PORT of vancouver | Vancouver Fraser Port Authority

ECHO Program

2021 Annual report

March 2022

Photo credit: Jeanne Hyde

Canada

Message from the vice president, environment & external 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. Towards this vision, the port authority launched the Enhancing Cetacean Habitat and Observation (ECHO) Program in 2014 to better understand and reduce the cumulative impacts of commercial shipping on at-risk whales, with a particular focus on endangered southern resident killer whales.

The year 2021 marked the ECHO Program's five-year anniversary of leading voluntary underwater noise reduction initiatives throughout the Salish Sea—a milestone that could not have been achieved without the continued support and participation of the program's many advisors, partners, and participants.

Thanks to the ongoing support of the ECHO Program's collaborators, the program completed its longest season of underwater noise reduction initiatives last year, successfully encouraging over a thousand ship operators to slow down or stay distanced in order to in reduce underwater noise for at-risk whales.

Despite an ongoing global pandemic and extreme weather events, more than 80 shipping organizations voluntarily participated in the ECHO Program's 2021 initiatives, reducing underwater sound intensity by approximately 50% in key foraging areas within southern resident killer whale critical habitat.

Abroad, the ECHO Program continued to lead efforts to align the quiet ship notations of international shipping classification societies—an important step toward making quieter ships more uniformly incentivized by ports across the globe.

The pioneering work of the ECHO Program continued to gain international recognition from organizations such as the European Maritime Safety Agency and the United Nations International Oceanographic Commission, which highlighted the ECHO Program as an example of effective voluntary action to reduce underwater noise from ships.

Across the border, the growth of Quiet Sound—a complementary initiative modelled after the ECHO Program—offers a further testament to the influence and impact of the ECHO Program. With ongoing support from the ECHO Program management team, Quiet Sound is well poised to strengthen regional efforts to reduce the impacts of shipping on at-risk whales across the Salish Sea.

Looking ahead, in 2022, the ECHO Program will embark on another ambitious year of underwater noise reduction efforts, research projects, and education activities. Notably, the program will explore the potential of a new slowdown trial in the inbound shipping lane at Swiftsure Bank while helping to shape the International Maritime Organization's new underwater noise reduction guidelines.

As we reflect on the year behind us, it's with gratitude that we thank our many advisors, partners, and participants for their collective efforts in helping to make a difference for at-risk whales.

We look forward to continuing to work collaboratively with our regional, national, and international advisors and partners to achieve our shared goal of creating quieter oceans for healthier whales, in Canada and beyond.

Duncan Wilson
Vice president, environment & external affairs
Vancouver Fraser Port Authority

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About this report

This report covers activities of the Vancouver Fraser Port Authority-led Enhancing Cetacean Habitat and Observation (ECHO) Program throughout the 2021 calendar year, as well as a brief overview of the year to come. Further details about the ECHO Program, including project summaries, technical project reports, and past annual reports can be found on our website at portvancouver.com/echo.

About the Vancouver Fraser Port Authority

As a Canada Port Authority, the Vancouver Fraser Port Authority is mandated under the *Canada Marine Act* to enable Canada's trade through the Port of Vancouver, while protecting the environment and considering the needs of local communities. Guided by a vision for the Port of Vancouver to be the world's most sustainable port, the port authority works 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, maintains a health environment and enables thriving communities.

About the ECHO Program

The Enhancing Cetacean Habitat and Observation (ECHO) Program is a world-leading, first-of-its-kind program developed and led by the port authority to better understand and reduce the cumulative effects of commercial shipping on at-risk whales along British Columbia's southern coast, with particular focus on endangered southern resident killer whales (SRKW).

Since 2017, the ECHO Program has brought together over 100 Canadian and U.S. advisors and partners from across government, the marine transportation industry, Indigenous communities, and environmental groups to develop and implement underwater noise reduction initiatives for at-risk whales.

To date, these initiatives have encouraged thousands of ship operators to slow down or stay distanced from key areas within southern resident killer whale critical habitat (Figure 1), helping to measurably reduce underwater noise, which can interfere with whales' ability to hunt using echolocation.

