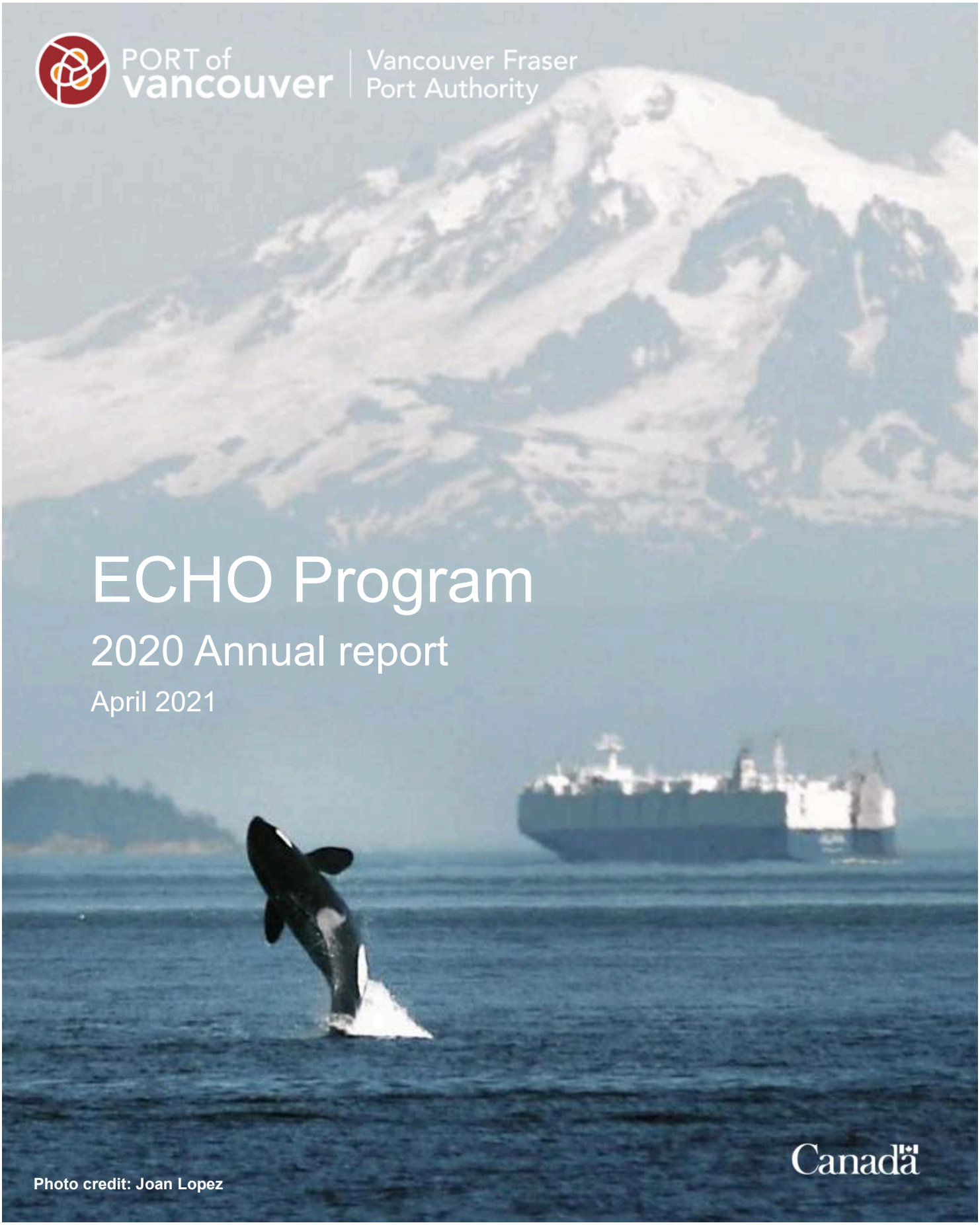
PORT of vancouver
Vancouver Fraser Port Authority
ECHO Program
2020 Annual report
April 2021
Canada
Photo credit: Joan Lopez

Message from the vice president, environment, community and government affairs

Environmental protection is a key part of both the port authority's federal mandate and our vision for the Port of Vancouver to be the world's most sustainable port. As part of these commitments, we launched the Enhancing Cetacean Habitat and Observation (ECHO) Program in 2014 to better understand and manage the impacts of marine shipping on at-risk whales and specifically, the endangered southern resident killer whale (SRKW) population.

Despite the many unexpected challenges posed by the COVID-19 pandemic, the ECHO Program continued to spearhead important research and education activities throughout the year, reaching record-high participation rates for two of its voluntary underwater noise reduction initiatives.

The strong participation of the ECHO Program's many partners and advisors during a year marked by tremendous uncertainty illustrates their continued dedication to this important effort to support the recovery of endangered SRKW population in our region.

