (3MTSim) was developed to simulate movements and interactions of navigational activities and marine mammals in the St. Lawrence Estuary and the Saguenay Fjord. This tool has been used since 2012 to inform the G2T3M in their search for solutions to lower the risks of vessel collision and underwater noise on large baleen whales in the area. After considering several scenarios, the G2T3M reached a consensus on voluntary measures (see Table 2).

In 2013, the first year these measures were applied, the average speed of ships decreased significantly from 14.3kt to 12.4kt in the speed reduction area. From 2012 to 2016, the average speed was 14.1kt when the speed restriction was inactive and 11.3kt when it was active. The recommended navigation route was a success, with a very high rate of participation the first year (93 per cent in 2014) and subsequent years (93.5 per cent in 2015 and 95.4 per cent in 2016). The success of these measures is largely attributed to pilots from the Corporation of Lower St. Lawrence Pilots (CLSLP), who pilot the vessels in the St. Lawrence River between Les Escoumins and Montréal (a compulsory pilotage area). The CLSLP is a member of G2T3M, and therefore a part of the discussions on finding ways to reduce shipping impacts on whales. CLSLP ensures that management measures get passed on to their pilots.

The avoidance zone has had poor participation and adoption since its establishment in 2013. Mariner behaviour appeared unchanged, and there was no significant speed reduction zone avoidance. This area is outside of the mandatory pilotage area, which may have contributed to the poor compliance.

More recently, G2T3M has been tackling underwater noise and using 3MTSim to see how the current protection measures are protecting beluga whales from shipping noise impacts. Simulations found that there was a 1.6 per cent decrease in the total amount of noise received by belugas and a 5.4 per cent reduction in cumulative noise in the upper estuary, which is critical habitat for females and their young. However, in the speed reduction area, the simulations found a 2.4 per cent increase in cumulative noise from shipping. More research on the impacts of underwater noise is underway. The estuary is a busy waterway, and new coastal and offshore development projects are underway. The threat of noise to cetaceans has been recognized in the region, and a new action plan is now guiding the implementation of measures to reduce the impacts of anthropogenic noise.

29 Chion, et al., 2018.

WHAT'S WORKING WELL ✓	WHAT COULD BE IMPROVED ✗
• Well-balanced representation of participants that are experts in their field and desire to find balanced solutions. • Government-led management of meeting logistics. • Parks Canada's clear mandate to protect marine mammals in the Saguenay-St Lawrence Marine Park. • Balance in the number of participants and annual time commitment (number of annual meetings). • Marine Mammal and Maritime Traffic Simulator (3MTSim) models being used to test scenarios and evaluate scientifically potential successes or failures of proposed measures. • An effective process with an adaptive approach. New measures are first implemented as trials, and compliance and conservation outcomes are monitored. • Balancing of risk reduction and socio-economic impacts.	• In 2019, a change in the representation and request to increase participation from other organizations has resulted in onerous bureaucratic discussions that have discouraged some members. • Measures are voluntary, but some feel that since measures have been in place since 2013 that they could be made mandatory. • Measures, research and initiatives carried by the G2T3M should be better communicated. • Lack of compliance monitoring and measures of success, as in the case of the Area to be Avoided. • No strategic plan – lacks vision and setting clear goals and deliverables.

NORTH ATLANTIC RIGHT WHALE ADVISORY WORKING GROUP IN THE GULF OF ST. LAWRENCE

Summary

- Established: 2017
- Trigger: An unprecedented NARW mortality incident in the Gulf of St. Lawrence, where 12 NARW were found dead. Following the establishment of mandatory measures, the shipping industry expressed the need to discuss the socio-economic and operational impacts of these measures with the Government of Canada.
- Goal: to recommend adaptive and efficient measures based on the best available scientific evidence to reduce risks to NARW while minimizing impacts on maritime industries.
- Target species: North Atlantic right whale (NARW)
- Working group structure: Chaired by Transport Canada. The advisory committee has over 25 members and a technical sub-committee that develops recommendations for management measures.
- Management measures: recommended to and implemented by Transport Canada, primarily mandatory.

