Restoring connectivity and habitat for juvenile salmon in the Fraser River Estuary

From Watersheds to Waves: Restoring Estuaries for Salmon

Virtual Knowledge Exchange Workshop Agenda
June 11th, 2025

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Pacific Salmon Ecology and Conservation Laboratory

RAINCOAST CONSERVATION FOUNDATION

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Pacific Salmon Ecology and Conservation Lab

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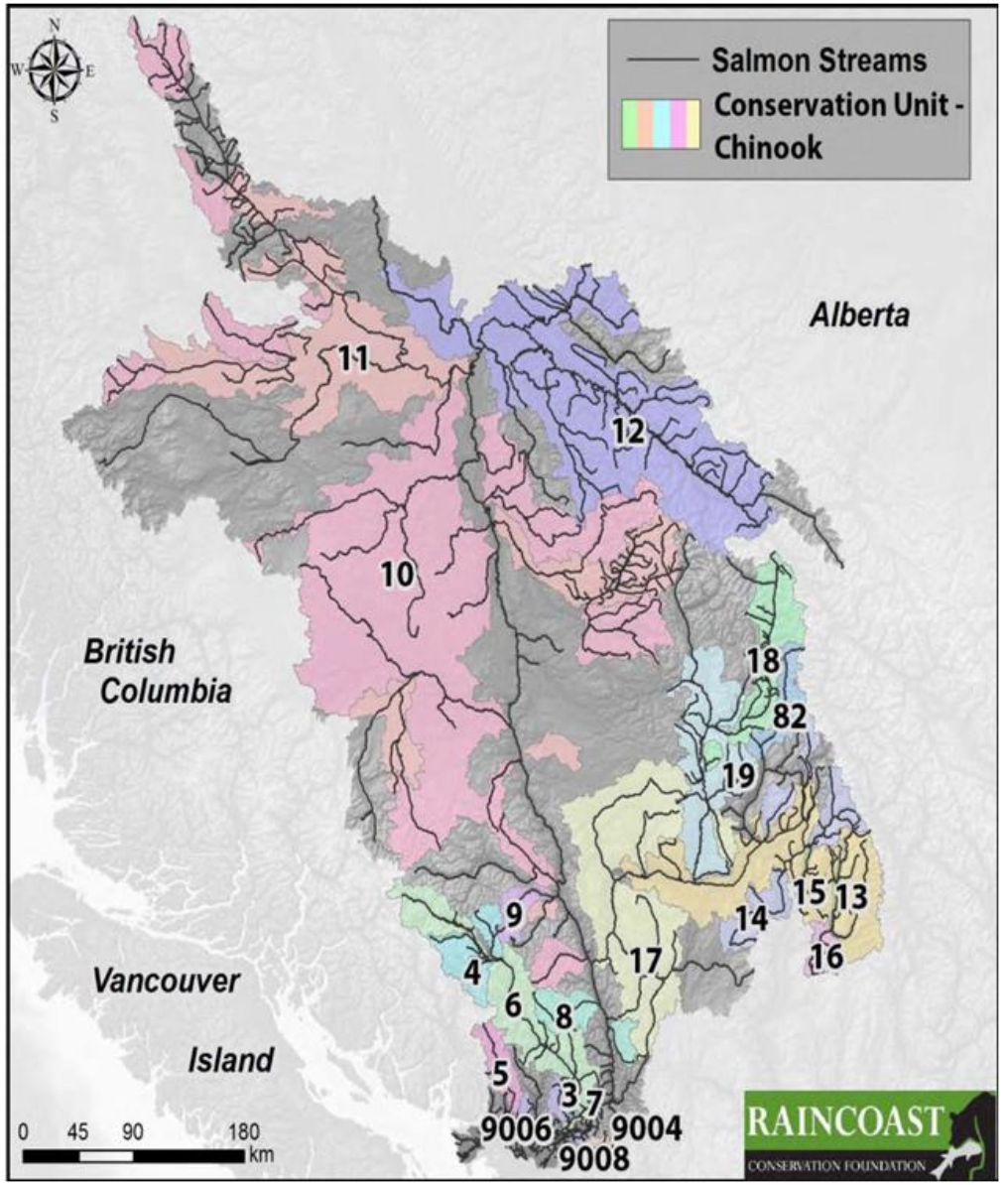
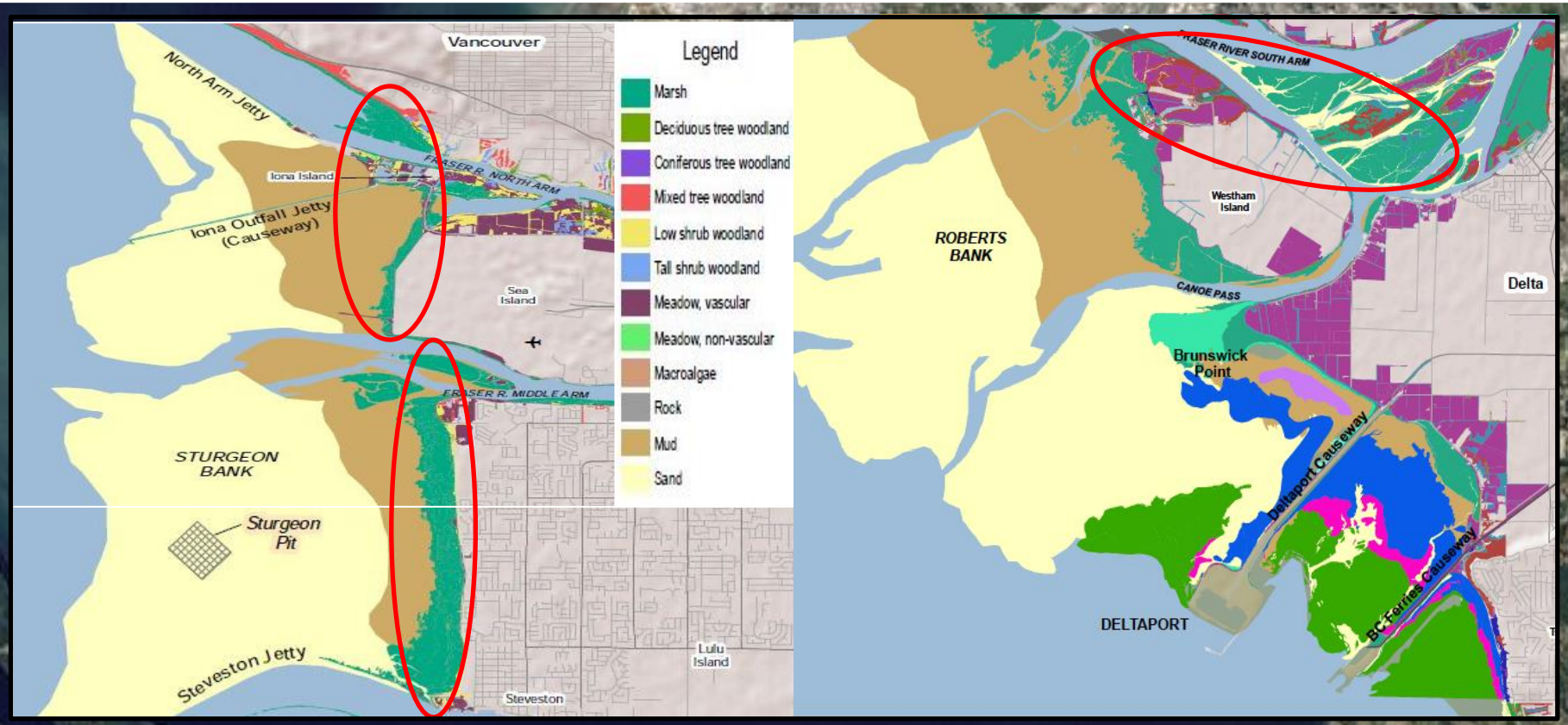
Salmon of the Fraser River

- Greatest salmon producing river worldwide
- Lower Fraser and estuary highly disconnected by flood control and other structures
- Chinook are the most estuary reliant
- Harrison Chinook spend ~42 days in the estuary as juveniles (Chalifour et al. 2021)
- Currently significant conservation concerns for Chinook and sockeye



Status of salmon habitats in the Lower Fraser River and estuary

- Lower Fraser has lost ~85% floodplain habitats
- Relatively few remaining marsh habitats in Fraser estuary
- Migration pathways in the estuary altered by multiple causeways and jetties



Fraser estuary monitoring

- 2016 – 2025, March – August
- Sandflat, eelgrass, and marsh habitats
- Abundance, fork length, DNA