In addition to coordinating large-scale underwater noise reduction efforts, the ECHO Program spearheads globally-reaching research and education efforts to broaden understanding of ship-generated underwater noise and inform the development of underwater noise reduction solutions.

The ECHO Program team has been invited to present its findings to international forums including the United Nations and the International Maritime Organization and is recognized as one of the world's most well-known and broadly spanning programs to address vessel-generated underwater noise.

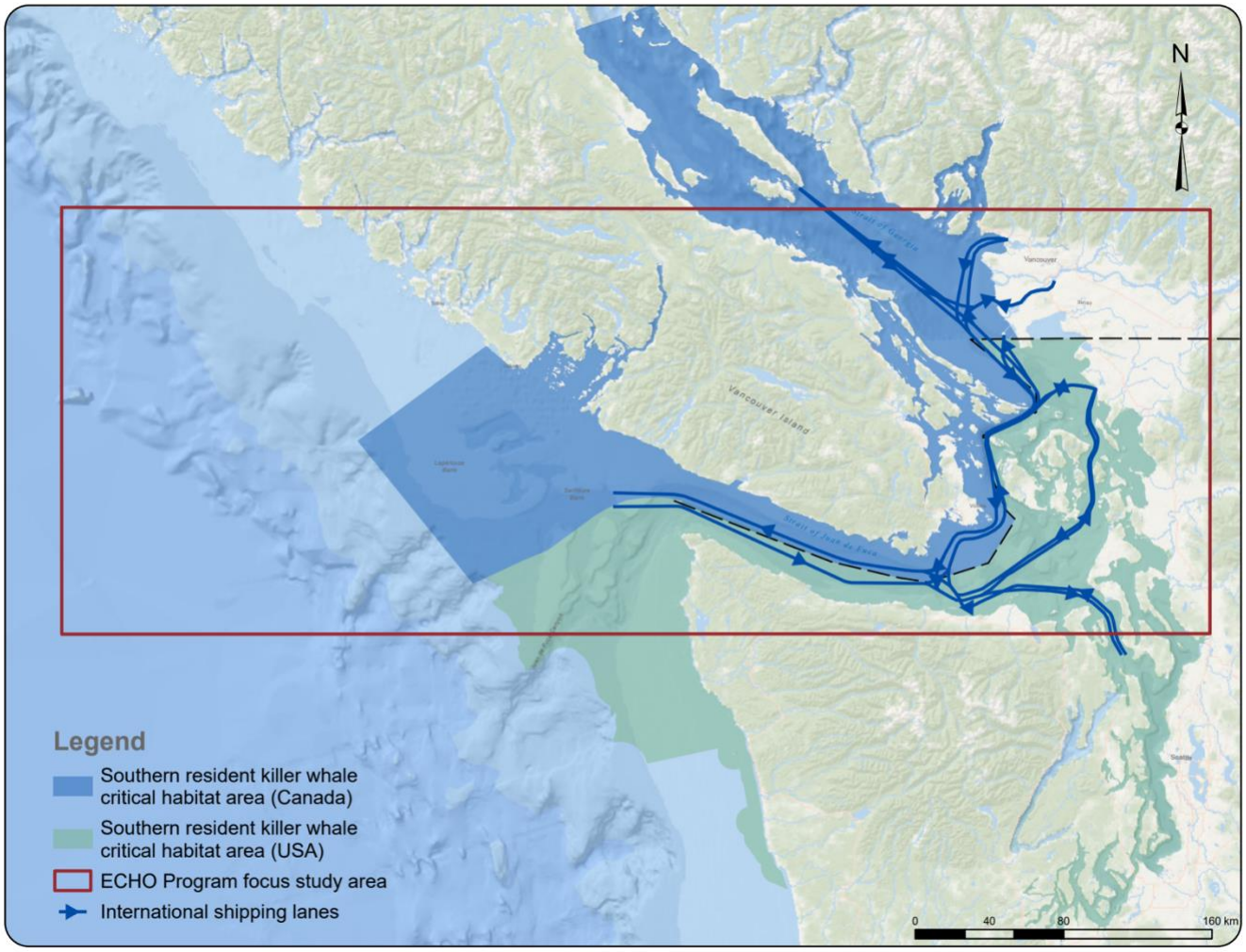

Figure 1: Map of ECHO Program focus areas along with international shipping lanes and U.S. and Canadian southern resident killer whale critical habitat