Figure 6. Management zones in the Gulf of St. Lawrence in 2020, established by Transport Canada in consultation with the North Atlantic Right Whale (NARW) Advisory Working Group.

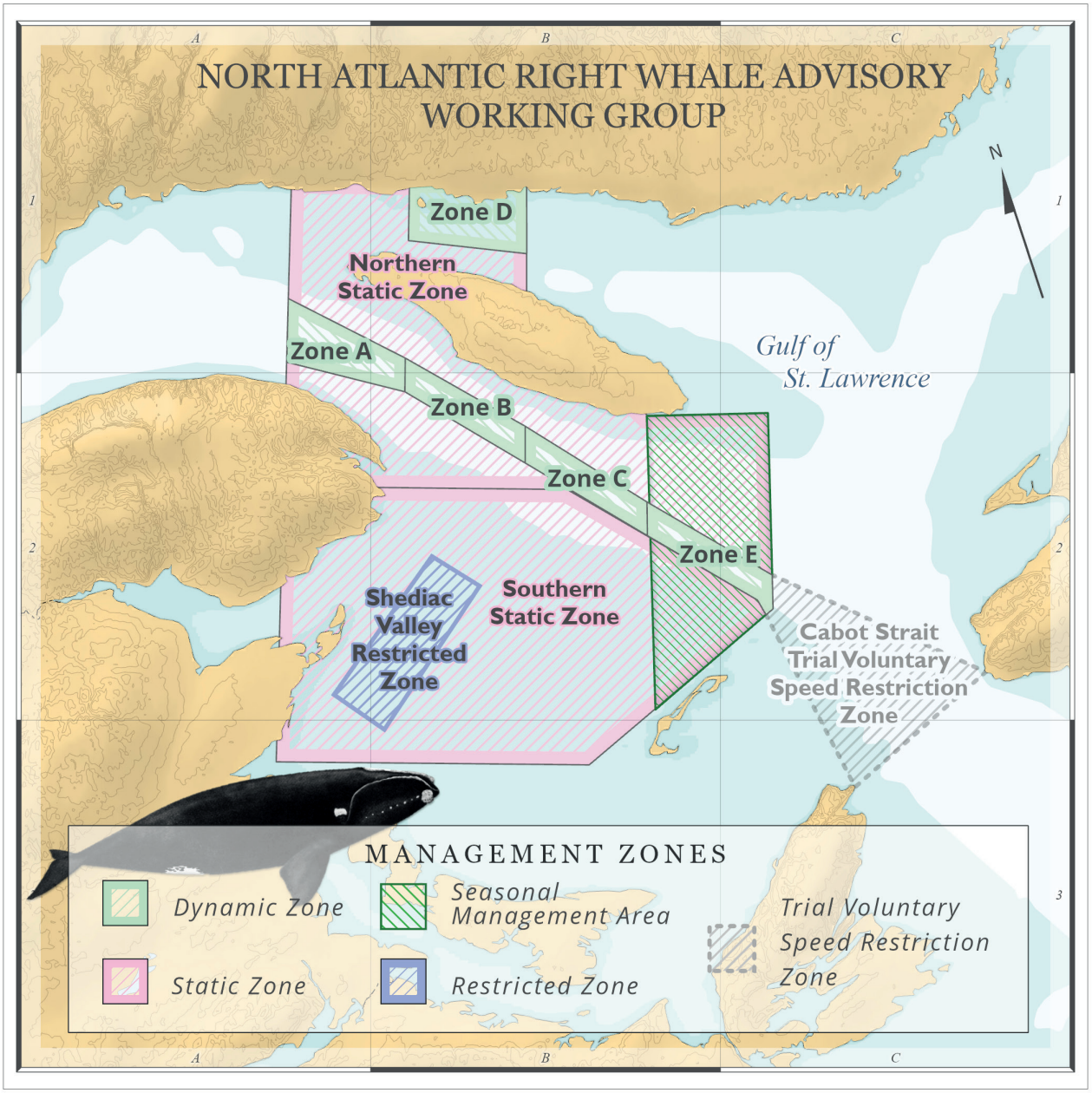

Table 3. Management measures established with consultation by the North Atlantic Right Whale Advisory Working Group from 2017 to 2020.