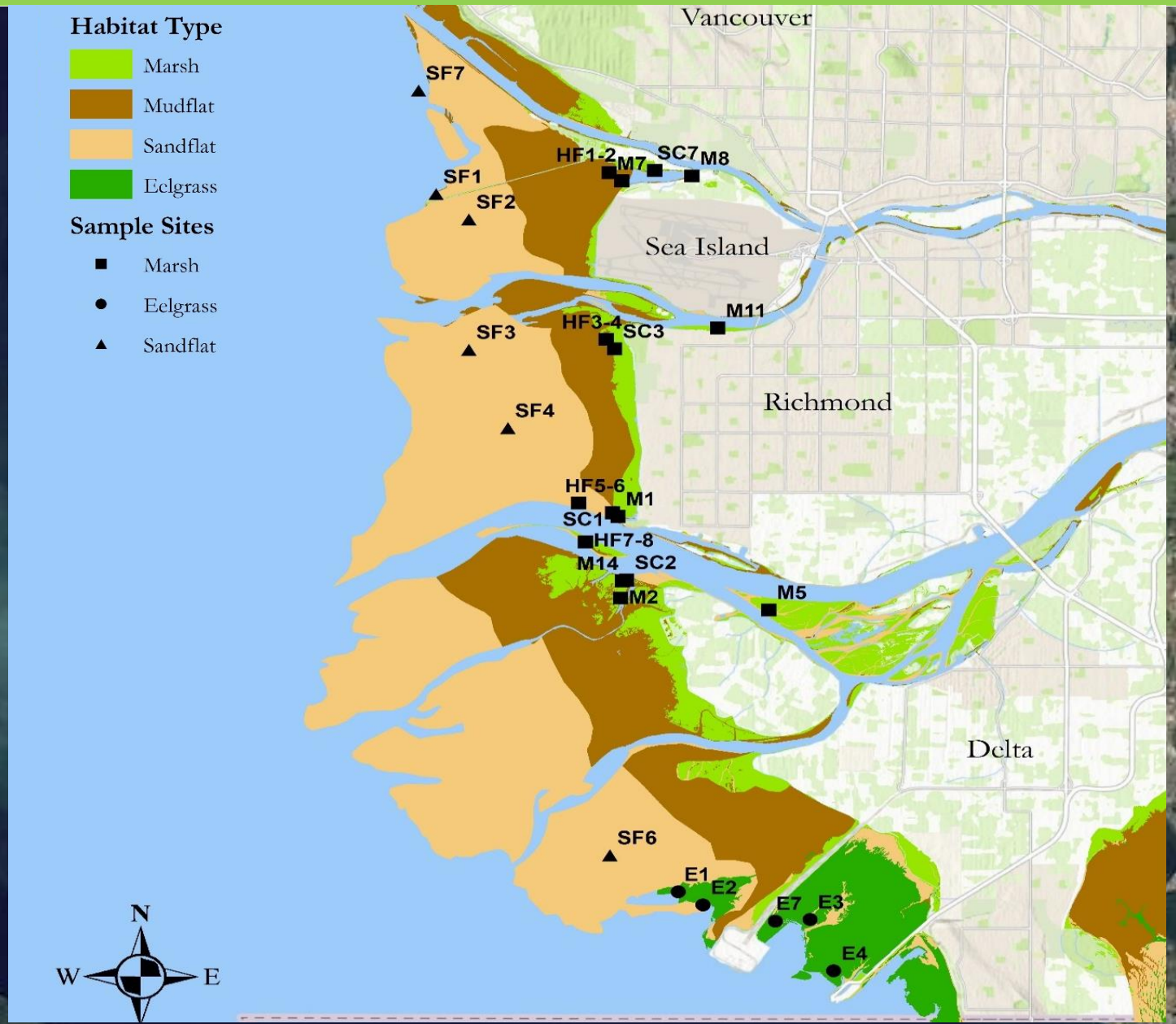
Photo: Alex Harris

Beach, purse seine and fyke net methods

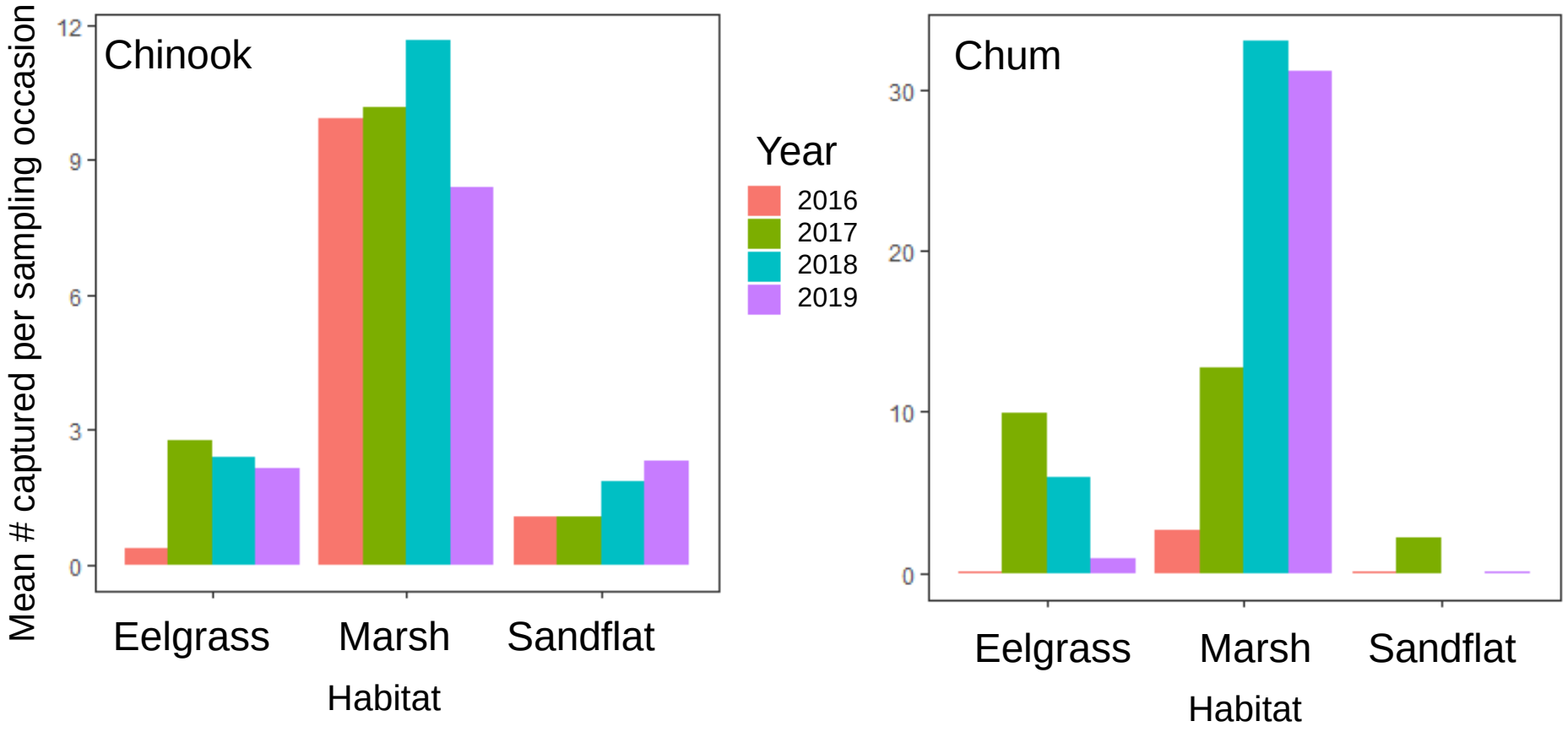
Photo: Yuri Choufour

Photo: Fernando Lessa

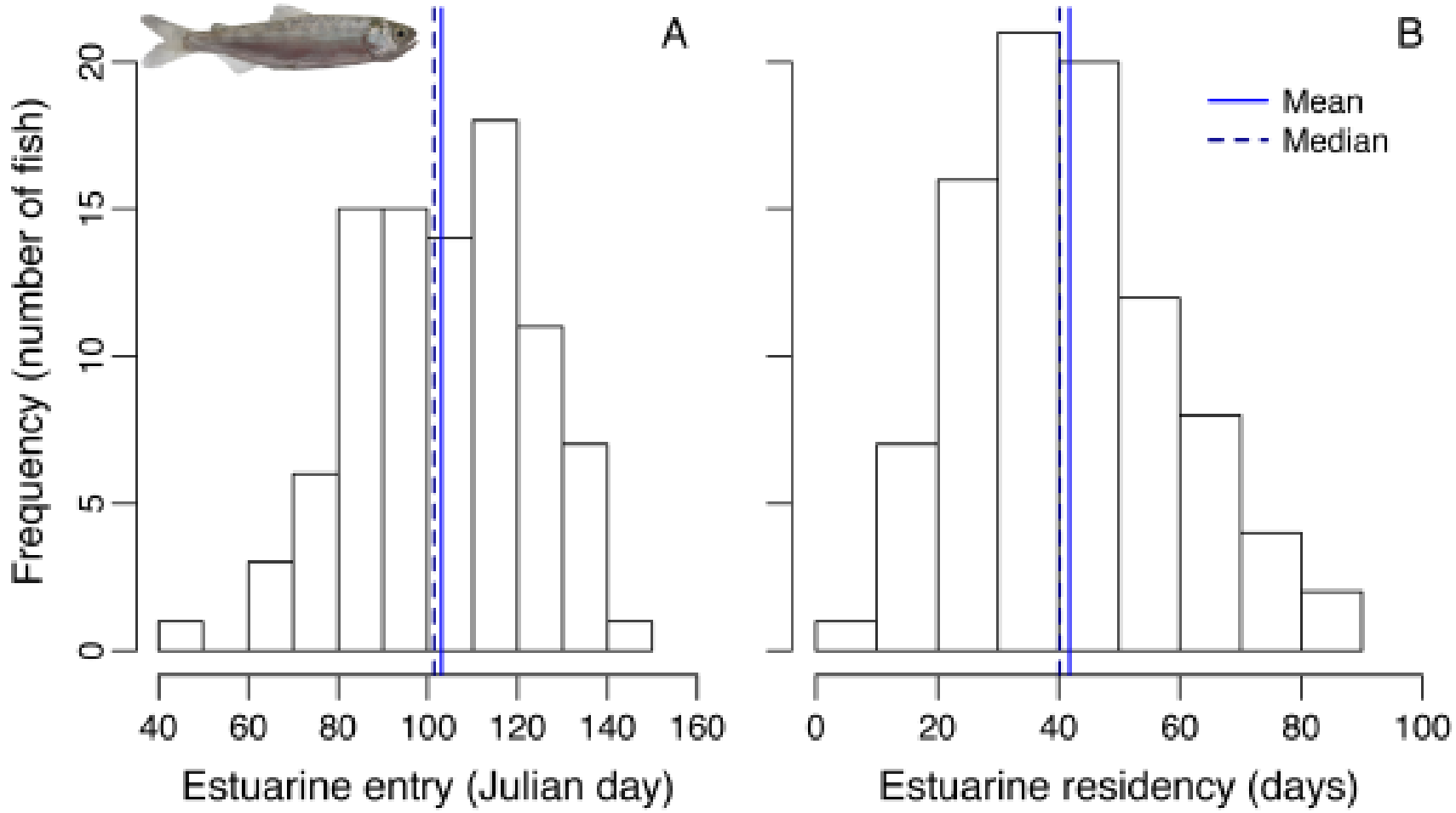
Fraser estuary sampling sites



Juvenile salmon mostly captured in marsh habitats

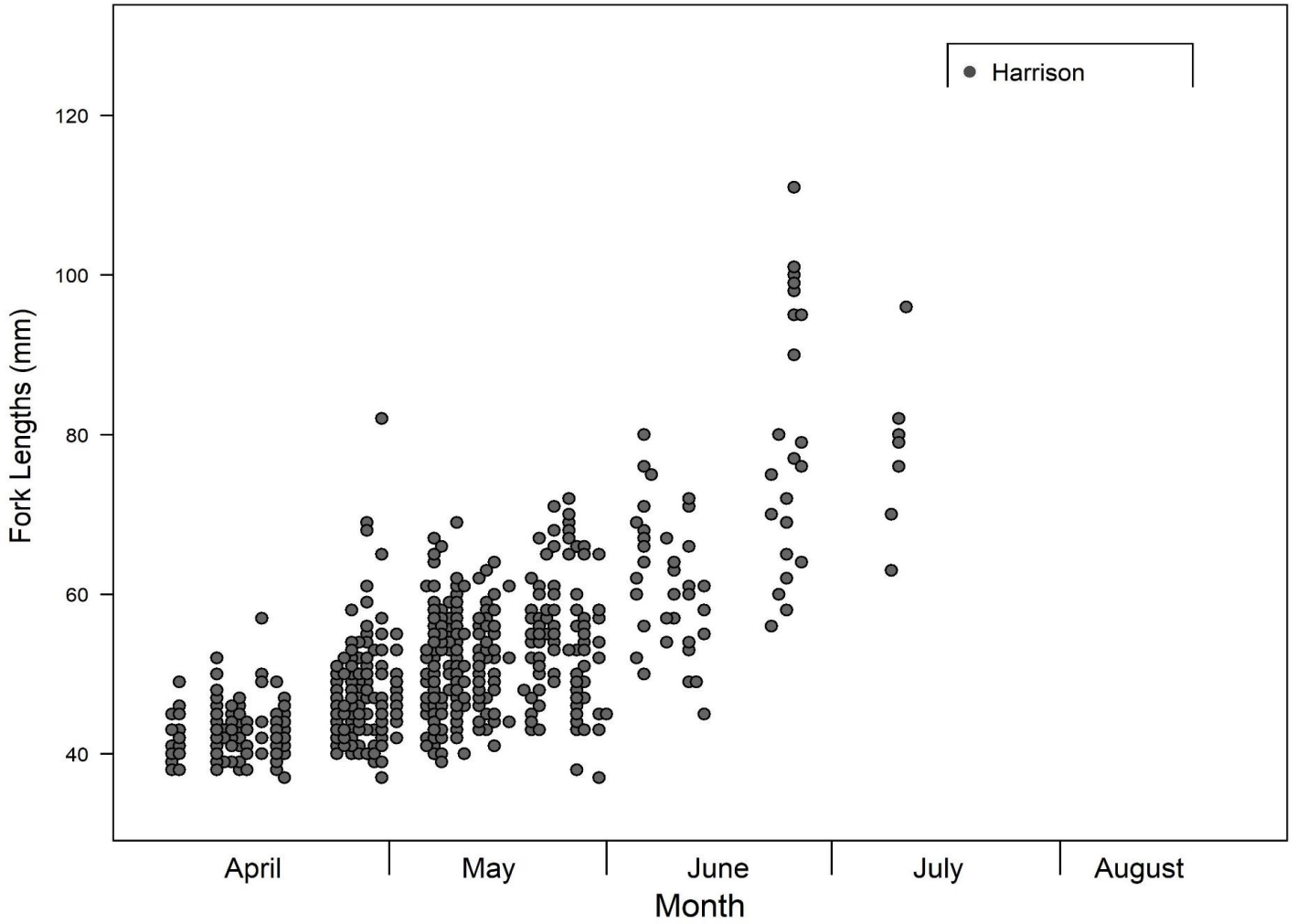


Otoliths demonstrate early entry and long estuary residence times for Harrison Chinook



