Juvenile salmon use of habitat mosaics across a spectrum of structurally diverse estuaries

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Salmon Watersheds Lab

earth to ocean

SFU | SIMON FRASER UNIVERSITY

Introduction

Introduction

Estuaries act as salmon **nurseries** by providing **refuge from predators** and **increased prey resources**

Fernando Lessa

Jon Moore

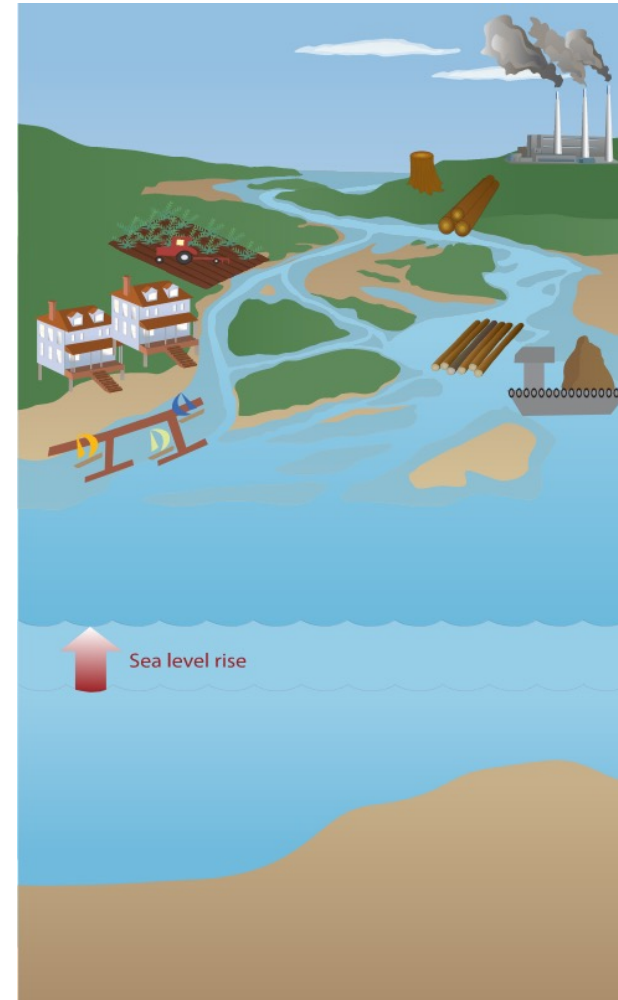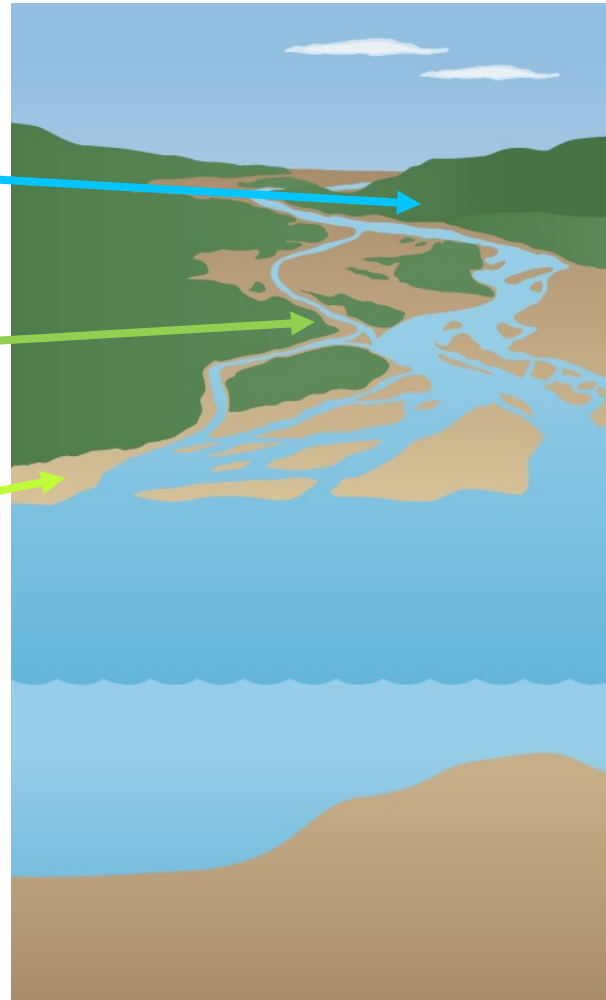Tavish Campbell

