Smolt migration through the Salish Sea: routes and survival for hatchery steelhead (*Oncorhynchus mykiss*)

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Outline

• Smolt stage and early marine period
• Study objectives
• Methods
  - Acoustic tagging, releases
• Results
  - Survival, route use, travel rates
• Summary
Early marine phase

- Productivity of salmonid populations can be linked to the smolt life stage
- Early marine survival typically poor
- This critical period suggested to be linked to declines of wild and hatchery steelhead (*Oncorhynchus mykiss*)
- Still many unknowns about this portion of the migration
- Better understanding of factors influencing survival is needed
Objectives

1. Use acoustic telemetry to quantify steelhead smolt survival in the Salish Sea, and identify regions of poor survival.

2. Link telemetry and non-lethal gill biopsies to assess links between smolt survival and physiological factors and/or microbes.
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Seymour River Hatchery

- Steelhead smolts (n=273)
- Gill biopsies taken for genomic analysis (n=164)
Survival to Queen Charlotte Strait

Marine release = 27.3%  
Freshwater release = 9.1%
Segment-specific survival
Segment-specific survival

![Map of the area with different segments and survival rates for each migration segment.](image-url)
Route use by Seymour steelhead
NSOG: More fish used Strait of Georgia
→ Proportional preference for E. Texada (p<0.0001)
Discovery Islands: Discovery Passage most used channel
Role of route on survival
• Route-specific survival:

Discovery Passage: 97.7%  (87.4-100%; 95% CI)

Sutil Channel: 46.2%  (22.7-71.7%; 95% CI)
• Survival rates by route:

**Discovery Passage:** ~80 km

**Sutil Channel:** ~110-120 km
• Survival rates by route:

**Discovery Passage:** 97% per 100 km  
(82-100%; 95% CI)

**Sutil Channel:** 48% per 100 km  
(24-73% per 100 km; 95% CI)
• Travel rates twice as fast through Discovery Islands
• Likely influence of currents and tides
Influence of tidal-driven currents?

(Foreman et al. 2016)
Summary

• Beginning to uncover the ‘black box’ of the Salish Sea
  - Compartmentalizing migration with acoustic telemetry

• Landscapes play an important role in smolt survival
  - River and Burrard Inlet poor survival
  - Routes: Discovery Passage (use and survival)
  - Influence to productivity?

Future Work:

• Analysis of gill biopsies currently underway

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