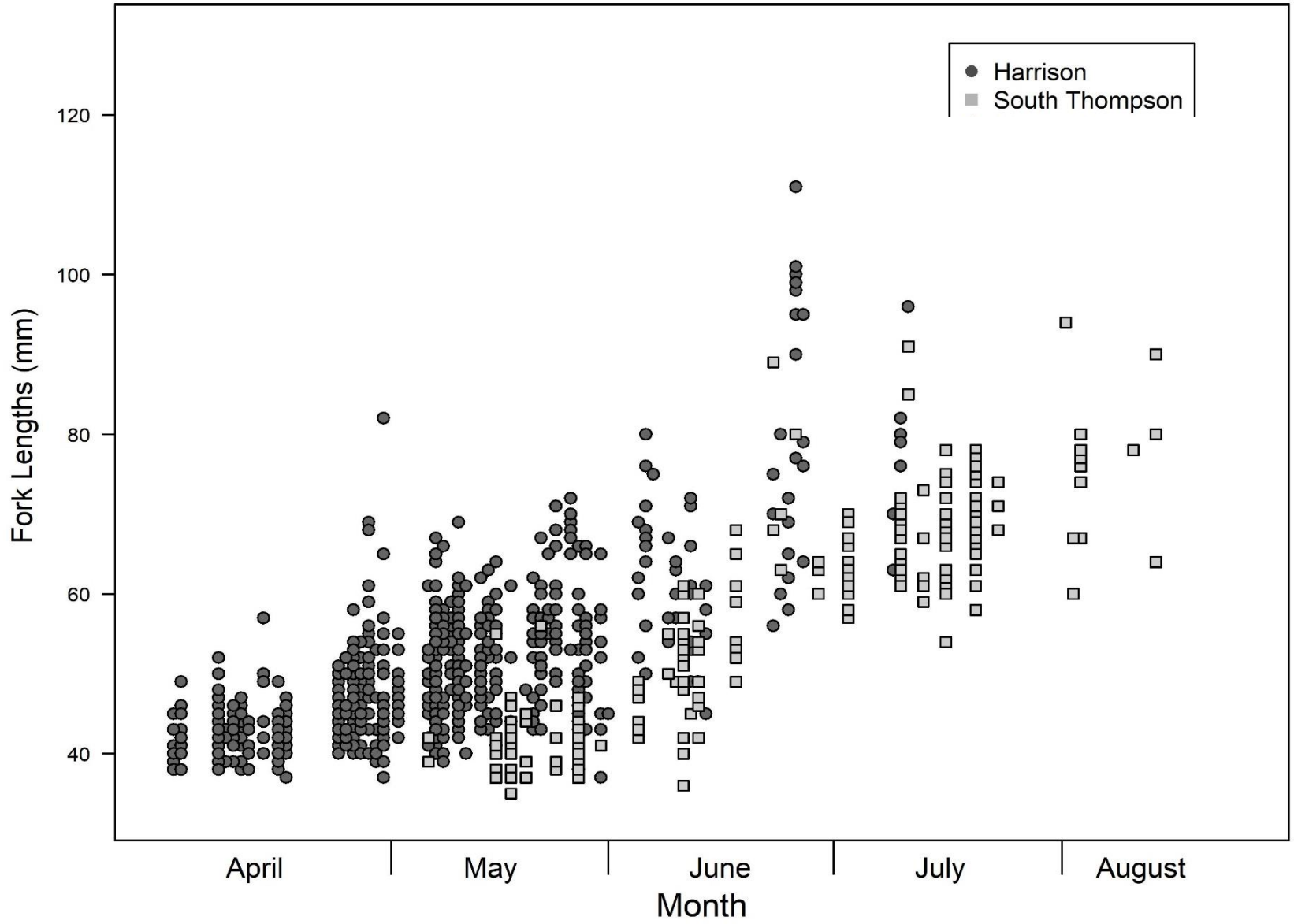
Chalifour, L., **Scott, D. C**., MacDuffee, M., Stark, S., Dower, J. F., Beacham, T. D., ... and Baum, J. K. 2020. Chinook salmon exhibit long-term rearing and early marine growth in the Fraser River, BC, a large urban estuary. *Canadian Journal of Fisheries and Aquatic Sciences*.

Harrison Chinook utilize marsh habitats extensively from April to June

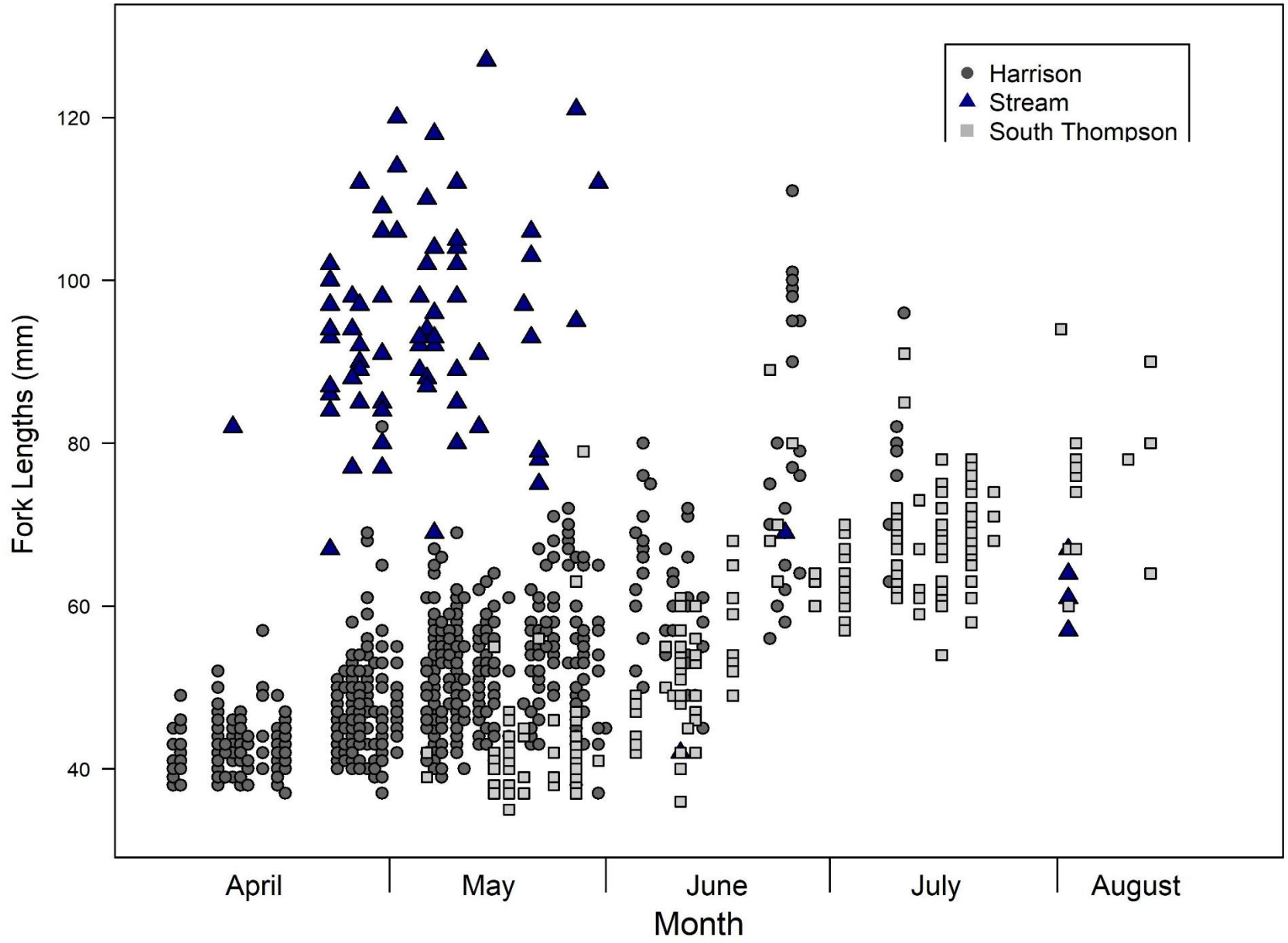


Scott, D. C., Chalifour, L., MacDuffee, M., Baum, J. K., Beacham, T., Rondeau, E., and Hinch, S. G. 2024. Variation in estuary use patterns of juvenile Chinook salmon in the Fraser River, BC. *Canadian Journal of Fisheries and Aquatic Sciences*, *81*(9), 1264-1278.

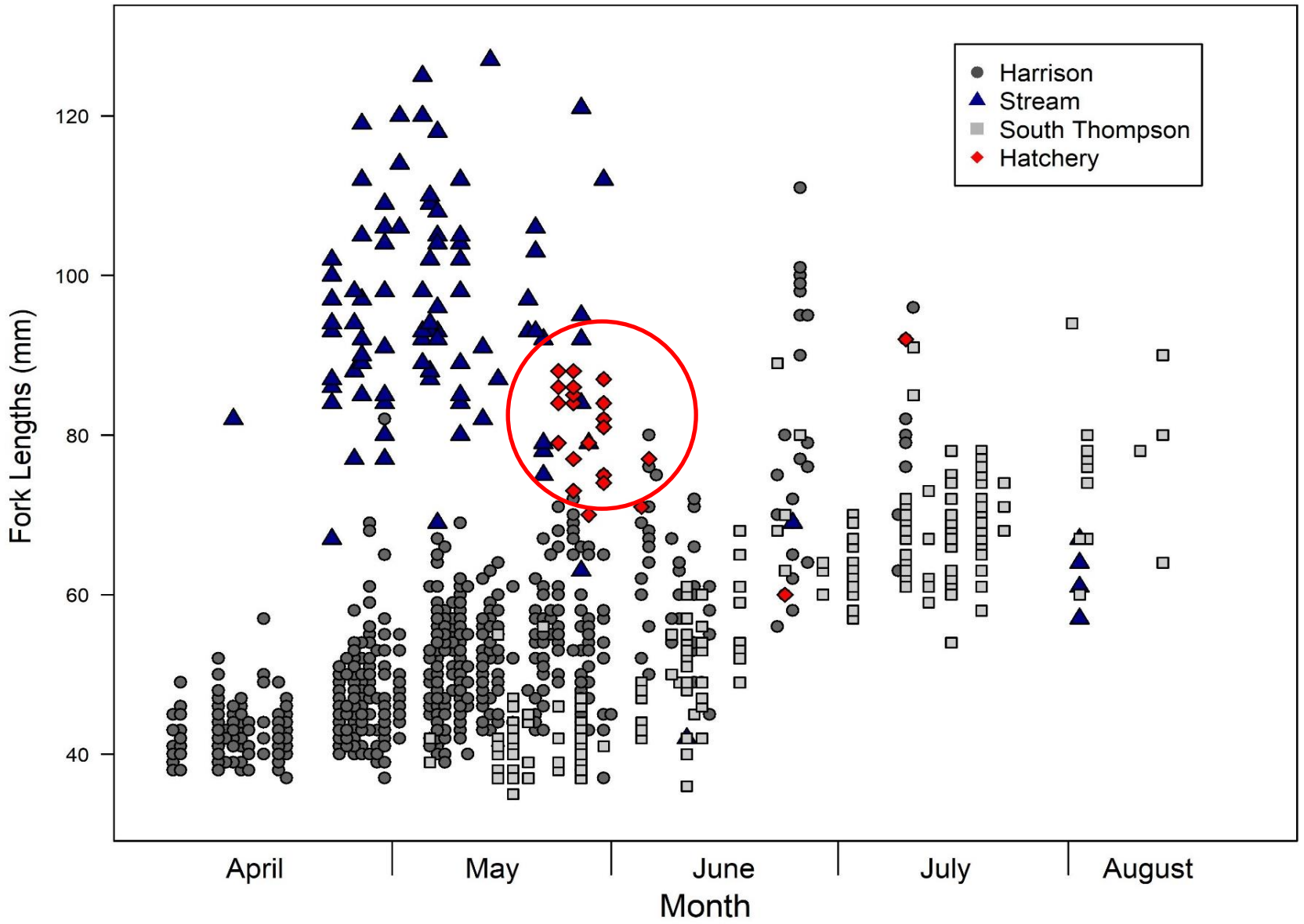
South Thompson Chinook utilize marsh habitats May to August