Our approach to collaboration

The ECHO Program is guided by the advice and input of over 100 Canadian and U.S. advisors and partners from across government, the marine transportation industry, Indigenous communities, and environmental groups. These advisors and partners provide invaluable assistance to the ECHO Program management team in determining which underwater noise reduction activities, scientific studies, and educational initiatives should be advanced to best meet program objectives.

Below is an overview of the ECHO Program's various working groups, technical committees, funding partners, and in-kind contributors who supported the success of the ECHO Program in 2021. A full list of advisors and partners can be found on our website at portvancouver.com/echo/partners-advisors.

Note: Meetings of the advisory working group and most technical committee meetings are independently facilitated by the Fraser Basin Council. In accordance with public safety guidelines around COVID-19, in 2021, the ECHO Program continued to meet remotely with its advisory groups and technical committees.

Key collaborators

Advisory working group

The ECHO Program advisory working group is made up of over 30 Canadian and U.S. representatives from a broad range of backgrounds and areas of expertise who share a common goal of reducing threats to at-risk whales. The role of the advisory working group is to provide the ECHO Program management team with timely input, advice and recommendations on the development and execution of the program's projects and initiatives. In 2021, the advisory working group met five times.

Vessel operators committee

The vessel operators committee provides the ECHO Program management team with input and guidance on key considerations relevant to the marine transportation industry, including navigational safety, economic impacts, and other factors that may affect the marine transportation industry's participation in underwater noise reduction initiatives. The vessel operators committee met five times in 2021.

Special planning meetings

In 2021, the ECHO Program convened an ad-hoc planning committee to explore the potential for a new voluntary vessel slowdown trial in the inbound shipping lane at Swiftsure Bank. Members of the Makah Tribe, the advisory working group, and the vessel operators committee met twice to discuss the potential benefits to southern resident killer whales as well as safety and operational considerations of the proposed slowdown. This special committee will continue to meet into 2022 to support planning of this potential trial.

Acoustic technical committee

The acoustic technical committee provides technical and scientific advice on the development and execution of the ECHO Program's research projects. The committee is composed of marine mammal biologists, acousticians, naval architects and engineers, and others with technical expertise in underwater noise. In 2021, the acoustic technical committee was convened for two, half-day workshops to provide technical advice to the ECHO Program management team.

Conservation agreement management committee

The conservation agreement management committee consists of the nine signatory parties of the *Conservation Agreement to Support the Recovery of the Southern Resident Killer Whale,* a first-of-its-kind agreement with the Government of Canada that formalizes the role of the ECHO Program and various partners to support the recovery of the southern resident killer whales.

The purpose of the conservation agreement management committee is to oversee the implementation 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.

The nine parties to the agreement are (in alphabetical order):

1. Chamber of Shipping
2. Council of Marine Carriers
3. Cruise Lines International Association – North West & Canada
4. Fisheries and Oceans Canada
5. International Ship-Owners Alliance of Canada
6. Pacific Pilotage Authority
7. Shipping Federation of Canada
8. Transport Canada
9. Vancouver Fraser Port Authority

In May 2021, the conservation agreement management committee and members of the advisory working group met to provide input into the development of the year three conservation agreement measures. In July 2021, the conservation agreement committee met again to finalize the year three measures and the Conservation Agreement Period 2 annual report.