Year of establishment	Management measures[30]	Description
2020	Trial Voluntary Speed Restriction Zone in Cabot Strait (April 28 to June 15; October 1 to November 15)	Whales migrate through the Cabot Strait in spring and fall. A trial voluntary speed restriction during these times was intended to reduce the risk of lethal collisions with NARW.
2020	Northern and Southern Static Zones (April 28 to November 15)	Vessels over 13 metres (m) in length are required to travel a maximum of 10kt. Smaller vessels were also encouraged to respect this speed limit.
2020	Restricted area in Shediac Valley, mandatory	NARW aggregate and feed in this area starting mid-summer. Vessels above 13m in length must avoid the area or reduce speed to 8kt. Coordinates and dates are based on whale detections.
2020	Seasonal management areas (April 28 to June 30, and 15 days following detection of a NARW in the area)	To provide protection during a time when larger numbers of NARW are migrating into the Gulf of St. Lawrence, vessels longer than 13m travelling through these areas must travel at 10kt or less.
2019	Interim precautionary measure of mandatory 10kt speed restriction (June 26 to August 1)	A maximum speed of 10kt is required for vessels 20m or more in length, travelling in the western Gulf of St. Lawrence in both the static and dynamic shipping zones.
2019	Mandatory static and dynamic shipping zones: mandatory 10kt speed restriction in the static and dynamic zones A, B, C, D, E (April 28 to November 15)	Shipping lanes north and south of Anticosti Island are divided into "dynamic zones" A through E. If a whale is spotted within a dynamic zone, or a zone cannot be cleared, a 15-day mandatory slowdown to 10kt is activated within the dynamic zone. "Clearing" of a zone was done via aerial surveillance in 2019, and acoustic detection by hydrophones was added in 2020. Zones were also closed preventively when aerial surveys could not be conducted to clear the shipping sectors. Initially applicable to vessels 20m or more in length, these restrictions were extended to vessels from 13m on July 8, 2019.
2019 and 2020	Voluntary slowdown period (November 15 to December 31)	Weather conditions were often unfavourable to conduct aerial surveys in late fall into early spring. It was recommended that vessels slow down to 10kt if North Atlantic right whales were confirmed to be in the area, and it was safe to do so.
2018	Mandatory 10kt slow zone and dynamic zones A, B, C, D (April 28 to November 15)	This speed restriction applied to vessels 20m and longer travelling in the western Gulf of St. Lawrence. Dynamic zones in shipping lanes in this area, entering the St. Lawrence Estuary, were introduced in 2018 based on the best scientific evidence on NARW distribution (and their absence in the main shipping corridor) to minimize economic impacts on the shipping sector. A 15-day mandatory slowdown to 10kt for NARW also applies here.
2017	Mandatory 10kt slow speed zone (August 11, 2017, to January 2018)	A 10kt maximum speed when travelling in the western Gulf of St. Lawrence from the Quebec north shore to just north of Prince Edward Island was a temporary mandatory measure for vessels 20m or longer. Vessels under 20m were also asked to respect the speed restriction.
2017	Voluntary 10kt slow speed zone (July 10 to August 11, 2017)	This was the first measure put in place in the western Gulf of St. Lawrence during the NARW mortality event in 2017.