Stream type Chinook move through the estuary quickly in early May

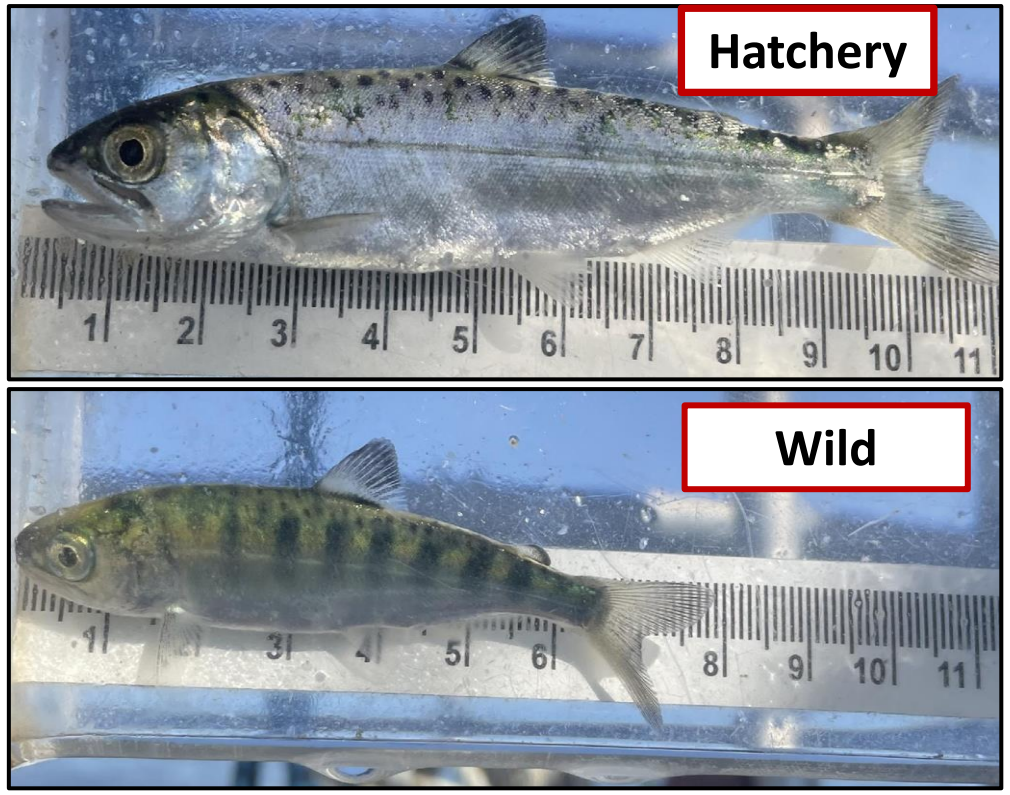


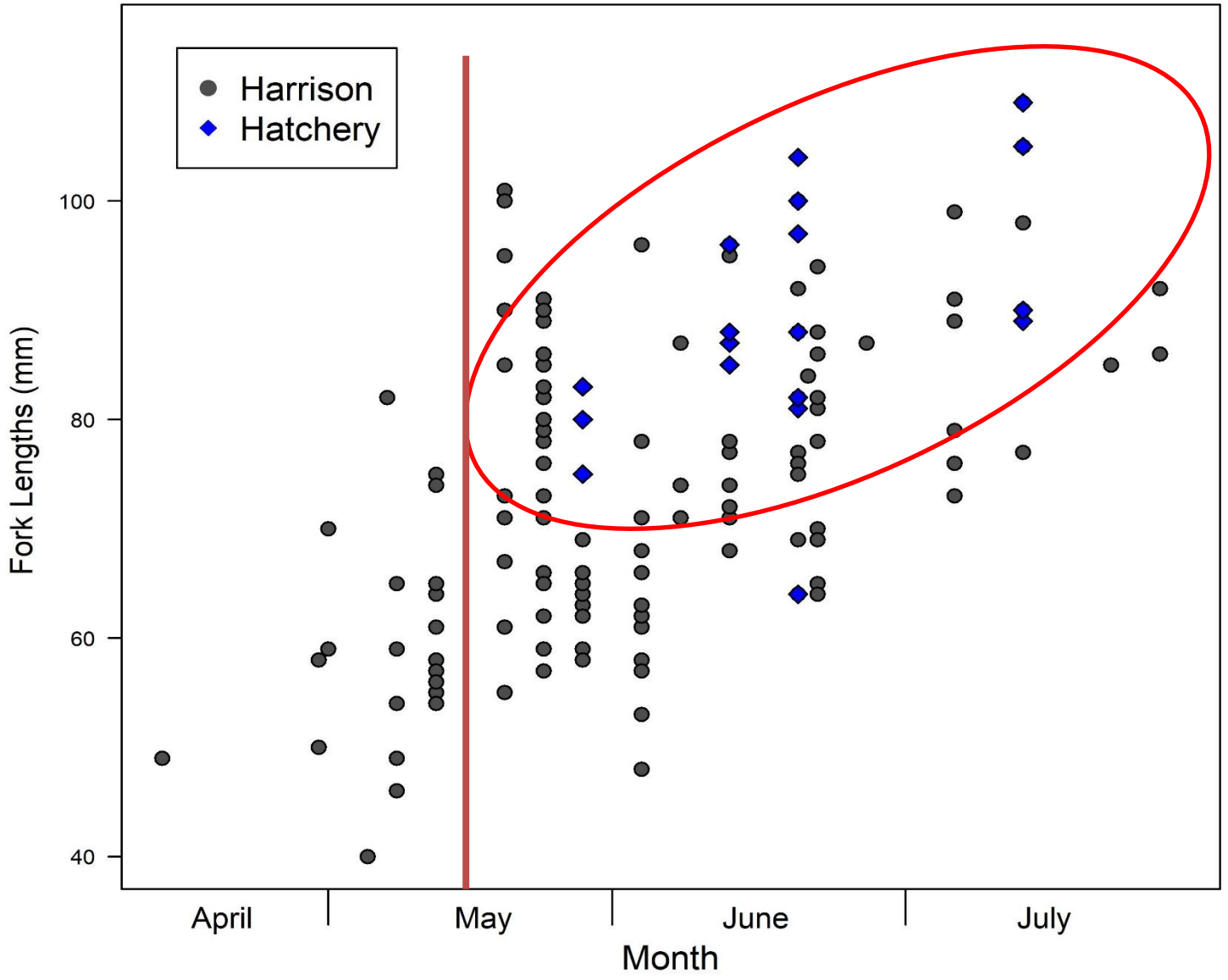
Hatchery Chinook spend very limited time in marsh habitats



Hatchery Chinook also captured in eelgrass habitats May to July

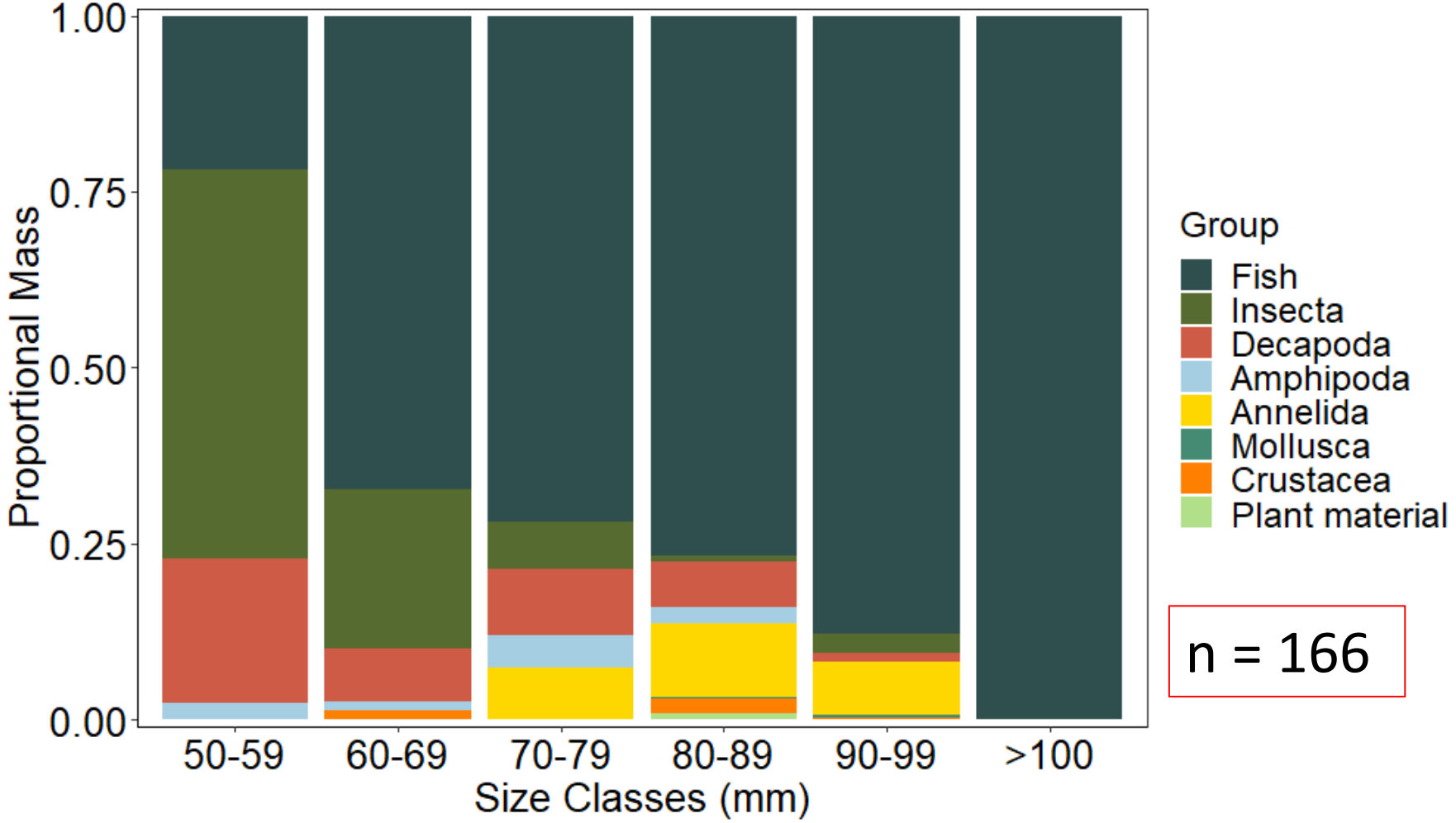
- **Hatchery Chinook move quickly to outer estuary habitats**
- **Hatchery Chinook larger than wild Chinook where they overlap**