Participation in government initiatives

The ECHO Program management team works closely with government to provide input on projects of shared interest related to the recovery of at-risk whales. In 2021, the ECHO Program management team participated in various government projects and initiatives, including:

- Providing regular updates on the program's voluntary initiatives to the government-led Indigenous and multi-stakeholder advisory working group (IMAG)
- Participating in government engagement opportunities, including providing input on Fisheries and Oceans Canada's Whales Initiative strategy and the Draft Action Plan and Amended Recovery Strategy for the Transient Killer Whale
- Collaborating with Transport Canada to provide input to the International Maritime Organization's review of underwater noise guidelines
- Participating in Transport Canada's Underwater Vessel Noise Reduction Targets committees and providing advice and data to support evaluation of potential ship noise targets
- Providing Fisheries and Oceans Canada with real-time southern resident killer whale presence data to support the initiation of their seasonal measures, creating alignment with the start of the Haro Strait and Boundary Pass slowdown

Funding partners and in-kind contributors

The year 2021 marked the completion of the second year of a five-year funding agreement with Transport Canada through the Marine Research and Development Innovation Centre. As part of the agreement, the ECHO Program provides Transport Canada with quarterly updates and reports on relevant projects and initiatives in progress.

Transport Canada and the Canadian Coast Guard provided an in-kind contribution to the ECHO Program of automatic information system (AIS) data and analysis, which was used to monitor and report on participation rates in the Strait of Juan de Fuca lateral displacement initiative.

Fisheries and Oceans Canada provided in-kind contributions of hydrophone equipment and analysis of acoustic data to support evaluation of the Strait of Juan de Fuca lateral displacement and the Swiftsure Bank voluntary outbound slowdown.

Key projects and initiatives in 2021

In 2021, toward the ECHO Program's objective of quantifiably reducing threats to whales as a result of commercial ship traffic, the ECHO Program organized three large-scale underwater noise reduction initiatives in the Salish Sea that led to significant reductions in underwater noise within southern resident killer whale critical habitat.

The ECHO Program is grateful for the ongoing participation and support of our many participants who contribute to the continued success of these voluntary initiatives, including federal agencies, shipping associations, ship agents and operators, pilots and others.

A summary of all three initiatives is available below, along with summaries of key research projects advanced by the ECHO Program:

1. Haro Strait and Boundary Pass voluntary vessel slowdown

The Haro Strait and Boundary Pass voluntary slowdown ran from July 1, 2021 to November 30, 2021—the longest duration in the slowdown's five-year history, totalling 21 weeks or approximately five months.

The slowdown start and end dates were determined based on historical data indicating that southern resident killer whale presence in Haro Strait and Boundary Pass is highest between June and September.

During the slowdown, operators of large commercial ships transiting through Haro Strait and Boundary Pass—two areas of known importance for the southern resident killer whales—were asked to voluntarily slow down to the following speeds, if it was safe and operationally feasible to do so:

- 14.5 knots or less through the water for vehicle carriers, cruise ships and container vessels
- 11 knots or less through the water for bulkers, tankers, ferries and government vessels

Throughout the slowdown period, on-land observers and in-water hydrophones placed nearby the slowdown areas monitored southern resident killer whale presence. As a result of continued southern resident killer whale presence, the slowdown was extended until November 30.

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

Of the 2,295 vessel transits through Haro Strait and Boundary Pass during the 2021 slowdown period, the BC Coast Pilots reported that 90% (2,074 of 2,295) of ships participated in the slowdown. The primary reasons noted by BC Coast Pilots for ships not participating in the slowdown related to schedule or tidal window requirements.

Ambient noise results during the slowdown period showed a reduction in ambient noise of more than 3 decibels (dB), which is more than a 50% reduction in sound intensity.

2. Strait of Juan de Fuca voluntary inshore lateral displacement

In the ECHO Program's fourth consecutive lateral displacement at the Strait of Juan de Fuca, tugboat operators were asked to move away, or laterally displace, from the southern coast of Vancouver Island—an area of known importance within southern resident killer whale critical habitat.