Estuaries come in all shapes and sizes

Hakai Institute

Habitat Conservation Trust Foundation

Cowichan Land Trust

Estuaries are under threat from *coastal squeeze*

Estuarine meadow

Estuarine marsh

Beach

Sea level rise

Research Question

How does juvenile salmon abundance vary across estuarine habitat types and other environmental variables?

Photo credit: Jon Moore

# Nature Trust BC's Estuary Resilience Project

- Collecting data in 15 estuaries across coastal British Columbia to assess vulnerability to climate change & sea-level rise and understand the health & fitness of wild fish populations

- Multi-partner collaboration between local First Nations, eNGOs, and provincial & federal governments

- Research to inform habitat restoration goals and guide land management decisions

NATURE TRUST
BRITISH COLUMBIA

Study region

Vancouver Island, British Columbia, Canada

May-June 2021

8 estuaries,
96 sites,
194 seines
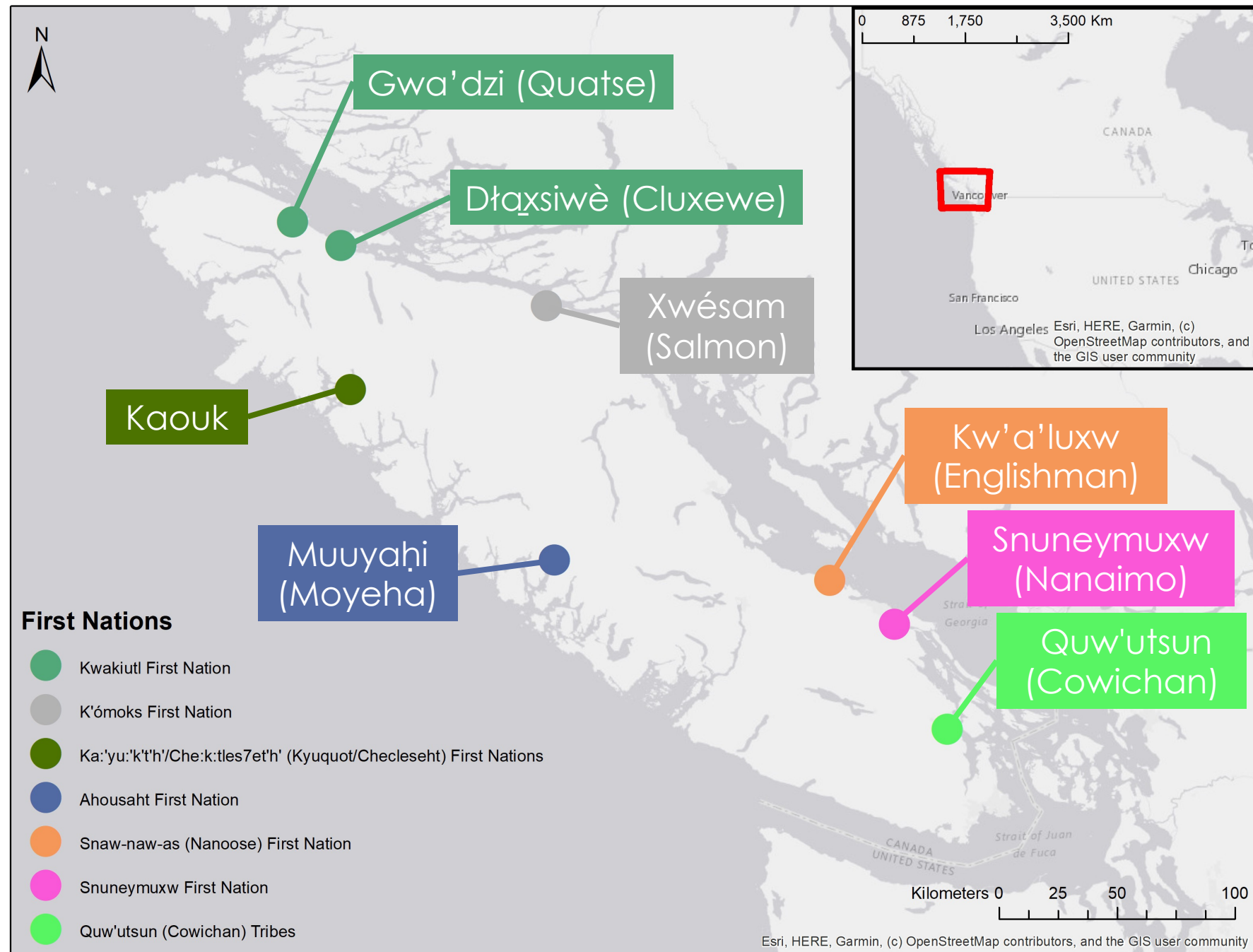
Collaborations