Juvenile Chinook stomach contents in eelgrass

- **Paige Roper MSc Project**



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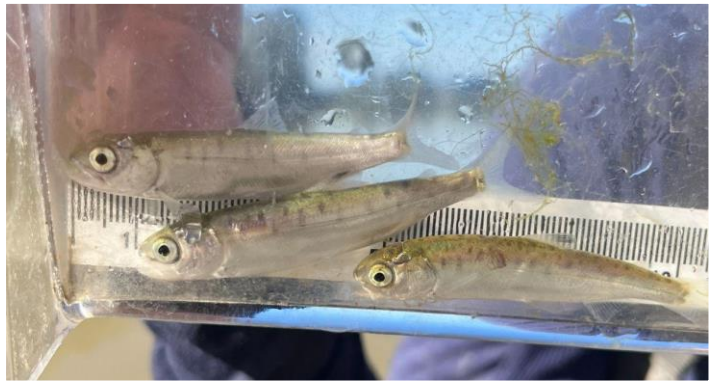
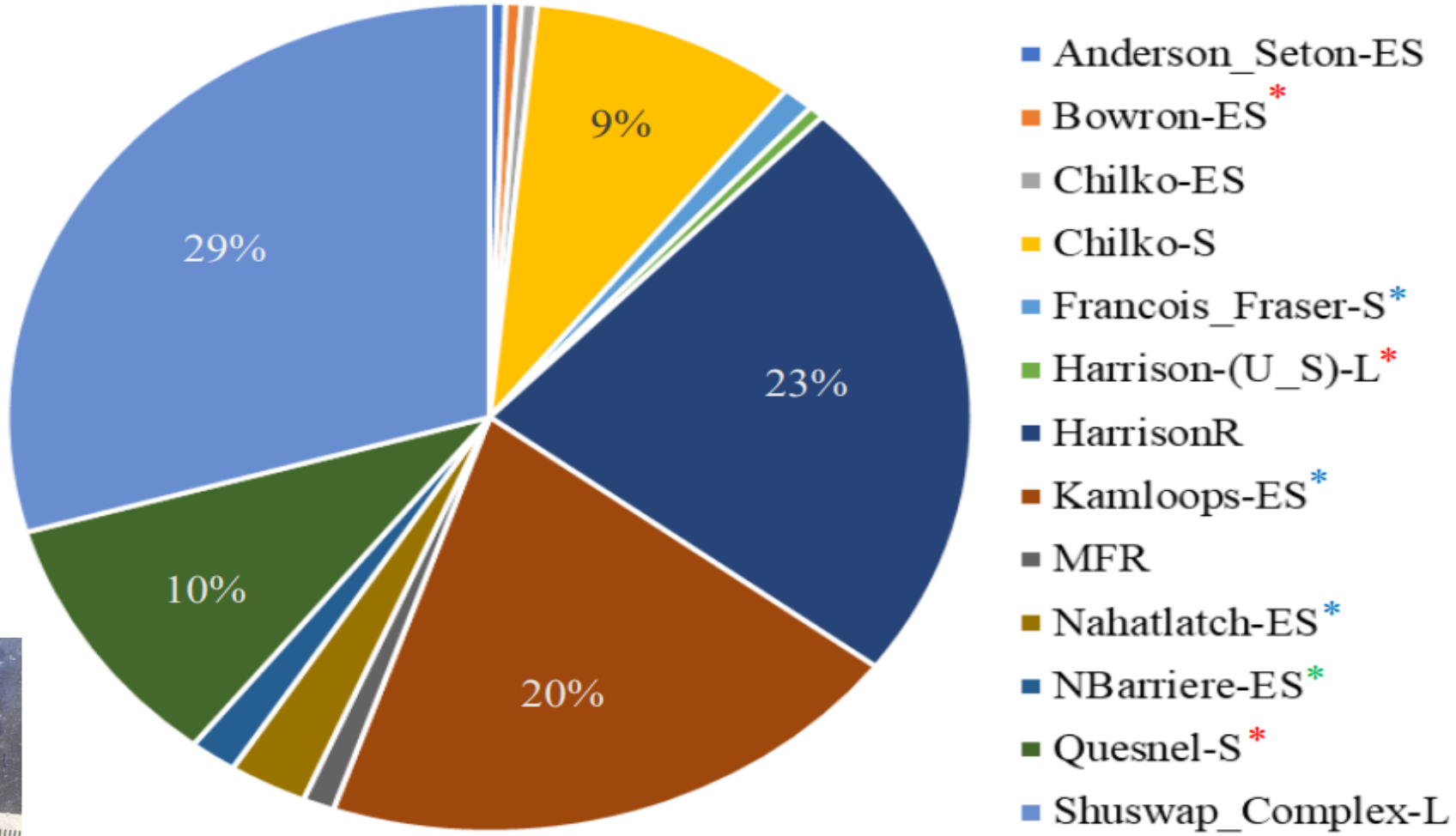
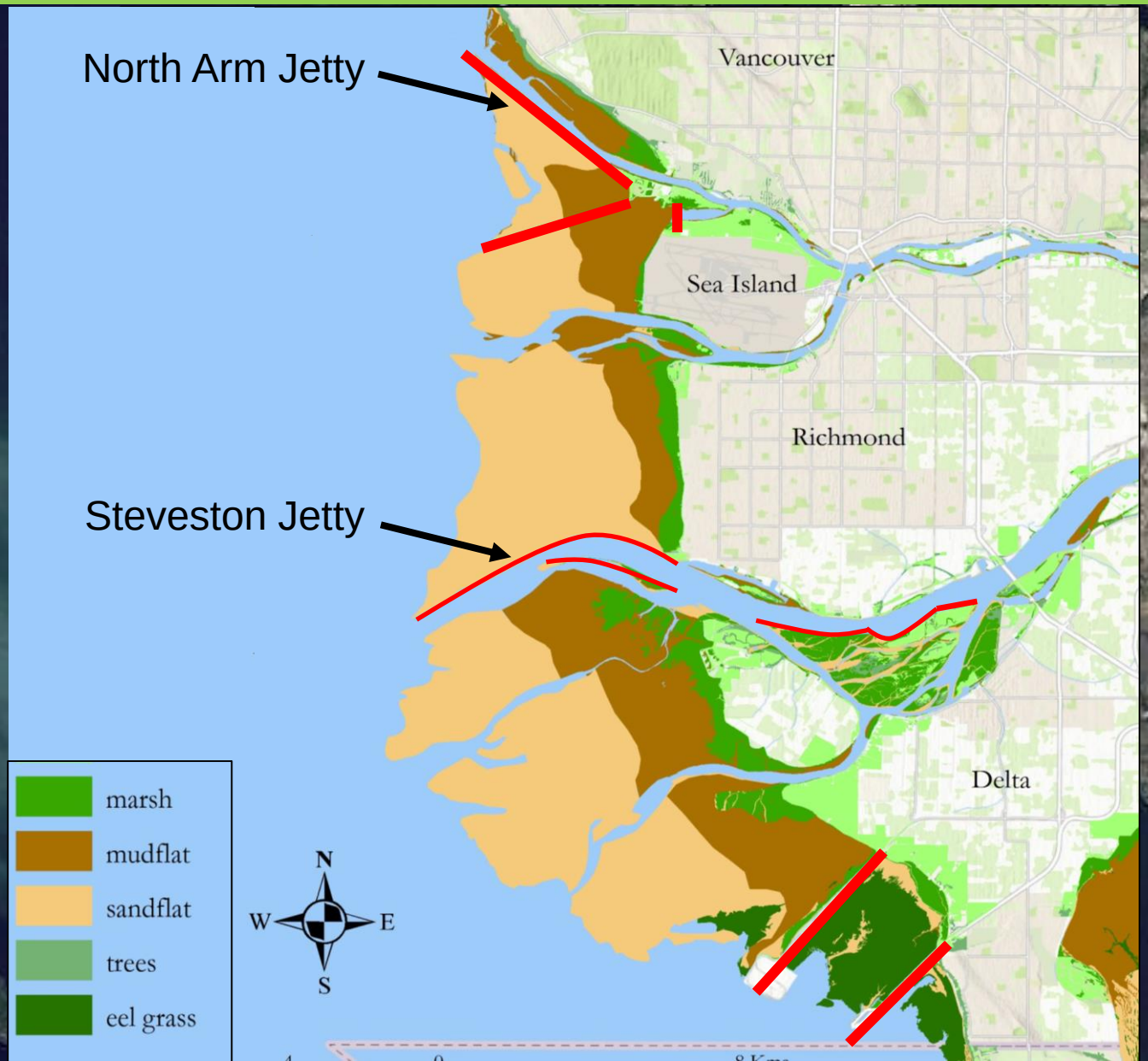
Investigating juvenile subyearling sockeye migrations in the Fraser estuary