30 DFO, 2018; Transport Canada, 2017, 2019, 2020.

Effectiveness of measures

In 2010, researchers noticed the NARW population start to shift in distribution outside of the existing conservation and critical habitat areas in the Bay of Fundy and Roseway Basin (south of Nova Scotia); after 2015, four times more NARW were found in the Gulf of St. Lawrence as previously. Management measures for NARW were not in place in the Gulf of St. Lawrence, and the shift in distribution to this new area was followed by a crisis in 2017, where 12 NARW were found dead in the Gulf of St. Lawrence.

In 2017, the relative risk of a lethal strike was estimated to have been reduced by 56 per cent within the area of the Gulf of St. Lawrence where a mandatory speed restriction zone was implemented. However, speed restrictions can have unintended consequences and important socio-economic impacts that need to be carefully considered. For example, in 2017 in the Gulf of St. Lawrence, vessels showed an increase in speed before they reached the boundary of the mandatory speed restriction zone when transiting between eastern PEI and northeast New Brunswick – an important corridor for NARW. This increased the risk of a ship strike being lethal to nearly 100 per cent. In 2019, vessels avoided the southern static zone where there were known whale aggregations, until mandatory 10-knot speed restrictions were implemented in the dynamic zone after the death of four NARWs. This resulted in an increasing number of vessels changing their navigational route and transiting the southern static zone to shorten their trip because there was no longer a benefit to navigating farther north to the dynamic zone.

Measures put in place by the Government of Canada have been reactionary to crisis events for NARW in the Gulf of St. Lawrence. In 2018, no deaths occurred. In 2019, eight NARW deaths occurred and reactionary measures were put in place following those deaths, including the addition of dynamic sector zone E and speed restrictions applying to vessels above 13m. In 2020, a combination of seasonal and dynamic management areas kept ships moving at slow speeds or diverted them from areas where NARW were known to be present. No NARW were killed by ship strike in Canadian waters as of the date of this paper. However, preliminary results of the voluntary slow-down in Cabot Strait in the spring showed a participation rate of only 43 per cent in the spring. This was attributed to a combination of factors including existing slowdown areas that extend through the rest of the Gulf of St. Lawrence, periods of bad weather that would make slow transiting unsafe and logistical and economic impacts relating to the COVID-19 pandemic during that time period.

Interesting fact: Before 2017, conservation measures for NARW were focused in in the Bay of Fundy and Roseway Basin (south of Nova Scotia) where the population was aggregating in the summer. In the early 2000s, it became evident that relocating the International Maritime Organization (IMO) traffic separation scheme (TSS) in the Bay of Fundy would reduce the probability of collisions with NARW by 80 per cent. The new TSS was adopted in 2002 and represented the first time that a shipping lane had been moved to decrease the risk of ships colliding with whales, paving the way for a number of subsequent proposals worldwide.

WHAT'S WORKING WELL ✓	WHAT COULD BE IMPROVED ✗
• The group is functional and well-balanced. There are nice exchanges and collaboration between the technical sub-group, the working group and government bodies. • There is a flexibility to this working group that allows for new members or subject-matter experts to join or participate as needed. Yet the same core group of participants has been involved since the beginning, which increases effectiveness. • The industry is really involved in trying to be part of the solution. • Best practices were drawn from other Canadian experiences. • There has been real recognition of the impacts on maritime safety and economic imperatives. • Enforcement and compliance have been very high.	• Lack of scientific evidence and transparency of unpublished information to support decision-making. • Enforcement is perceived as extremely rigid and lacking consideration for operational errors. • The reaction time for adaptive management is not optimal to minimize risks to NARW. • Lack of fishing representatives on the working group. (This issue was addressed in 2020.) • There is a perceived imbalance between the navigational needs of Canadian vs. international companies destined for Canadian ports. • Migratory areas should be considered for management.

