Understanding and managing underwater noise: results from the Haro Strait vessel slowdown trial

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Krista Trounce  
ECHO Project Manager  
April 6, 2018
ECHO Program
(Enhancing Cetacean Habitat and Observation)

What? A collaboration with marine transportation industries, conservation groups, scientists, First Nations and Canadian and US governments

When? Convened Nov. 2014

Why? To better understand and reduce the cumulative impacts of commercial vessel activities on at-risk whales throughout Canada’s Pacific south coast
ECHO Program work areas

Advancing projects and initiatives to inform threat reduction

- Prey availability
- Physical Disturbance
- Environmental Contaminants
- Acoustic Disturbance

Photo: Joan Lopez

Design
Operational
**Vessel slowdown trial: Overview**

**Why:** The trial aims to better understand the relationship between vessel speed, underwater noise and potential effects on killer whales.

**Where:** ~16 nautical miles through critical whale foraging habitat in Haro Strait.

**When:** Two (lunar) month trial, August 7 - October 6, 2017.

**What speed:** 11 kn through the water.

**Who:** Over 50+ organizations.
Vessel slowdown trial: Participation results

- 951 total piloted transits during trial period
- 79% intended to participate (752 transits)
- 60.5% reported participation (578 transits)
- 44% achieved speed <12 knots STW (421 transits)
Trial results: Reduction in vessel speed and source level (control vs. trial period)

- Reduction in speed (knots)
- Reduction in source level (dB)

<table>
<thead>
<tr>
<th>Cargo Type</th>
<th>Reduction in speed (knots)</th>
<th>Reduction in source level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container ships</td>
<td>-7.7</td>
<td>-11.5</td>
</tr>
<tr>
<td>Passenger ships</td>
<td>-6.1</td>
<td>-10.5</td>
</tr>
<tr>
<td>Vehicle carriers</td>
<td>-5.9</td>
<td>-9.3</td>
</tr>
<tr>
<td>Tankers</td>
<td>-2.3</td>
<td>-6.1</td>
</tr>
<tr>
<td>Bulk/general cargo</td>
<td>-2.1</td>
<td>-5.9</td>
</tr>
</tbody>
</table>

*Note: a 3 dB reduction is roughly equivalent to a 50% reduction in sound intensity.*
Trial results: Change in vessel source levels

<table>
<thead>
<tr>
<th>Reduction in broadband noise emissions with speed</th>
<th>Vessel type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8 dB/knot</td>
<td>Bulker/general cargo</td>
</tr>
<tr>
<td>2.6 dB/knot</td>
<td>Tanker</td>
</tr>
<tr>
<td>1.7 dB/knot</td>
<td>Cruise</td>
</tr>
<tr>
<td>1.6 dB/knot</td>
<td>Vehicle Carrier</td>
</tr>
<tr>
<td>1.5 dB/knot</td>
<td>Container</td>
</tr>
</tbody>
</table>
Trial results: Change in ambient noise

- 1.2 dB median reduction in all (unfiltered) ambient noise during the trial period
  - Equals a ~22% reduction in sound intensity
- 2.5 dB median reduction in ambient noise when large commercial vessels within 6km detection range of hydrophone, no small boats, filtered for high wind/current
  - Equals a ~44% reduction in sound intensity

Source: SMRU Consulting
Trial results: Vessel noise modelling

Source: JASCO Applied Sciences
Trial results: Vessel noise modelling

Comparison of a container ship

Baseline speed

Trial speed

Source: JASCO Applied Sciences
Trial results: SRKW behavioural response modelling

- 24-hour noise and whale model simulation
- Broadband dose-response curve and residual echolocation masking
- Evaluating potential lost foraging time:
  - Baseline vs. actual trial compliance and speed
  - Other compliance rates and speeds
  - Future traffic scenarios
Next steps

- Final slowdown trial report May 2018
- Correlate vessel noise dataset with vessel design parameters to identify key drivers
- Potentially trial other mitigation options
Thank you for listening. Questions?

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Vessel slowdown trial participants

50+ organizations

AAL Shipping
ACGI Shipping Inc.
BC Coast Pilots
Carnival Cruise Line
Celebrity Cruise Line
CMA CGM
Colley West Shipping Ltd.
COSCO
Crystal Cruises
CSL International
Evergreen Line
Fairmont Shipping (Canada) Ltd.
G2 Ocean
Hamburg Sud
Hapag-Lloyd
Holland America Line
Hyundai America Shipping Agency Inc.
Inchcape Shipping Services
K-Line
Maersk
Mason Agency Ltd.
Mitsui O.S.K. Lines
Mocntship Inc.
MSC Mediterranean Shipping Company
Navitran Shipping Agencies West Inc.
Neptune Bulk Terminal
Norton Lilly Vancouver
Norwegian Cruise Line
NYK Line
Oceania Cruises
Oldendorff
OOCL
Pacific Basin Shipping
Pacific North West Ship & Cargo Services Inc.
Ponant
Princess Cruise Line
Ravensdown Shipping Services Ltd.
Robert Reford
Royal Caribbean International Cruise Line
Royal Canadian Navy
SAAM SMIT Vancouver
Saga Welco AS
Seabourn Cruise Line
Seaspan ULC
Sinotrans
Swire Shipping
Trans-Oceanic Shipping
Valles Steamship (Canada) Ltd.
Washington State Ferries
Westward Shipping Ltd.
Westwood Shipping Lines
Wheelhouse Shipping Agency
Wilhelmsen Ships Service
Zim