- **Sam Rhodes**
  MSc Project



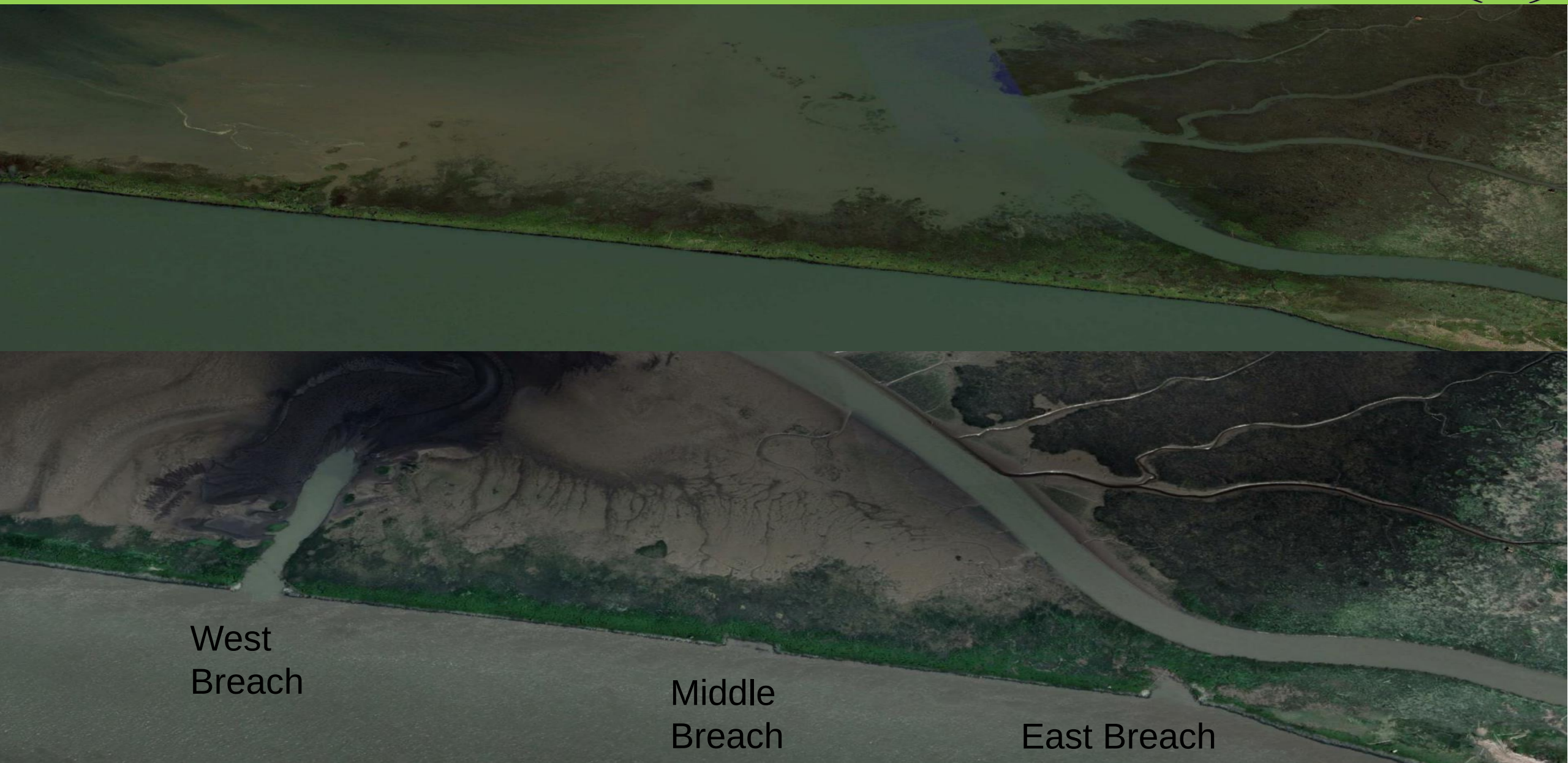


Fraser estuary habitats and barriers

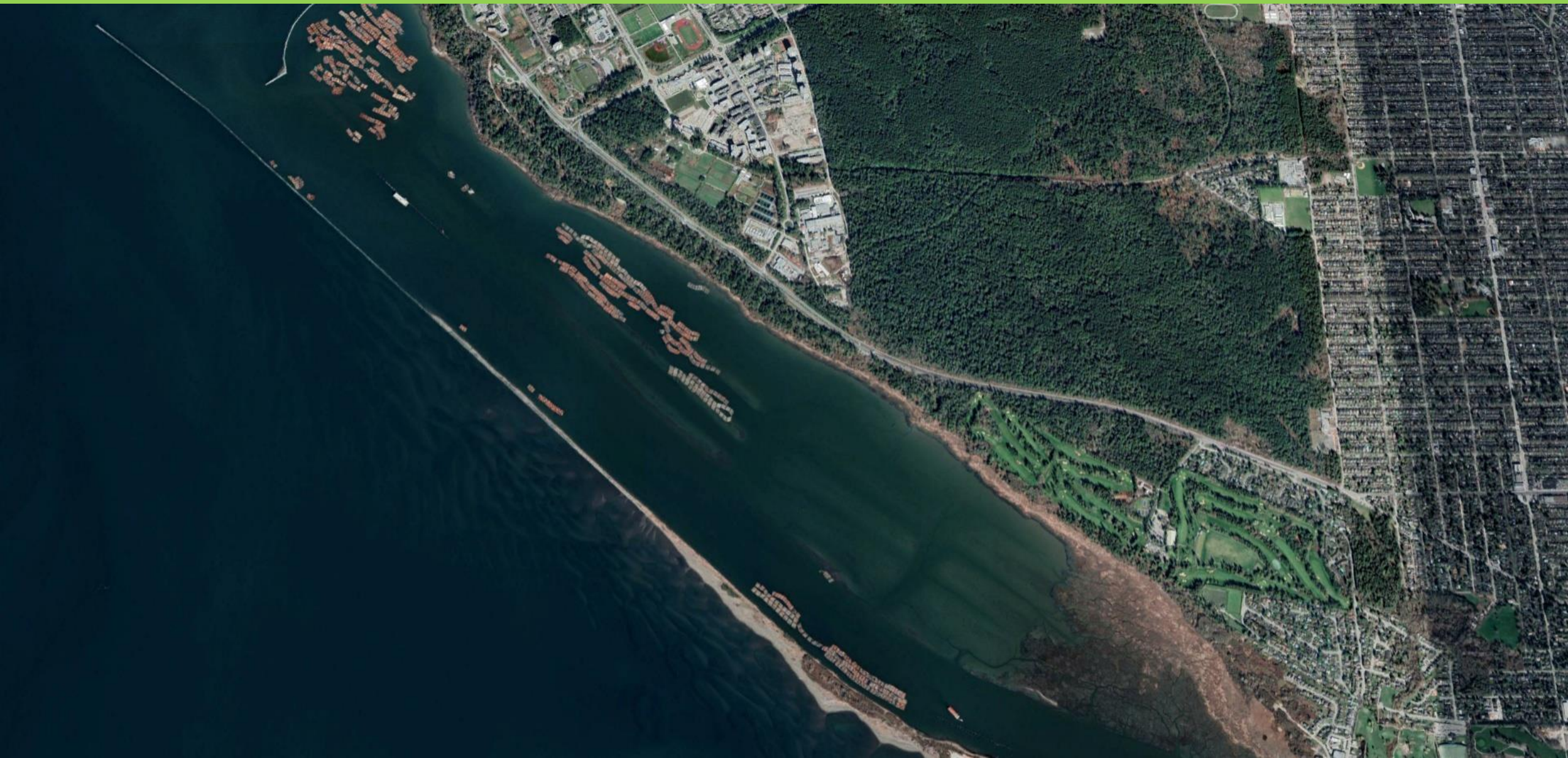


Fraser Estuary Connectivity Project – Steveston North Jetty

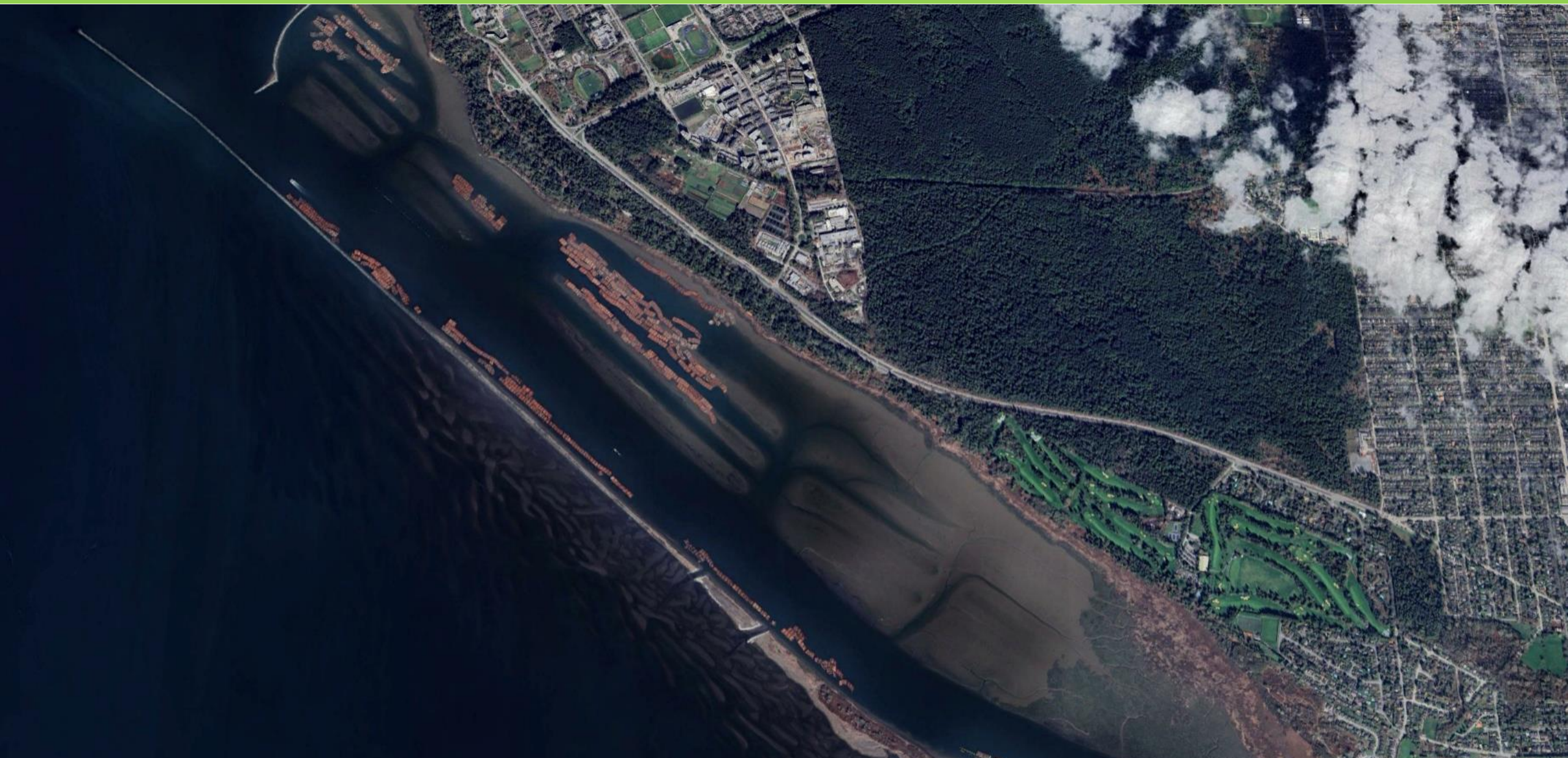
Fraser Estuary Connectivity Project - Steveston Jetty Breaches



Fraser Estuary Connectivity Project - North Arm Jetty Breaches



Fraser Estuary Connectivity Project - North Arm Jetty Breaches



Fraser Estuary Connectivity Project - North Arm Jetty Breaches

Fraser Estuary Connectivity Project - North Arm Jetty Breaches

Hydraulic modelling work and engineering

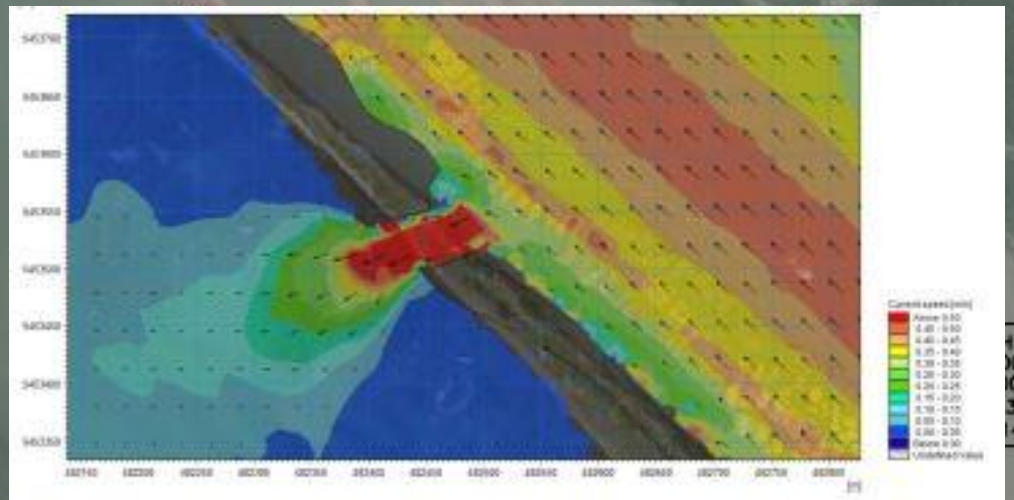


Figure 9. Modelled current speeds through the Option 1 breach with raised invert without additional rotation on June 9, 2012