New in 2020, we also conducted our first trial of a voluntary slowdown of ships in the known SRKW foraging area of Swiftsure Bank, a milestone that couldn't have been achieved without the participation of our partners in the United States.

Across the border, we are encouraged to see the successful launching of the Quiet Sound program in Washington, an initiative modelled on the ECHO Program that complements ongoing collaborative efforts to protect SRKWs in the Salish Sea and Puget Sound regions.

Looking ahead, we will continue to advance our long-term vision of driving change towards quieter vessel design and technologies. Towards this goal, we are working with ship classification societies across the globe to align the measurement and analysis of underwater noise emissions and associated 'quiet' ship notations.

Importantly, with Transport Canada's installation of the Boundary Pass underwater listening station, the breadth of data available to the ECHO Program will continue to expand, providing a clearer picture of the underwater soundscape and its correlations with vessel activity and design.

As we look back on 2020, we are truly proud of the unwavering support our advisors and partners showed us during an exceedingly challenging year, and we extend our sincere gratitude for their continued participation.

We look forward to continuing to work collaboratively with our regional, national and international advisors and partners towards cleaner and quieter oceans in Canada and beyond.

Duncan Wilson
Vice president, environment, community and government affairs
Vancouver Fraser Port Authority

Contents

About this report

This report covers activities of the Vancouver Fraser Port Authority-led Enhancing Cetacean Habitat and Observation (ECHO) Program in the 2020 calendar year, and also provides a brief overview of the year to come. Further details including project summaries, full technical project reports, and past annual reports can be found on our website at portvancouver.com/echo.

About the Vancouver Fraser Port Authority and the Port of Vancouver

As a Canada Port Authority, we are mandated under the *Canada Marine Act* to enable the nation's trade objectives, ensuring goods are moving safely, while protecting the environment and considering local communities.

The Port of Vancouver plays a vital economic role in connecting Canadians with the global marketplace, affecting the well-being of communities and businesses across the country. Guided by a vision for the Port of Vancouver to be the world's most sustainable port, we work with government, industry, Indigenous peoples and local communities to shape the future of the port for the benefit of all Canadians. To us, a sustainable port delivers economic prosperity through trade, enables thriving communities, and maintains a healthy environment.

About the ECHO Program

The ECHO Program is a port authority-led regional collaborative initiative aimed at better understanding and reducing the impacts of shipping activities on at-risk whales throughout the southern coast of British Columbia.

The ECHO Program was launched in 2014 in response to growing commercial marine activity in the region, including the movement of ships through critical southern resident killer whale habitat when calling at the Port of Vancouver. The ECHO Program focuses on the geographic area outlined in the map below (Figure 1). This map also shows the shipping lanes for vessels calling the Port of Vancouver that overlap directly with critical habitat for the endangered southern resident killer whale population.

We collaborate with government agencies, the marine transportation industry, Indigenous communities, conservation and environmental groups, scientists, and others to advance ECHO Program projects beyond the Port of Vancouver, within the Salish Sea, as well as the waters off the western coast of Vancouver Island and the entrance to the Strait of Juan de Fuca.

Thanks to the ongoing support of our many program advisors, partners and participants, in 2020 we:

- Facilitated the design and implementation of various voluntary noise reduction initiatives and research projects
- Secured the participation of thousands of vessels in voluntary initiatives to slow down or laterally displace vessels away from key whale feeding areas, leading to measurable decreases in underwater noise
- Presented program research findings to organizations across British Columbia, Canada, and the globe on the issue of underwater noise and its impact on marine ecosystems
- Advanced research into quiet ship design in order to better understand the correlations between vessel characteristics and underwater noise emissions