BAFFINLAND IRON MINES CORPORATION MARINE ENVIRONMENT WORKING GROUP (MEWG)

Summary

- Established: 2013
- Trigger: The Baffinland Iron Mines Corporation (Baffinland) Certificate for its Mary River Project has specific conditions relating to the marine environment. The Baffinland MEWG was established to provide advice and recommendations.
- Goal: to act as an advisory group for Baffinland to establish cooperative environmental arrangements with MEWG members and Inuit communities to preserve the natural environment.
- Working group structure: Chaired by Baffinland. The working group has 10 to 15 members and four observers.
- Management measures: developed alongside and integrated in Baffinland monitoring programs.

Figure 7. Baffinland Iron Mines Corporation's Mary River Project development and marine monitoring program area by the Baffinland Iron Mines Corporation MEWG.

Table 4. Monitoring programs established by the Baffinland Iron Mines Corporation MEWG from 2013 to 2018.

Year of establishment	Monitoring programs[31]	Description
2018	Passive Acoustic Monitoring Program (August 4 to September 28)	Documents ambient underwater noise levels and identifies marine mammal presence. Evaluates shipping noise levels in the project area.
2018	Ship-based Observer Program (July 28 to August 7 and September 28 to October 17)	Observes responses from narwhals and other marine mammals to shipping activities from the icebreaker *MSV Botanica* in Milne Inlet and Eclipse Sound. Seabird information is also collected.
2018	Bruce Head Vessel-based Monitoring Program (August 7 to August 14)	Observes narwhal response to shipping activities along the Northern Shipping Route. This was the first monitoring survey to be undertaken from a vessel near Bruce Head.
2017	Narwhal Tagging study (July 31 to September 11)	In collaboration with DFO's existing tagging program, 20 narwhals were live-captured in Tremblay Sound and tagged with biologgers to monitor lateral movements, dive behaviour and habitat use.
2015	Marine Mammal Aerial Survey (August 1 to September 17)	Surveillance flights in Eclipse Sound, Milne Inlet and Pond Inlet were conducted to estimate narwhal abundance and distribution and other marine mammal species in the project area.
2015	Annual Milne Inlet Marine Environmental Effects Monitoring Program and Aquatic Invasive Species Monitoring Program (2015 to 2018)	Ballast water and vessel hulls were video monitored. Data was collected on water quality, sediment quality, benthic epifauna and macroflora, fish and mobile epifauna and aquatic invasive species. Baseline studies had been conducted in 2013 and 2014.
2013	Annual Bruce Head Shore-based Monitoring Program (open-water season; 2013 to 2017)	Narwhal response to shipping activities along the Northern Shipping Route was monitored by observing them from the top of Bruce Head.

The Baffinland MEWG focuses primarily on monitoring programs but also provides advice to the company on voluntary management measures related to shipping impacts on marine mammals.

Below are examples of measures put in place:

- Ship speed limits (9kt), designated anchoring areas, routing modifications, icebreaker transit limitations, no-go zones in key sensitive habitat areas, limited vessel idling and ballast exchange restrictions (ships can release ballast water at the dock, but not where they anchor; e.g. in Ragged Island, outside of Milne Inlet).
- Marine mammal observers: there are now community marine mammal observers on escort vessels at the beginning and end of the shipping season (July to October).

The Baffinland MEWG is also addressing multiple environmental impacts through its Marine Environmental Effects Monitoring Program and Aquatic Invasive Species Monitoring Program.

31 Baffinland, 2020a; Baffinland, 2020b.

Effectiveness of measures

Because the MEWG is focused on monitoring, it is difficult for the Baffinland MEWG to determine if the measures established by the company are yet effective. The discussions for the MEWG focus mainly on the specifics of the science and monitoring programs. A variety of reports and annual updates are published on the Baffinland website.