The lateral displacement was in effect from June 1 to October 31, 2021. In total, 88% (138 of 168) of tug 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—the highest participation rate ever achieved in the lateral displacement's four-year history.

Tug operators were encouraged to navigate either through the outbound shipping lane or in the inshore lateral displacement zone, while maintaining a buffer distance of 1,000 metres from the traffic separation scheme (TSS), if it was safe and operationally feasible to do so.

During the lateral displacement period, Pacheedaht First Nation monitored and recorded whale presence at Swiftsure Bank and the Strait of Juan de Fuca through dedicated boat surveys within their territorial waters.

Data analysis indicates that a noise reduction of approximately 4 dB to 7 dB can be achieved for each individual tug displacement, which is a 60-80% reduction in sound intensity.

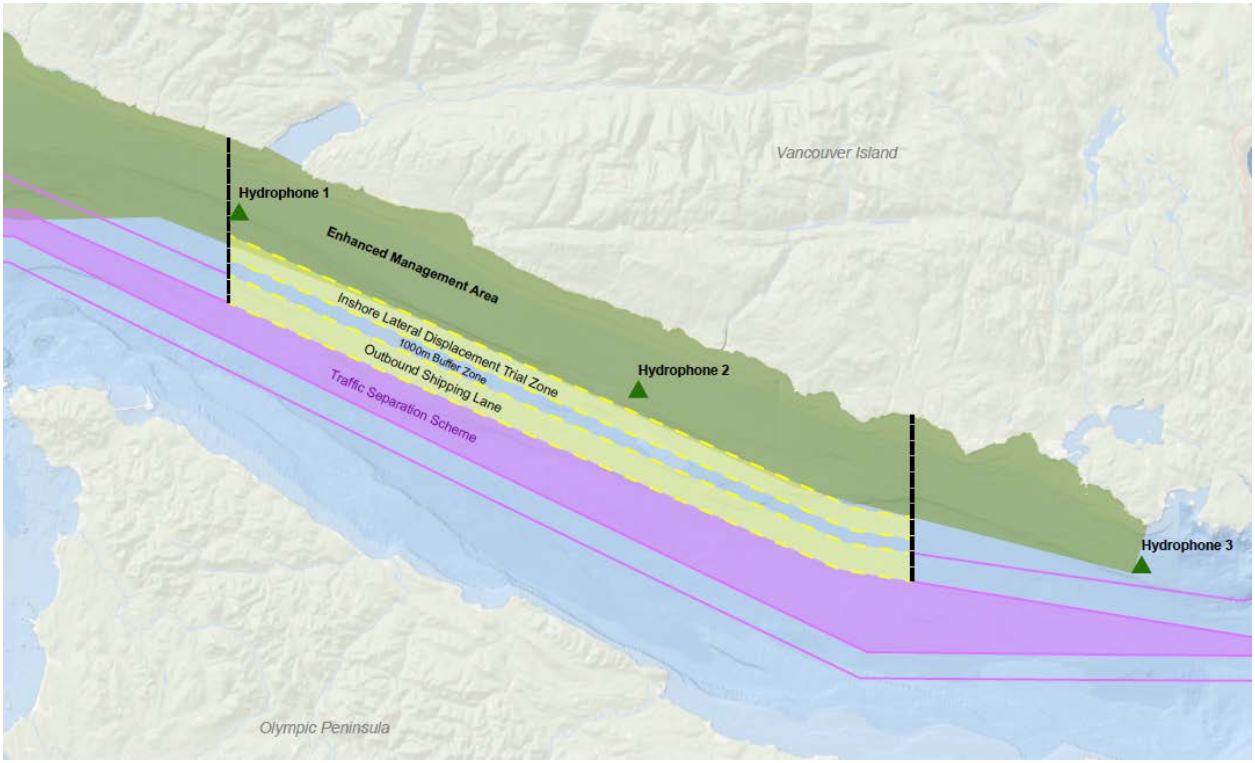

Figure 3: Strait of Juan de Fuca voluntary inshore lateral displacement area

3. Swiftsure Bank voluntary ship slowdown trial

Following the success of the ECHO Program's trial slowdown for outbound vessels at Swiftsure Bank in 2020, the ECHO Program implemented its second slowdown at Swiftsure Bank from June 1 to October 31, 2021.