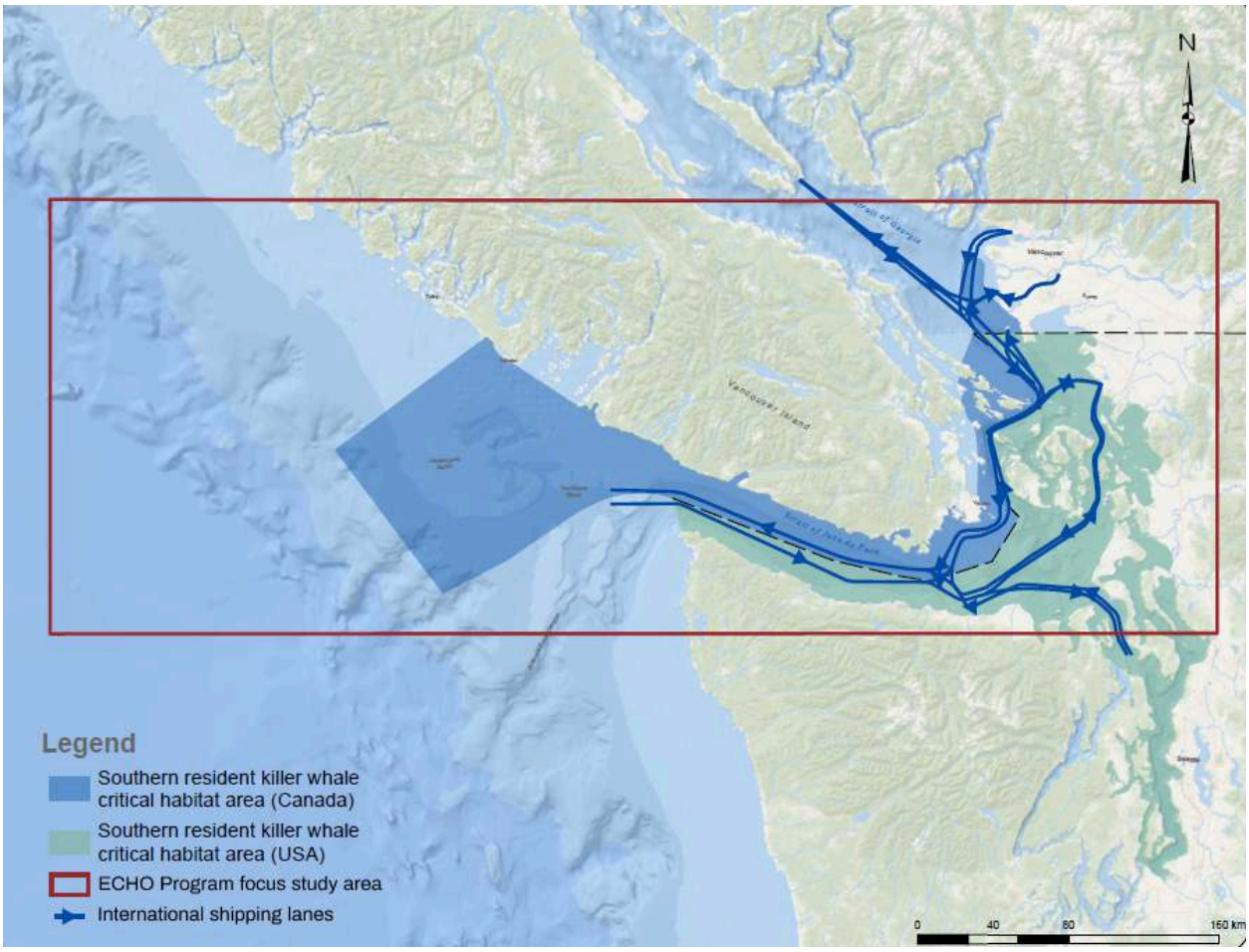

Figure 1: Geographic representation of ECHO Program focus study area

Geographic representation of ECHO Program focus study area, southern resident killer whale critical habitat, and international shipping routes. The blue shaded area indicates Canadian critical habitat and green shaded area indicates U.S. critical habitat for southern resident killer whales. The ECHO Program focus area incorporates Canadian and portions of U.S. critical habitat for southern resident killer whales as well as offshore foraging areas for large marine mammals.

Our approach to collaboration

Like all organizations in 2020, the Vancouver Fraser Port Authority adjusted our approach to collaboration in order to comply with public safety guidelines regarding COVID-19. Given that the ECHO Program's voluntary initiatives require ongoing logistical coordination with over 100 organizations, we had to quickly adapt our approach in order to keep the planning and implementation of these initiatives on schedule. Over the course of 2020, we increased the frequency of our communications with our partners and advisors, enabling the program's planned initiatives to continue without major disruption.

Below is an overview of our committees, funding partners and other program and project collaborators who have contributed to the success of the ECHO Program in 2020. A full list of members can be found on our website at portvancouver.com/echo/partners-advisors.

Advisory working group and technical committees

The ECHO Program is guided by the advice and input of a volunteer advisory working group and associated technical committees, which greatly assist the ECHO Program management team in deciding which scientific studies, educational initiatives, and other projects should be advanced to best meet program objectives. The advisory working group and most technical committee meetings are independently facilitated by the Fraser Basin Council.

Advisory working group

The ECHO Program advisory working group was first convened in 2014. It brings together a broad spectrum of representatives with relevant backgrounds, perspectives, and interests from both Canada and the United States, who share the common goal of reducing threats to endangered whales. The role of the advisory working group is to provide the ECHO Program management team with timely input, advice and recommendations during the development and execution of the program's projects and initiatives. While the advisory working group normally meets in person three times a year, due to the global pandemic, they met virtually on six occasions in 2020.

Vessel operators committee

The vessel operators committee was established in December 2016 to help provide the ECHO Program with advice, support, and guidance on how potential voluntary operational underwater noise reduction initiatives may impact the shipping industry. This includes providing feedback on navigational safety and economic factors that may affect the marine industry's participation in underwater noise reduction initiatives. The vessel operators committee met virtually seven times in 2020.