Monitoring during the 2018 season showed that 69 per cent of vessel travel was faster than 10kt, with the maximum speed from an ore carrier at 18.4kt. Compliance with the voluntary speed reduction of 9kt in the Northern Shipping Route varies among ship companies and vessel type. Recommendations in 2019 were to continue to provide instructions for all vessel types travelling at speeds not exceeding 9kt in the Northern Shipping Route. No ship strikes with marine mammals or seabirds have been reported since the beginning of the Baffinland Mary River Project.

Evidence of prolonged displacement of narwhals due to the presence of ships was observed in 2018, with a decreased presence in the region. This stands in contrast to results from the Bruce Head Shore-Based Monitoring Program from 2014 to 2017, which did not observe a change in narwhal abundance in response to increased shipping. Results from the 2017 Narwhal Tagging Program showed similar behaviour responses, from no obvious response when ships were present to temporary and localized displacement and changes in behaviour. Both monitoring programs are planned to continue with improvements, such as supplementing visual observations with drone footage and increasing the frequency of GPS transmissions when setting up tags.

Phase II of the Mary River Project, which aims to expand the railway south and increase production, is in development. DFO presented their concerns on the expansion during a public hearing in November 2019. Some of the main shipping-related concerns include unaccounted impacts of potential alternative shipping routes, impacts from increased shipping on marine mammals, and ballast water discharge on the marine environment.

WHAT'S WORKING WELL ✓	WHAT COULD BE IMPROVED ✗
• The group is effective at ensuring that Baffinland Iron Mines Corporation is communicating what they're doing to the various groups. There are open discussions about what's working and what's not. • Different organizations (federal agencies, community members, NGOs, etc.) are talking to one another and contribute technical expertise. • At the moment, members are satisfied with Baffinland Co. chairing the meetings, as it is part of the project certificate. • There has been an improvement in transparency from Baffinland Co. in the past few years. For example, the company has started to append member comments to the meeting minutes. • The group feels that they have been able to get more accomplished recently via the environmental review process for Phase II of the project.	• The group participants are questioning the effectiveness of their work as they are only advising Baffinland but cannot implement regulations. • The communication between Baffinland and the MEWG is not optimal. The group will hear back in the next six to twelve months about whether Baffinland made changes or not following some recommendations. • It is unclear how changes are implemented, and the process is not transparent. • Effectiveness of management measures implemented by Baffinland needs to be evaluated. • There could be a better representation of local Inuit communities and of federal government expert scientists.

CONCLUSIONS: LESSONS LEARNT AND RECOMMENDATIONS

As demonstrated by the work accomplished by the working groups, substantive resources are allocated to mitigate shipping impacts on cetaceans and more particularly on the NARW, the St. Lawrence Estuary beluga whale and the SRKW in Canada. More recent measures are showing some long-needed success; both the ECHO program and the NARW Working Group were established after years of inadequate actions to reduce threats to these endangered species.[32]


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Measures reviewed in this report are part of a larger suite of both voluntary and mandatory measures to protect cetaceans in Canada and need to be considered within that context. Best practices will be highly specific to each working group's purpose, geographic area and stakeholders. There are, however, some good practices common between these case studies that can be adapted and applied in just about any geography, depending on conditions.

Lesson: Whereas cetaceans have relatively stable distributions, the most effective measure is to separate these significant areas and key hotspots from vessel traffic. This can be accomplished by modifying navigation routes or designing vessel exclusion zones where vessel traffic is prohibited, thus significantly reducing the risk that ships encounter cetaceans or disrupt cetaceans' critical life functions. In the context of these working groups, such measures were developed for SRKW, NARW,[33] blue whale feeding aggregations and beluga nursing habitats.