Snuneymuxw First Nation and
Fisheries & Oceans Canada (Nanaimo)

K'omoks First Nation (Sayward)

Uu-a-thluk, Nature Trust BC, and
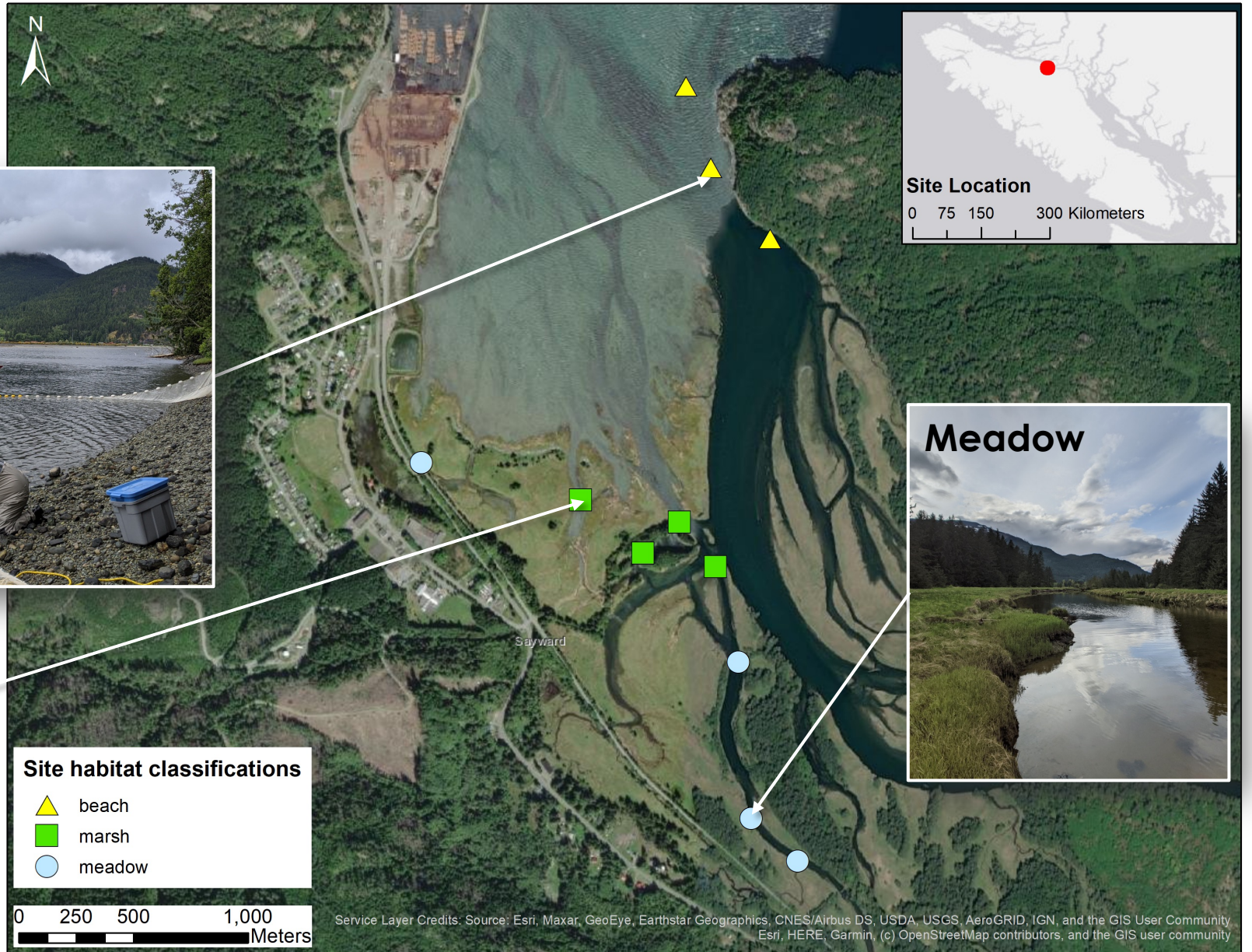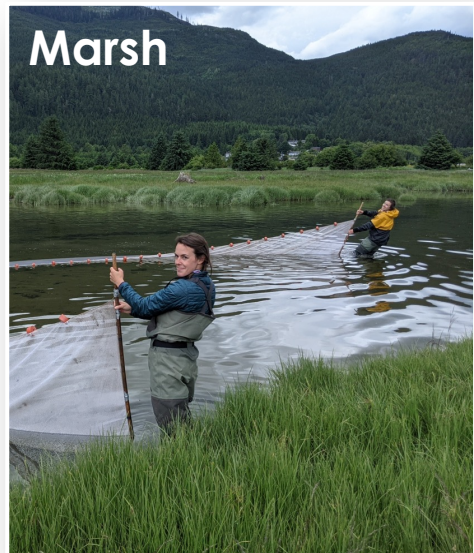Redd Fish Restoration Society (Ahousaht)