Acoustic technical committee

First convened by the ECHO Program in 2015, the acoustic technical committee's role is to provide technical and scientific advice in the development and execution of ECHO Program research, mitigation, and management projects. The committee is composed of marine mammal biologists, acousticians, naval architects, and others with specific technical knowledge around the sources and effects of underwater noise. The acoustic technical committee meets on an as-needed basis.

Conservation agreement management committee

The conservation agreement management committee was formed by the nine signatory parties of the *Species at Risk Act, Section 11 Conservation Agreement to Support the Recovery of the Southern Resident Killer Whale*. This first of its kind conservation agreement was signed on May 20, 2019. The purpose of the committee is to oversee the implementation and effectiveness of the conservation agreement, and to provide a collaborative forum to discuss and resolve issues regarding the interpretation and implementation of the agreement, as needed. In May 2020, the conservation agreement management committee and members of the advisory working group met virtually to provide input into the development of the year two conservation agreement measures. In July 2020, the conservation agreement committee met again to finalize the year two measures and the Conservation Agreement Year 1 annual report.

Participating in government initiatives

Since the beginning of the ECHO Program in 2014, Fisheries and Oceans Canada and Transport Canada have participated in the ECHO Program advisory working group and other technical committees.

The federal government, including Transport Canada, Fisheries and Oceans Canada, and Environment and Climate Change Canada, announced its Oceans Protection Plan in 2016 and the Whales Initiative in 2018, and shortly thereafter convened five technical working groups and an Indigenous multi-stakeholder advisory working group to inform government measures to help protect southern resident killer whales. In 2020, the port authority, through the ECHO Program, provided regular updates on our voluntary initiatives to the Indigenous multi-stakeholder advisory working group.

The port authority also participated in other related government engagement opportunities including Transport Canada's Traffic Separation Scheme Feasibility Study and Fisheries and Oceans Canada's Ocean Noise Strategy discussion document.

Funding partners and in-kind contributors

In 2014, the ECHO Program received seed funding from the Vancouver Fraser Port Authority and additional support from government and industry partners. Over the years, other stakeholders have also committed direct financial support or in-kind contributions of equipment, resources, and staffing at either the program level or for specific projects.

2020 marked the completion of the first year of a five-year funding agreement with Transport Canada, through the Marine Research and Development Innovation Centre supports the ECHO Program projects and initiatives to better understand and manage threats posed by underwater vessel noise. As part of the agreement, Transport Canada receives quarterly updates and reports on the relevant projects and initiatives conducted through the ECHO Program.

Year in review: 2020 ECHO Program key projects and initiatives

The ECHO Program leads, collaborates on, and supports a series of short and long-term projects designed to better understand and manage the effects of underwater noise on at-risk whales. Towards this goal, six notable projects advanced in 2020 are highlighted below:

1. Haro Strait and Boundary Pass voluntary vessel slowdown

A key part of the ECHO Program is the voluntary slowing of ships to reduce noise in critical habitat for whales, known as slowdowns. Based on historical information indicating the presence of southern resident killer whales in Haro Strait and Boundary Pass is highest between June and September, the 2020 slowdown timing was set to begin any time after June 1 and end any time between September 30 and October 31, depending on whale presence. This was the fourth year of the slowdown in Haro Strait and the second year of the slowdown extension into Boundary Pass.

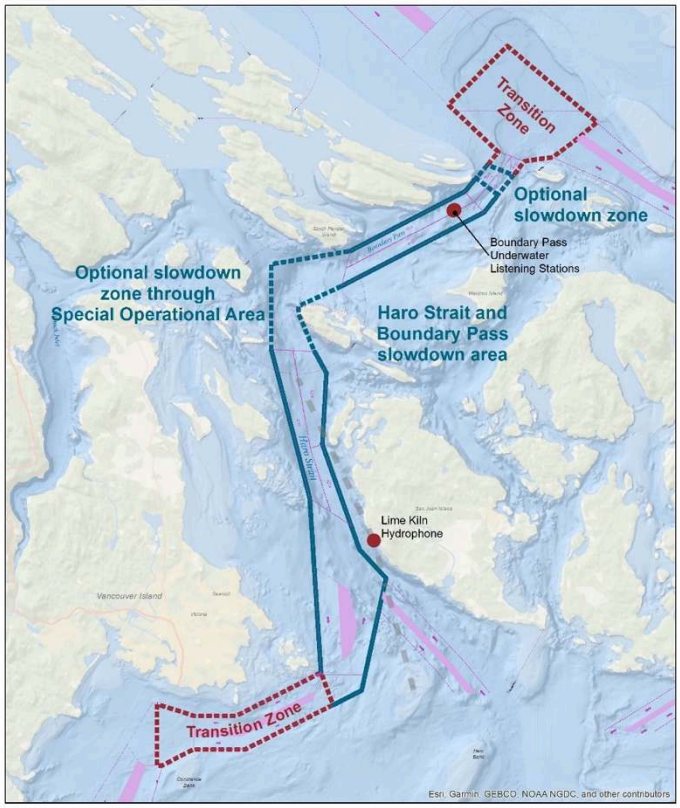

Figure 2: Haro Strait and Boundary Pass voluntary ship slowdown area

The official start to the slowdown began on July 1 when southern resident killer whales were first seen in the slowdown area by on-land observers and acoustically detected by hydrophones. Southern resident killer whales were seen several times in the slowdown area throughout the month of October so the slowdown end date was extended to October 31.