Recommendation:

- **Protect ecologically or biologically significant areas where cetaceans have relatively stable distributions by first modifying routes or designing vessel exclusion zones in high-risk areas.**

32 Office of the Auditor General of Canada, 2018.
33 Transport Canada, 2020c.

Lesson: Slowing vessels down has been a key management measure to reduce the risk of both ship strikes and underwater noise from shipping on cetaceans in Canada. The benefit of slowdown for underwater noise has been shown by the extensive research and monitoring conducted by the ECHO program.[34] Slowdown is increasingly viewed by many to benefit not only cetaceans but the environment in general, including lowering greenhouse gas emissions, air pollution and black carbon.[35]

Recommendations:

- **Encourage speed restrictions in known cetacean habitats, especially high-risk areas;**
- **Evaluate co-benefit of slowdowns for cetacean conservation (ship strike and noise reduction) and for the environment to better quantify benefits versus costs of these regional measures.**

Environmental co-benefits of speed reduction

Globally, reducing ship speed by 20 per cent could lead to a substantial decrease in fatal ship strikes (22 per cent), underwater noise pollution (67 per cent) and greenhouse gas emissions (24 per cent).[36]

Lesson: All working groups heavily focus their work on one species apart from G2T3M. For example, ECHO lists other species in their objectives, yet few studies evaluate management on species other than SRKW. In the Gulf of St. Lawrence, unpublished scientific evidence suggests that slowdowns designed to protect NARW have increased vessel strike risks to endangered blue whales in some regions.[37]

Recommendation:

- **Consider all endangered, threatened and protected species in the area when designing mitigation.**

Lesson: In-depth interviews emphasized that effective management is dependent on the process – how measures are informed and advanced by working group members and other stakeholders. Actions and measures are almost always strengthened when there is goodwill, trust and a common understanding among stakeholders (particularly industry) of the threats to cetaceans from potential actions in the concerned geography. These can be achieved through effective working groups.

34 Tollit, Joy and Wood, 2017; Wladichuk, et al., 2018; Enhancing Cetacean Habitat and Observation (ECHO) Program, 2018.
35 Faber, et al., 2019; Joy, et al., 2019; Leaper, 2019; A.O. MacGillivray, et al., 2019; Reynolds, 2019; Chion, et al., 2018; Conn and Silber, 2013.
36 Reynolds, 2019.
37 Taggart, 2020.

Best practices:

- Balanced representation and collaborative members. Groups of 20 to 25 members appears to be a manageable size, while having all interested parties at the table. Collaboration and trust are strongest when it is the same people (not organizations) involved and working together.
- Consensus-based decision making. Groups that work best are those in which every member feels heard and respected. The purpose is to reconcile different interests and balance the imperatives of environmental, economic and social sustainability.
- Leadership and an independent chair. It is important to have a strong chair (or co-chairs) who is neutral and unbiased. They must be able to keep discussions moving forward and moderate potential debates.
- Logistics management. Having a designated person (or outside firm) handle the agenda, minutes, invitations and follow-ups is essential to keeping a group productive and accountable.
- Proper funding. Adequate long-term funding is needed to support initiatives, research and monitoring, and administrative aspects of the working group.

Lesson: Relying on evidence from scientific, local and Indigenous sources helps members build consensus. It ensures holistic assessments, issue prioritization and solution testing and implementation. An evidence-based approach encourages ongoing monitoring and evaluation to establish baseline data, measure compliance and, ultimately, determine the success of management measures. The implications of any operational measures for navigational safety and conservation efforts must be carefully considered to inform management measures.

Recommendation:

- **Use science-based risk assessment and solutions.**

Lesson: Trials have provided opportunities to test and evaluate mitigation measures and to refine measures the following year. Voluntary actions may be a way to begin and adapt through time to more formalized, sustained measures. For example, some members of G2T3M now feel that after six years of voluntary measures, their measures could become mandatory.

Recommendation:

- **Take an adaptive management approach to adjust to new knowledge when required.**

Advantages of taking a voluntary approach Voluntary measures work best in creating engagement among members and a climate of collaboration and trust among participants. When measures are voluntary, it is easier to propose ideas and test pilot measures, build evidence to support broader implementation and increase industry stewardship and ownership of an issue. However, for member compliance under voluntary measures, there needs to be consensus and social acceptability around a given issue as well as a willingness to act.