During the slowdown, operators of large commercial ships transiting outbound through the Swiftsure Bank area were asked to voluntarily slow down to the following speeds, if it was safe and operationally feasible to do so:

- 14.5 knots or less through the water for vehicle carriers, cruise ships and container vessels
- 11 knots or less through the water for bulkers, tankers and government vessels

In total, 81% (1624 of 2010) of vessels transiting through the outbound lane at Swiftsure Bank participated in the slowdown by reducing their speeds to within ~1 knot of the target speeds.

During the slowdown period, Pacheedaht First Nation monitored and recorded whale presence at Swiftsure Bank and the Strait of Juan de Fuca through dedicated boat surveys within their territorial waters.

Canadian and U.S. coast guards, as well as both the BC Coast and Puget Sound pilots, captured data regarding ship operators' intention to participate. Participation rates were verified using AIS data providing speed over ground, followed by a correction for tidal currents to calculate the speed of vessels through the water.

Reductions in underwater noise as a result of the Swiftsure Bank slowdown are currently being evaluated by Fisheries and Oceans Canada and are expected to be published in spring 2022.

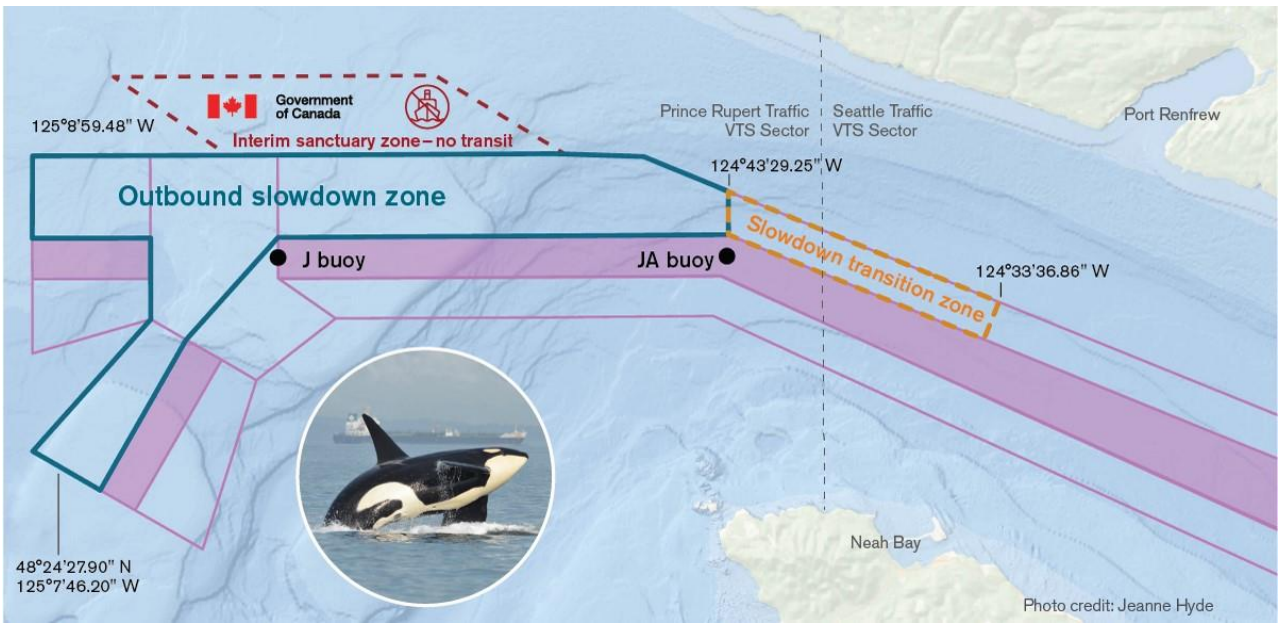

Figure 4: Swiftsure Bank voluntary slowdown area

4. Quiet vessel notation alignment

The ECHO Program management team continued to lead efforts to align the quiet vessel notations of international ship classification societies, in partnership with Transport Canada and JASCO Applied Sciences. At present, the varying methodologies used to measure and analyze underwater noise makes it challenging for ship owners and operators to compare the different notations and determine which quiet

notation may be appropriate for their organization.