Of the 1,980 piloted vessel transits through Haro Strait and Boundary Pass during the 2020 slowdown period, the BC Coast Pilots reported that 91% (1,803 of 1,980) of ships participated in the slowdown. This was a record high rate, exceeding our 2020 participation goal of 85%. The primary reasons noted by BC Coast Pilots for vessels not participating in the slowdown related to the vessel needing to meet a schedule or a tidal window.

Although ambient noise results are still being analyzed for 2020, analysis showed a ~3 decibel (dB) reduction in ambient noise or a 50% reduction in sound intensity. Final results for the 2020 slowdown will be published by late spring 2021.

2. Strait of Juan de Fuca voluntary inshore lateral displacement

For the third year in a row, tug boat operators were asked to move away, or laterally displace, from the southern coast of Vancouver Island during the summer to reduce underwater noise in an important southern resident killer whale feeding area. This year, between June 1 and October 31, 2020, 82% (138 of 168) of tug boat transits spent more than half of their transit in the inshore lateral displacement zone or the outbound shipping lane in the Strait of Juan de Fuca. This high rate exceeded our 2020 participation goal of 80%.

Although the number of tug boat transits in the Strait of Juan de Fuca is relatively low compared to other large commercial vessels, the initiative resulted in a 4-7 dB noise reduction for each individual tug displacement and an associated 60-80% reduction in sound intensity. Ambient noise results are still being analyzed for the 2020 lateral displacement and final results will be published in late spring 2021.

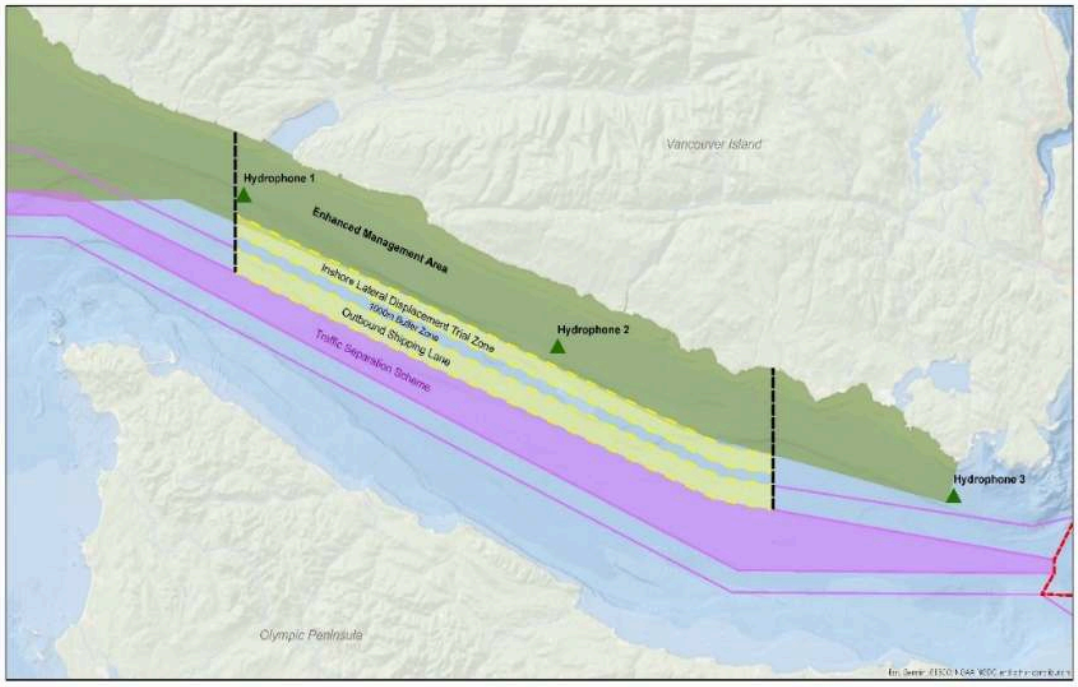

Figure 3: Strait of Juan de Fuca voluntary inshore lateral displacement area

3. Swiftsure Bank voluntary ship slowdown trial

In collaboration with the ECHO Program's partners in both Canada and the United States, a voluntary vessel slowdown trial for outbound ships was implemented from August 1 through October 31, 2020 at Swiftsure Bank, a known feeding area for endangered southern resident killer whales and other at-risk marine mammals. This research trial was implemented in order to evaluate the level of voluntary participation and underwater noise reduction that could be achieved by slowing down in non-piloted waters through the area.