Lesson: In some geographies, operational measures that are place-based alone (lateral displacement, restricted areas or slowdowns) may not be enough to mitigate harm from vessel-generated underwater noise, particularly when shipping traffic is increasing irrespective of such measures, and noise pollution is thus also increasing. This is the case for SRKW and St. Lawrence beluga whales, which are already experiencing high levels of noise and are further threatened by new developments and their resulting increase in shipping traffic. In these situations, source reductions are necessary either through quieter ships or setting a maximum limit to shipping traffic. Mitigation can be driven by industry through certification or port-led incentive, both schemes that have proven very effective for protecting the SRKW.

Recommendations:

- **Encourage ships to employ noise reduction technologies;**
- **Encourage port-led incentive measures and industry certification schemes;**
- **Encourage the development of quantifiable noise-reduction targets and/or noise thresholds to regulate shipping.**

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APPENDIX

Mapping methodology

In order to identify high-risk areas, spatially explicit data was acquired for both cetacean observations and ship transits. The data are described in the table below:

Data	Source	Processing
Canada-wide AIS data	ExactEarth	Hourly AIS point data converted to raster format.
East Coast use areas	**Whalesightings Database, Team Whale, Fisheries and Oceans Canada, Dartmouth, NS, [20200214]*** and Marine Mammal Observer Network (MMON) collection program from the shipping industry 2015-19	Observation points were grouped into 50km^2 grid bins. Bins were then categorized by the 90th percentile (high), 50th percentile (medium use) and 0th percentile based on observation counts.
West Coast cetacean use areas	Mariners Guide to Whales, Dolphins and Porpoises of Western Canada[38]	Relative abundance maps were georeferenced and abundance categories (medium and high) were vectorized using an Iso-Cluster classifier based on the original abundance colour ramp.
Arctic cetacean use areas**	Arctic Trails Research Group[39]	Summer observation points were grouped into 50km^2 grid bins. Bins were then categorized by the 90th percentile (high), 50th percentile (medium use) and 0th percentile based on observation counts.

* Please note the following caveats regarding data in the Whale Sightings Database: The quality of some of the sighting data is unknown. Most sightings are collected on an opportunistic basis, and observations may come from individuals with a variety of expertise in marine mammal identification. Most data have been gathered from platforms of opportunity that were vessel-based. The inherent problems with negative or positive reactions by cetaceans to the approach of such vessels have not yet been factored into the data. Sighting effort has not been quantified (i.e., the numbers cannot be used to estimate true species density or abundance for an area). Lack of sightings do not represent lack of species present in a particular area.[40]

** Data was obtained in a pre-gridded format based on observations for both Cetaceans (n = 240) and pinnipeds (n = 165). As such the use areas identified in this region are relevant to both taxonomic groups.

38 Coastal Ocean Research Institute. 2016. Mariner's Guide to Whales, Dolphins, and Porpoises of Western Canada. portvancouver.com/wp-content/uploads/2017/07/Mariners-Guide-to-Whales-Dolphins-Porpoises-of-Western-Canada.pdf

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Analysis

Once the data was processed, overlay maps were constructed in ArcGIS Pro in order to highlight the areas of overlap between cetacean use and shipping. In addition, zonal statistics were calculated to quantify the amount of ship traffic within the different cetacean use areas. These numbers are reported in the table below and represent the average hours (AIS points) of vessel traffic per 100km^2 of cetacean habitat. Note that this information was derived from all available 2017 AIS data.

	Habitat Use Classification		
Region	**Observed Use**	**Medium Use**	**High Use**
Arctic	6hrs/100km^2	3hrs/100km^2	14hrs/100km^2
East Coast	78hrs/100km^2	203hrs/100km^2	310hrs/100km^2
West Coast	NA	263hrs/100km^2	1,102hrs/100km^2

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