To create alignment between the different notations, the ECHO Program management team is applying research undertaken by the program and others to develop a methodology to measure and analyze underwater noise. The long-term goal of these efforts is to increase the number of commercial vessels that seek and qualify for a quiet notation, while ensuring consistency between the notations.

In 2021, the ECHO Program, along with technical experts and representatives from seven international ship classification societies, participated in the second of three annual workshops to review new information and discuss alignment of parameters. This workshop group reviews, discusses, and provides amendments to a technical document outlining recommendations on measurement and analysis parameters. Key to this work is the integration of forthcoming research data on the best approaches to measure and analyze vessel underwater radiated noise in shallow water.

In 2022, the technical document will continue to be refined based on new research, as well as feedback from the classification societies. The third and final workshop is planned for fall 2022, with the intent to achieve a closer alignment of quiet vessel notations by 2023.

5. Quiet vessel case study with BC Ferries

To promote the uptake of underwater noise reduction solutions with ship owners and operators, in 2021, the ECHO Program reviewed the approach that BC Ferries—one of the world's largest ferry operators—took in setting underwater radiated noise reduction goals for the design and construction of its new major ferries replacement program.

In partnership with BC Ferries and West Pacific Marine, the ECHO Program developed a case study outlining the steps and processes undertaken by BC Ferries to integrate underwater vessel noise targets into its ferries' design, highlighting lessons that may benefit other ship owners who are considering the inclusion of underwater radiated noise reduction targets in new vessel builds.

The ECHO Program team developed the case study through a review of technical documentation about the major ferries replacement program, as well as interviews with key personnel involved in the project. The case study considered how underwater radiated noise reduction targets may impact other performance or design requirements, as well as the technologies or design modifications that showed the greatest potential to reduce underwater radiated noise. The full case study is available on our website: BC Ferries quiet vessel ferry design case study.

6. Ship noise localization study

To test the feasibility of identifying the location of specific sound sources on a vessel, in 2021, the ECHO Program completed a ship noise localization study using data from the Boundary Pass underwater listening station.

Since June 2020, the Boundary Pass underwater listening station has been performing real-time measurements of underwater noise from ships enabled with AIS. To test if these data could predict the specific sound sources on a vessel, these data were used to produce noise maps that illustrate the spatial distribution of noise emissions intensity along the length and breadth of ship hulls.

The study's key finding was that propeller noise at the stern of the ship was clearly dominant, and often masked the identification of other specific sound sources on a vessel. In some of the vessels studied, a second noise source, approximately 10-20 metres forward of the propellers could be identified and was assumed to be generated by the engine. The full report will be available on our website in April 2022.

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

Educational activities

In 2021, the ECHO Program team continued to advance awareness of underwater noise through a variety of educational activities, including webinars, workshops, and educational tools such as the Whales in our Waters online tutorial.

The ECHO Program team delivered a series of one-hour educational webinars on the program's technical research findings to program advisors, committee members, and partners. The webinars explored a variety of topics related to ship-generated noise, including:

- the outcomes of the ECHO Program's vessel noise correlations study, which investigated the relationship between ship design characteristics and underwater radiated noise
- a review of quiet ship notations and the program's efforts to create a more uniform approach to the measurement and analysis of underwater noise
- the results of the ECHO Program's Burrard Inlet noise monitoring project, which assessed ambient underwater noise in partnership with Tsleil-Waututh Nation

Presentations and training sessions

Presentations and training sessions are a key component of the ECHO Program's efforts to increase understanding of the impact of underwater noise on whales and assist the development of similar regional initiatives.

