Workshop on the Relationship between Energy Efficiency and Underwater Radiated Noise from Ships

Operational measures to reduce underwater noise

Derek White
Senior Project Manager – ECHO Program
September 19, 2023
About the ECHO Program

A first-of-its-kind program, convened in 2014 to better understand and **reduce the impacts of commercial shipping on at-risk whales**, in collaboration with government, the marine transportation industry, Indigenous communities, and environmental groups.
- On-water initiatives to reduce underwater noise
- Correlation of vessel characteristics to underwater noise
- Co-benefits of vessel slowdown beyond underwater noise
- Environmental technology that increases underwater noise
- EcoAction incentive program
On-water initiatives – results of 2017 slowdown trial

At the vessel source, noise reductions may be up to 2.8 dB per knot of speed

Based on broadband MSL
Source: JASCO Applied Science
On-water initiatives – results of 2022 voluntary efforts

Slow to **11 knots or less** for bulkers, tankers, government

Slow to **14.5 knots or less** for car carriers, container ships, cruise ships

Tugs to displace from shoreline

---

[Enhancing Cetacean Habitat and Observation (ECHO) Program](https://www.portvancouver.com/environmental-protection-at-the-port-of-vancouver/maintaining-healthy-ecosystems-throughout-our-jurisdiction/echo-program/projects/)

- **93%** Participation 2.7-2.8 dB reduction
- **82%** Participation 2.2-3.1 dB reduction
- **97%** Participation 4-7 dB reduction
Correlation of vessel characteristics to underwater noise

Which key vessel design and operational characteristics drive differences in underwater noise?

- Three-phase statistical study of vessel characteristics and underwater noise
- Utilized 9880 passes of 3188 unique ships measured in our region
- Considered GHG and EVDI ratings
- Model tested against dataset from California
- Peer-reviewed publication of final model and associated noise prediction tool

Operational

1. Speed through Water
2. Draft
3. Wind resistance
4. Measurement angle

Design

1. Length
2. Main Engine design PRM
3. Design Speed
4. Engine Power kW
5. Vessel Age

Co-benefits study objectives – air emissions and whale strike risk

Study undertaken to evaluate the results of the 2022 slowdown

• **Why do this study:** ECHO slowdowns focus on underwater noise reduction quantification of other benefits may help to improve both participation and promotion

• **How was the study conducted:** Leveraged the previous work of the Blue Whales Blue Skies program in California to evaluate both absolute (air emissions) and relative benefits (air emissions and whale strike)
Co-benefits study results – air emissions and whale strike risk

- Voluntary slowdowns have benefits beyond reduction of underwater noise
- Localized reductions in air emissions ranged from 13-17% overall
- Regional air emissions are heavily dependent on vessel behaviour outside of the slowdown area
- Whale strike risk reduced by between 10 - 22% on a per transit basis across the slowdown regions

Photo credit: Robin Silvester

Acoustic measurements of vessel with active anti-fouling system

Spectrogram of vessel at berth with system enabled: characteristic bright spectra line at 23 kHz

Measurement as a function of time for specific frequency bands. Spikes indicate vessel passes.
EcoAction incentive program for Port of Vancouver

- Since 2007, the Port of Vancouver offers discounted harbour dues for cleaner and quieter ships.
- **NEW Platinum** (75%) discount option in 2023 for vessels using alternative marine fuels and technologies, connecting to shore power, and obtaining underwater noise notations.
- Incentivizing standardized evaluation criteria internationally such as Environmental Ship Index (ESI), Green Marine or RightShip GHG rating and class society notations can help encourage technology adoption.

Thank you

Derek White, ECHO Program Senior Project Manager
derek.white@portvancouver.com

ECHO@portvancouver.com
www.portvancouver.com/echo

Photo credit: Olivia Murphy