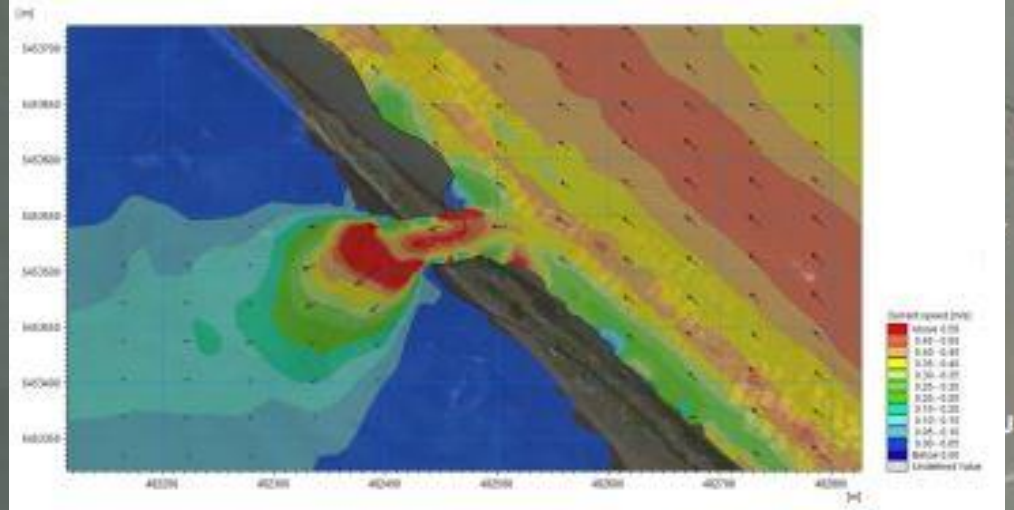
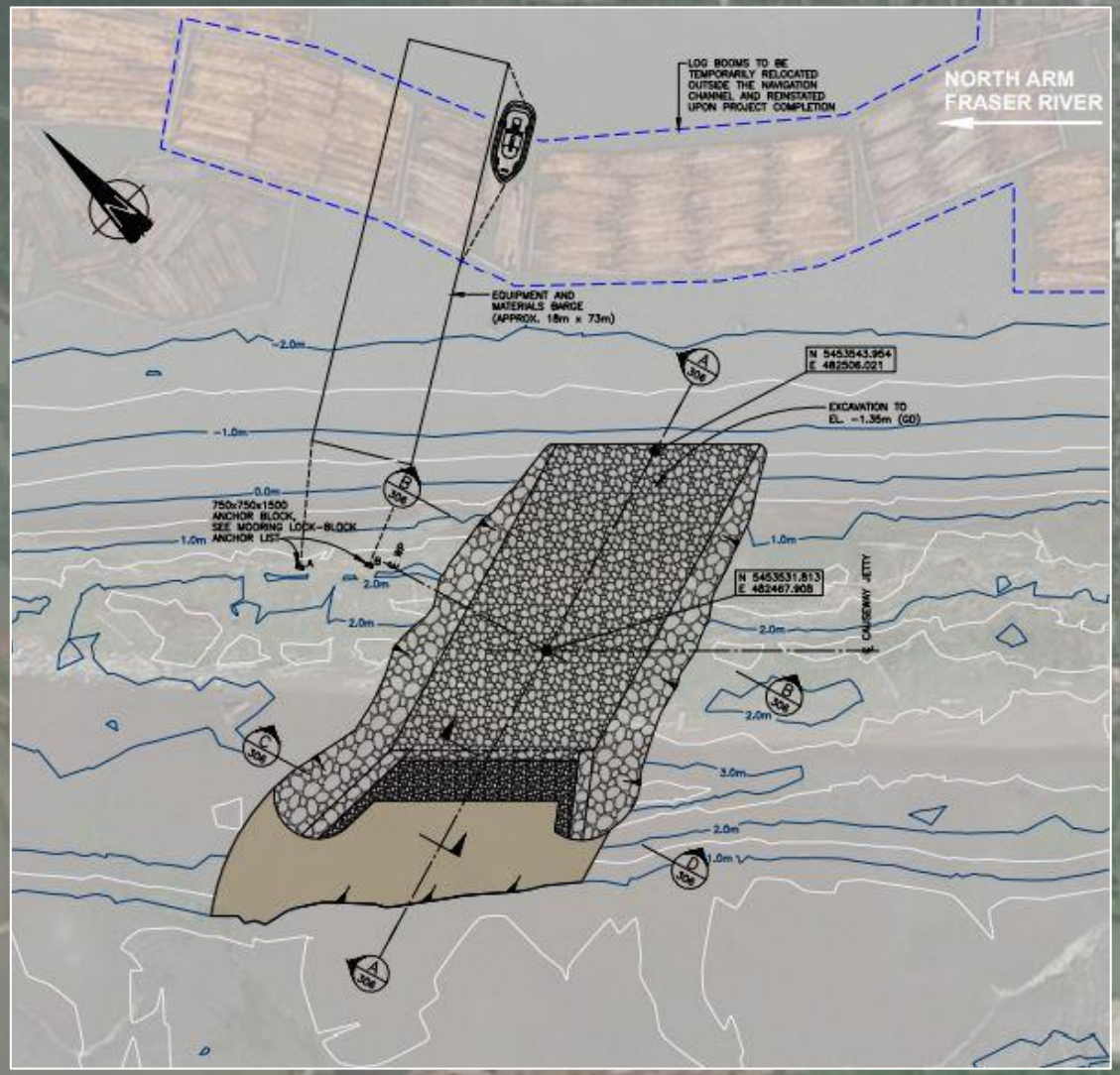
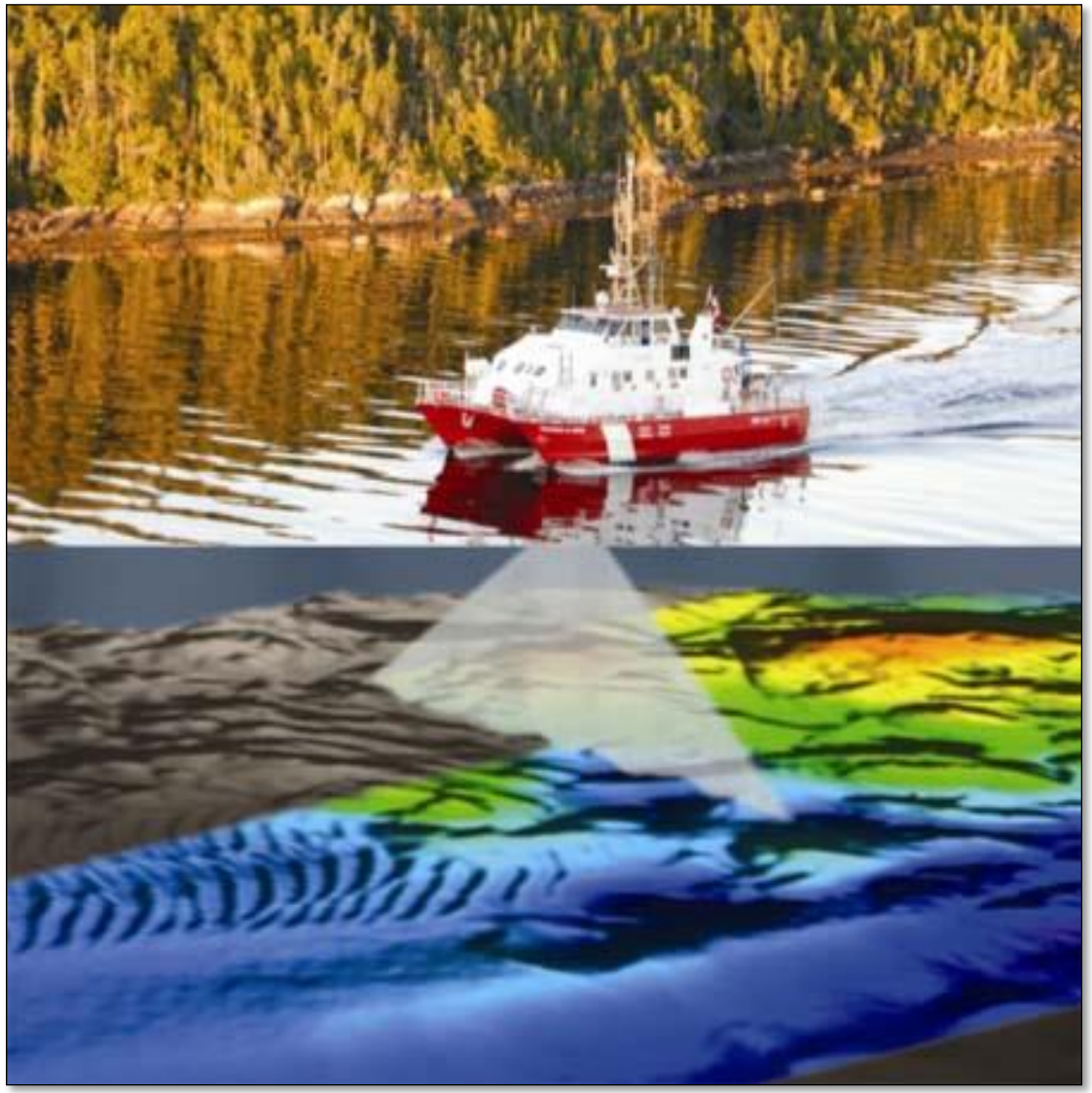


Figure 10. Modelled current speeds through the Option 1 breach with additional rotation on June 9, 2012



Current, sedimentation and channel monitoring

- Current surveys with drogues
- Annual drone LiDAR Surveys at low tide
- Annual sounding surveys



Steveston Jetty Fish Sampling Methods

2019

2020

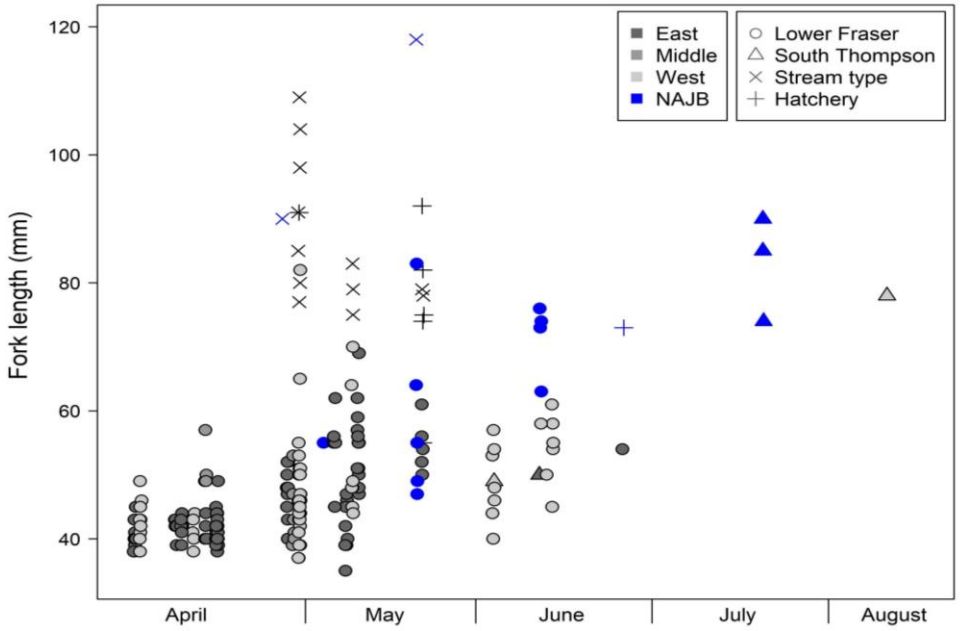
Steveston Jetty Fish Sampling Methods

2021-2022

North Arm Jetty Fish Sampling Methods

Chinook from throughout Fraser captured at breach locations

- **Majority small fry from Lower Fraser Fall population in spring**
- **Large Stream type individuals captured from Upper Fraser**
- **Small number hatchery produced captured**
- **South Thompson captured latest**



Key Project Takeaways

- Creation of breaches in Steveston and North Arm jetties has significantly improved connectivity for juvenile salmon, including Chinook salmon fry
- Breach creation has had no impact on navigation in adjacent shipping channels
- Channel development has occurred but at highly variable rates between breaches, continues to improve connectivity over time