In 2021, the ECHO Program team delivered over 20 presentations and training sessions to a variety of audiences across regional and international marine industry groups, port authorities, government agencies, environmental organizations, academic institutions, and more.

Noteworthy presentations were provided to:

- International Association of Ports and Harbors (IAPH)
- International symposium on underwater noise by University of Paris
- Acoustical Society of America
- Olympic Coast Marine Sanctuary advisory group
- Fisheries and Oceans' Indigenous and multi-stakeholder advisory working group (IMAG)
- Whale Museum's Gear Up Workshop for Marine Naturalists

In addition, the ECHO Program provided one day-long presentation to the Canadian Coast Guard's Marine Mammal Desk staff, discussing marine mammal biology, underwater noise and the ECHO Program's research and noise reduction initiatives. Each attendee also completed the Whales in our Waters tutorial.

Figure 4: The European Maritime Safety Agency's 'Status of Underwater Noise from Shipping' report

International recognition

In 2021, the ECHO Program continued to build awareness of its efforts to reduce threats to at-risk whales among local, national and international audiences.

Of note, the ECHO Program contributed a case study to the development of the European Union Maritime Safety Agency's report on the status of underwater noise from shipping. This report identified the ECHO Program as "the largest coordinated effort on ship noise abatement to have been performed to date" and highlights the program as an example for ports across Europe to follow.

In addition, the ECHO Program contributed a feature-length article to the United Nations' Special Edition Magazine on the Decade of Ocean Science, a publication highlighting global efforts to advance sustainable oceans through research and action. This magazine edition featuring the ECHO Program was promoted at the 2nd UN Ocean Conference, which was virtually attended by thousands of delegates.

Looking ahead to 2022

In 2022, the ECHO Program team will continue to lead voluntary underwater noise reduction initiatives throughout the Salish Sea while advancing globally-reaching research and education efforts. Highlights of the ECHO Program's 2022 priorities are summarized below.

1. Potential inbound voluntary slowdown trial at Swiftsure Bank

The ECHO Program will work with regional partners to explore the potential for a new voluntary vessel slowdown trial in the inbound shipping lane at Swiftsure Bank, a known foraging area within southern resident killer whale critical habitat identified by Fisheries and Oceans Canada.

2. International Maritime Organization

In 2022, the ECHO Program will help shape the International Maritime Organization's new underwater noise reduction guidelines, as a representative for the International Association of Ports and Harbors. These guidelines will be used to develop a set of best practices for the reduction of underwater noise by ship manufacturers, owners, and operators across the world.

3. Co-benefits study

In addition to reducing underwater noise, research has shown that slower ship speeds may offer additional benefits to marine mammals and the environment. To better understand the full benefits of ship slowdowns, in 2022, the ECHO Program will conduct a co-benefits study to quantify the benefits of its slowdowns on factors such as whale strike risk and greenhouse gas emissions.

4. Cavitation inception speed study

To better understand the factors that contribute to ship-generated underwater noise, the ECHO Program will explore undertaking a new study on propeller cavitation and its relationship to vessel speed. The goal of this study is to evaluate which speeds are associated with a steep increase in underwater radiated noise, which may help inform optimal slowdown speeds.

5. Outreach and education efforts

In 2022, in partnership with BC Ferries and Ocean Wise, the ECHO Program will support the re-launch and promotion of the Whales in our Waters tutorial, a key resource to educate mariners on best practices for safely navigating ships in the presence of at-risk whales. The updated tutorial will outline Fisheries and Oceans Canada's latest recovery measures for at-risk whales, including minimum distances that ships must keep from southern resident killer whales.

Thank you

We recognize the tremendous voluntary efforts that our advisors, partners, and participants contribute to making the ECHO Program a success. We sincerely appreciate the continued support of our many collaborators and look forward to continuing to work together to reduce the cumulative impacts of commercial shipping on at-risk whales in our region. A complete list of collaborators can be found on our website.