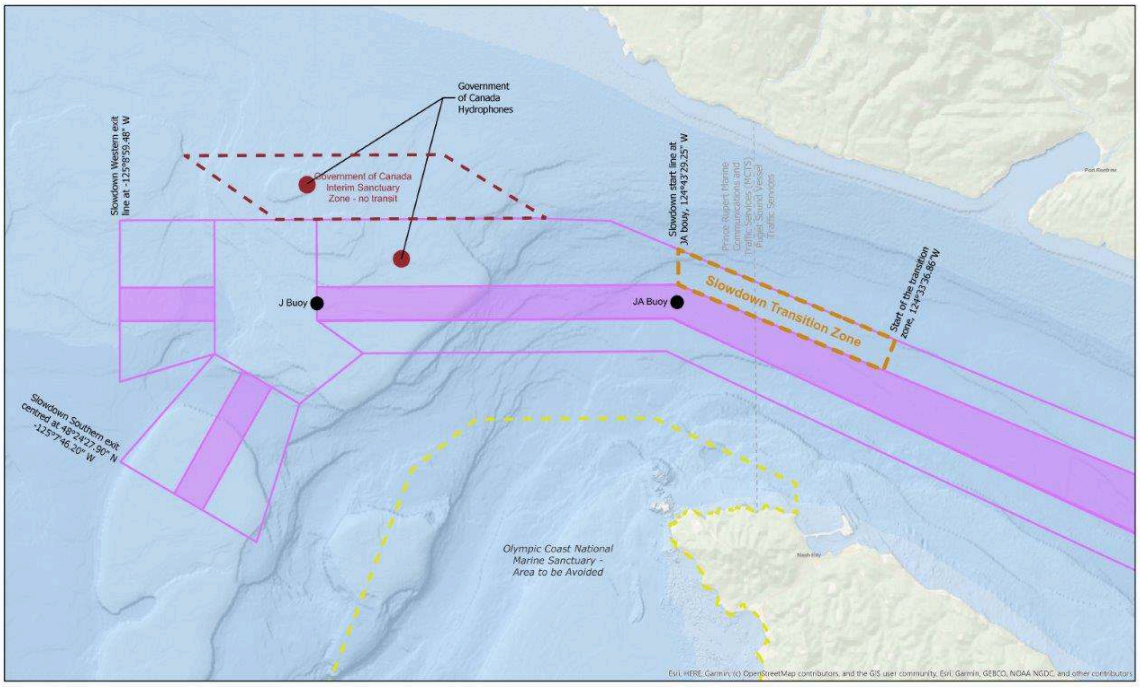

Figure 3: Swiftsure Bank voluntary ship slowdown trial

Given the pressures facing the marine industry globally due to COVID-19, the ECHO Program team recognized that it could be challenging to achieve high participation levels during this trial. For this reason, no participation goal was set for the trial but vessel operators were encouraged to participate if it was deemed safe and operationally feasible to do so.

The target slowdown speeds mirrored those of the Haro Strait and Boundary Pass slowdown for simplicity and ease in communications. Outbound vessel operators were asked to voluntarily slow down to 14.5 knots or less through the water for vehicle carriers, cruise ships, and container vessels, and 11.5 knots or less through the water for bulk cargo ships, tankers, and government vessels.

Data regarding the vessel's intention to participate was captured with the help of both the Canadian and U.S. Coast Guards as well as both the BC Coast and Puget Sound pilots. Participation rates were determined using automatic information system data providing speed over ground, followed by a correction for tidal currents to calculate the speed of vessels through the water. Exceeding all of our expectations for a new trial in its first year, 82% (861 of 1,044) of vessels participated by slowing down to within one knot of their target speed.

Whale presence was monitored and recorded at Swiftsure Bank and the Strait of Juan de Fuca through dedicated boat surveys undertaken by Pacheedaht First Nation within their territorial waters. Ambient noise results and marine mammal survey results will be available in the full report in late spring 2021.

4. Vessel underwater noise correlation study

In 2020, we completed phase one and two of a vessel noise correlation study investigating the relationships between vessel design and operational characteristics and underwater radiated noise, seeking to understand if certain characteristics were correlated with louder or quieter vessels.

To conduct this study, the port authority retained a team led by JASCO Applied Sciences (Canada) Ltd., the developer of the automated vessel source level measurement software used by the ECHO Program, supported by subject matter experts in statistics, noise control engineering, and naval architecture from ERM, Acentech, and Bay Marine, respectively.

The project used the extensive vessel source-level dataset collected through three underwater listening stations installed in the Salish Sea in partnership with Transport Canada, combined with readily-available vessel design and operational characteristics from Lloyd's List Intelligence, the Pacific Pilotage Authority, and Rightship. In the second phase of the work, additional vessel design and operational data were provided by participating ship owners for a small sub-set of vessels.

Using these data sources, a statistical model was developed to predict vessel underwater radiated noise based on vessel characteristics. Evaluation of the loudest and quietest vessels within a vessel category and repeat passes of the same vessel were also investigated to further refine the statistical model and identify potential trends.