Next steps – Addressing habitat gaps in the Lower Fraser

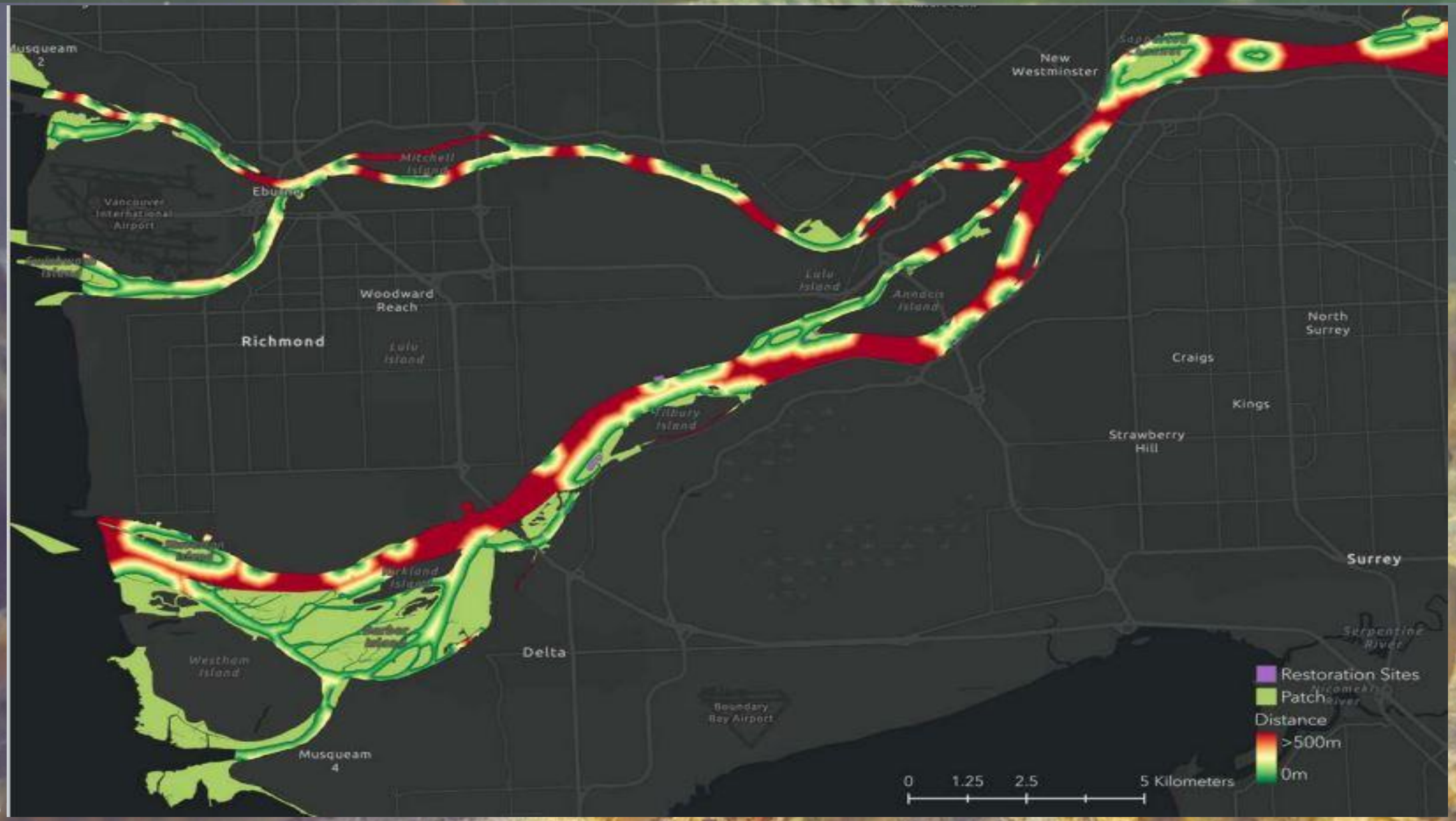


Photo: Fernando

Marsh Restoration in the Lower Fraser

- Raincoast is currently developing several marsh restoration projects
- Projects selected based on feasibility, public landownership
- Difficult to find potential sites in some key gap areas, and in South Arm
- Numerous threats which can reduce success

Woods Island Marsh Project

- Raincoast conducted our first large marsh restoration project from fall 2024 to early 2025
- Former compensation site which had limited connectivity and was dominated by invasive cattail
- Baseline monitoring spring/summer 2024

Woods Island Marsh Project

- Cattail cut occurred in Sept 2024 prior to construction
- Also occurred at our No 2 Road Marsh site
- Each basin took 3 staff approx. ~1 week to cut

Woods Island Marsh Project

- Construction occurred in Jan – Feb 2025
- Wooden screen removed and additional outlet created
- Marsh basin depth reduce by ~0.5 – 1 m, channels created

Woods Island Marsh Project

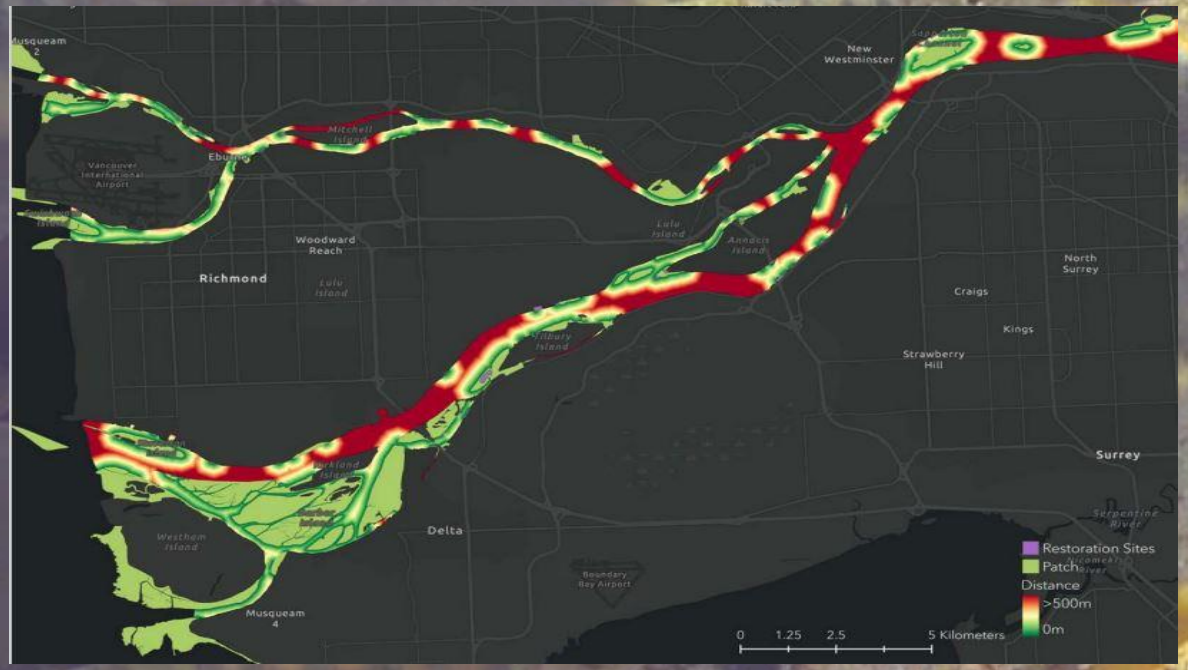
- Marsh planted with >10k plugs late March
- Marsh growth as of May 2025 showing very high planting success
- Supplemental planting and cattail management

Woods Island Marsh Project

- Initial monitoring has shown 25-fold increase in juvenile salmon captures
- Large densities of juvenile Chinook and chum salmon captured at the site in April and May

Next steps – Addressing habitat gaps and threats in the Lower Fraser

- Raincoast advancing 4 more projects over coming years
- Future project selection will need increased focus on addressing gaps
- Need to work with First Nations and all levels of Governments to conduct restoration projects while addressing threats that impact marshes



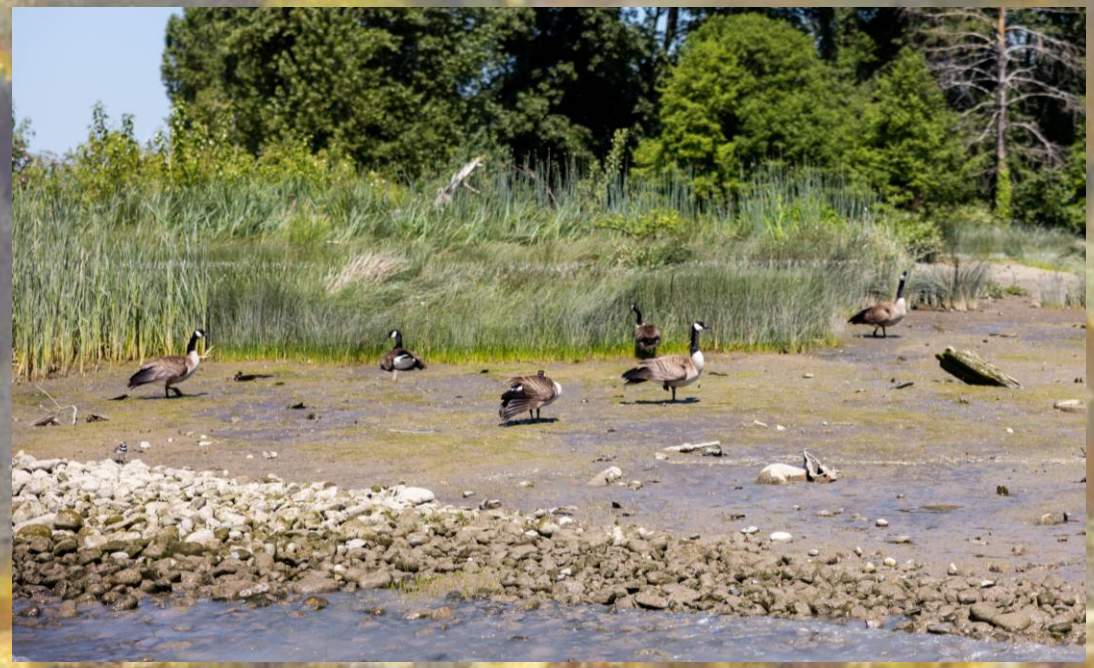
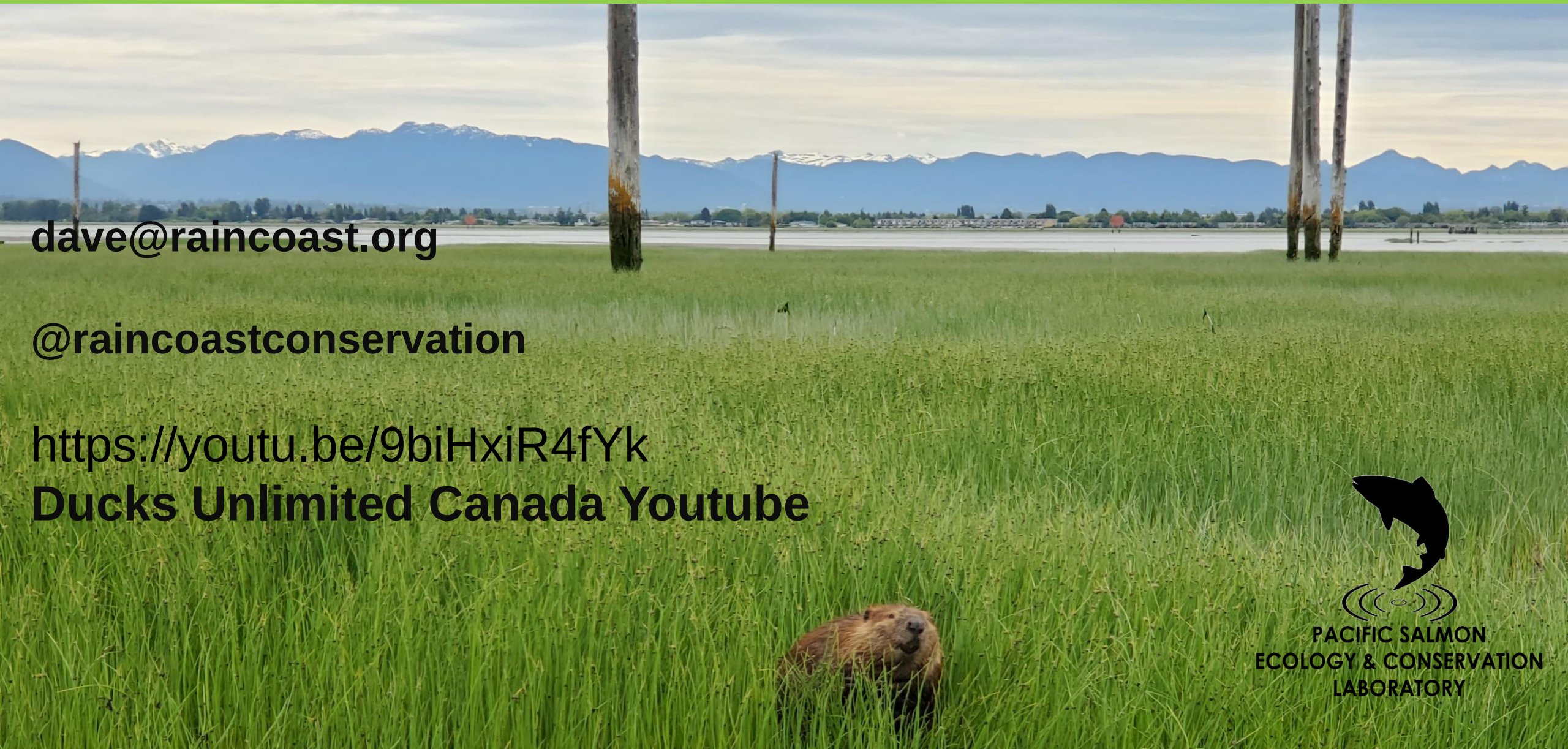


Photo: Fernando Lessa

Thanks for listening!



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https://youtu.be/9biHxiR4fYk
Ducks Unlimited Canada Youtube

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