The study indicated that vessel size (represented by length overall) is the design characteristic with the strongest correlation to underwater radiated noise, with larger ships producing higher noise levels. The operational characteristics most strongly associated with underwater radiated noise were found to be speed through water and vessel draft (the distance between a ship's keel, or bottom, and the waterline of the vessel.

There were no clear trends in vessel design characteristics between the loudest and quietest ships in any category, although significantly higher noise levels in the lower frequencies (below 500 Hz) were common among the loudest ships. Repeat passes of the same vessel showed significant variation in radiated noise levels, even when corrected for the key operational parameters of speed and draft. Variations between approximately 2.5 and 6 dB were observed for the same vessel under the same operating conditions.

5. Quiet vessel notation alignment

In partnership with Transport Canada and JASCO Applied Sciences, the ECHO Program team is leading efforts to align the quiet vessel notations of international ship classification societies. The goal of this effort is to use recent and ongoing research on vessel underwater radiated noise conducted by through ECHO Program and others, working in parallel with efforts by the International Organization for Standardization (ISO), to inform a more standardized methodology for measurement and analysis techniques for use by international ship classification societies

These efforts seek to create consistency in the methodologies used for measuring, analyzing, and representing units for quiet vessel thresholds. At present, the variability of these elements makes it challenging for vessel owners and operators to compare the different notations and evaluate which, if any, quiet notation may be appropriate and achievable for their organization. The overarching goal of this effort is to increase the number of commercial vessels seeking and qualifying for a quiet notation from a classification society, while ensuring consistency between the available notations.

In 2020, we commissioned the preparation of a draft document providing recommendations on aligned methodologies for measurement and analysis. Following the completion of this document, we spearheaded a series of three technical workshops with subject matter experts and representatives from international ship classification societies to discuss and refine the document. An iterative process will

follow wherein the document is refined based on new research and feedback from the classification societies, with the intent to achieve a closer alignment of quiet vessel notations by 2023.

6. Boundary Pass underwater listening station

In May 2020, JASCO Applied Sciences installed a near real-time, cabled, underwater listening station in Boundary Pass, commissioned by Transport Canada under the federal government's Whales Initiative.

The station consists of two observation frames, each with eight underwater microphones (hydrophones), installed 190 metres (620 feet) below the shipping lanes of Boundary Pass, and located about 50 kilometres south of Vancouver.

The data captured by this station will be used to inform and evaluate a number of research projects and initiatives. In particular, the station will help measure the underwater noise emissions of commercial vessels transiting adjacent shipping lanes, collect information on marine mammal presence in Boundary Pass, and enable the ongoing monitoring of ambient noise levels in the region.

Transport Canada and the Vancouver Fraser Port Authority will provide ongoing funding for data analyses from the station.

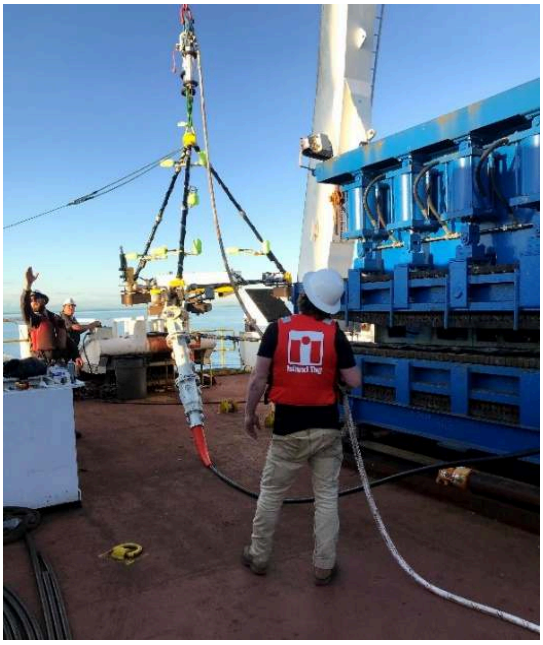

Figure 4: Underwater listening station array prior to deployment

Increasing global awareness of the effects of underwater noise on at-risk whales

Educational outreach

The ECHO Program management team maintains regular communication with program advisors and collaborators through public newsletters, information resources on its website, and educational presentations aimed at raising awareness about the program and the issue of underwater noise.

In 2020, we developed a new infographic to illustrate how decreasing vessel speeds can create measureable reductions in underwater noise and make a positive difference for the whales. The infographic proved helpful in explaining the scientific basis behind and the importance of participating in the ECHO program's voluntary slowdown initiatives, and was distributed via email to all slowdown participants, shared on social media, and posted to the Vancouver Fraser Port Authority's website. All ECHO Program educational materials can be found on our resources webpage.

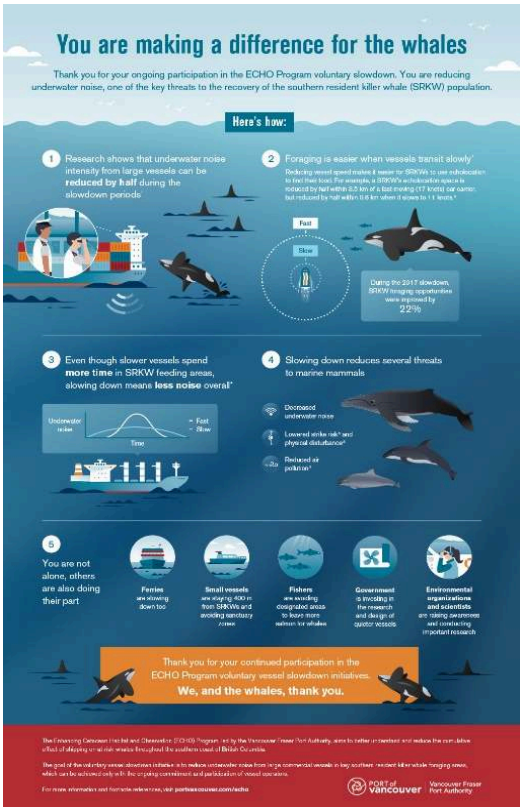

Figure 5: You are making a difference for whales infographic

Presentations and training sessions

In 2020, despite the challenges of COVID-19, the ECHO Program team and our partners delivered over 25 presentations and training sessions via virtual platforms to a variety of audiences across the public and private sectors. Audiences ranged from regional and international marine industry groups, port authorities, government agencies, environmental organizations, acoustic scientists, and naval architects.

These presentations and training sessions are a key component of the ECHO Program's efforts to increase awareness and understanding of the impact of underwater noise on whales, and assist the development of similar regional initiatives aimed at managing the impacts of commercial shipping on marine ecosystems.

Noteworthy presentations were provided to:

- Green Marine's Greentech Conference
- BC Ferries
- National Oceanic and Atmospheric Administration (NOAA) - Gulf of Mexico
- Joint Pacific Coast Marine Review Panel (PACMAR) and Puget Sound Harbour Safety Committee (PSHSC) meeting

Other notable training and education activities included:

- Two, day-long training sessions for the Canadian Coast Guard's Marine Mammal Desk officers
- An educational webinar explaining the findings of the ambient noise evaluation project

Media releases

In 2020, the Vancouver Fraser Port Authority issued one media release announcing the voluntary ship slowdown through Swiftsure Bank.

Looking ahead to 2021

In 2021, though the COVID-19 pandemic will continue to impact our advisors and partners, the ECHO Program team will continue to set ambitious goals for the year ahead, with particular focus on continuing voluntary underwater noise reduction initiatives in critical whale habitat, maintaining outreach and education activities, and furthering efforts to encourage the adoption of 'quiet' ship design technologies and incentives.

Highlights of the 2021 ECHO Program work plan are summarized below.

Underwater noise reduction initiatives

With a focus on continuous improvement, we will continue to coordinate voluntary slowdown initiatives in Haro Strait and Boundary Pass and Swiftsure Bank, as well as a lateral displacement in the Strait of Juan de Fuca. Participation goals will be established based on consultations with ECHO Program advisors in early 2021.

Outreach and education efforts

The ECHO Program team will continue to host educational presentations outlining the findings of our research and technical studies. In particular, we hope to encourage other port authorities to adopt incentives for quiet vessels and share data with ship owners that can encourage the adoption of quiet vessel design attributes, technologies, and operations that limit disturbances on marine ecosystems.

Quiet vessel notation alignment

The ECHO Program team will continue our efforts to align the measurement and analysis of quiet vessel notations from ship classification societies across the globe. This will be accomplished through integration of emerging research and feedback from the ship classification societies into the recommended methodologies. These efforts support the ECHO Program's longer-term vision of encouraging cleaner and quieter ships to call the Port of Vancouver.

Vessel noise correlations research

We will continue to refine and improve knowledge of the different design and operational characteristics affecting vessel underwater radiated noise. Through the ongoing collection of underwater noise measurements using the Boundary Pass underwater listening station, the increasing statistical power of the ECHO Program's world-leading dataset will be harnessed to better understand and develop statistical models that can predict vessel source levels for different categories of ships. The program will continue to seek research opportunities with vessel owners and operators to help better understand and reduce underwater noise from the commercial shipping fleet.

Thank you

We recognize that the past year placed significant challenges on our many advisors, partners, and research participants. Despite these hardships, the ECHO Program had a very successful year, which is a true testament to our collaborators' dedication to this important voluntary initiative.

A complete list of collaborators can be found on our website. We sincerely appreciate their ongoing support and engagement and look forward to continuing our work together to reduce the cumulative impacts of marine shipping on the endangered southern resident killer whale population in this region and on other marine ecosystems beyond.