Study design

Beach   Estuarine marsh   Estuarine meadow

Example: Salmon River Estuary

Beach

Marsh

Meadow

Site Location

0 75 150 300 Kilometers

Site habitat classifications

▲ beach

🟩 marsh

🔵 meadow

0 250 500 1,000
Meters

Sayward

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

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Sampling methodology

- Enumeration & identification of all fish species

- Subsample for fork length measurements and lethal collection

Sampling methodology

Abiotic measurements of water quality

- Temperature
- Salinity
- Dissolved oxygen
- pH

Catch results

Coho
O. kisutch

Chinook
O. tshawytscha

Chum
O. keta

Statistical analysis (GLMMs)

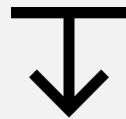**Response:**

- Catch per unit effort

Predictors (fixed):
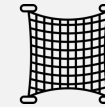
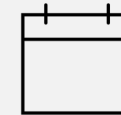- Habitat type

- Water column depth

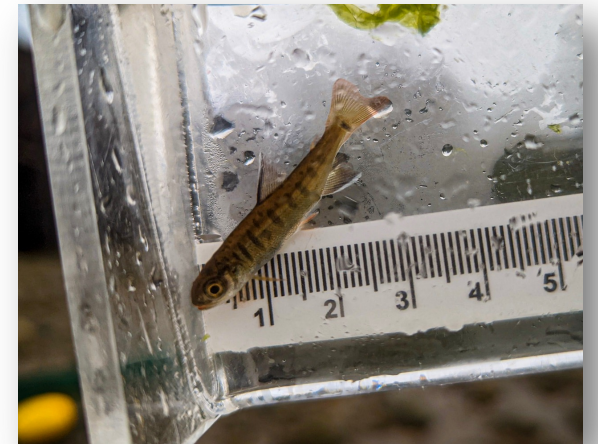- Water quality

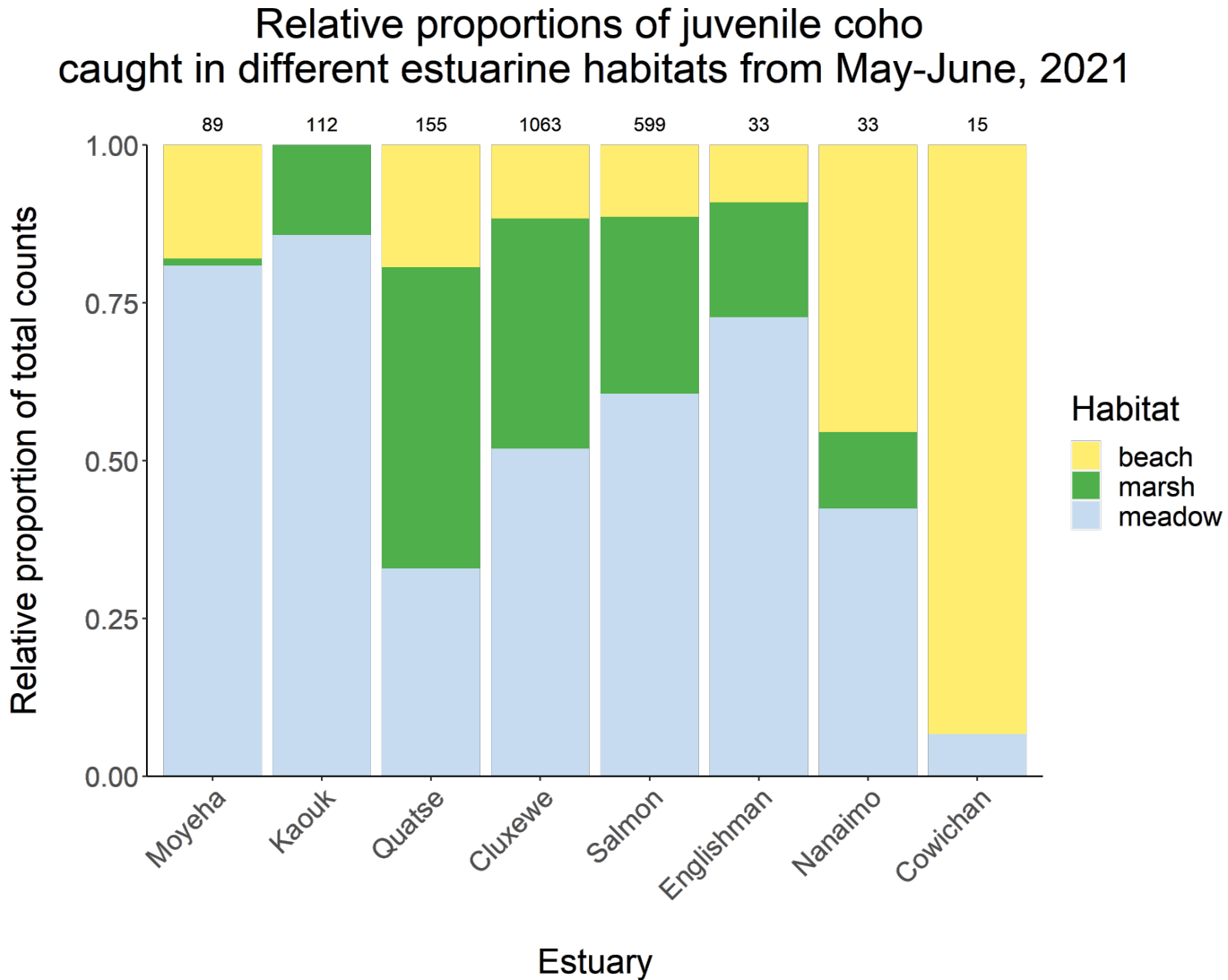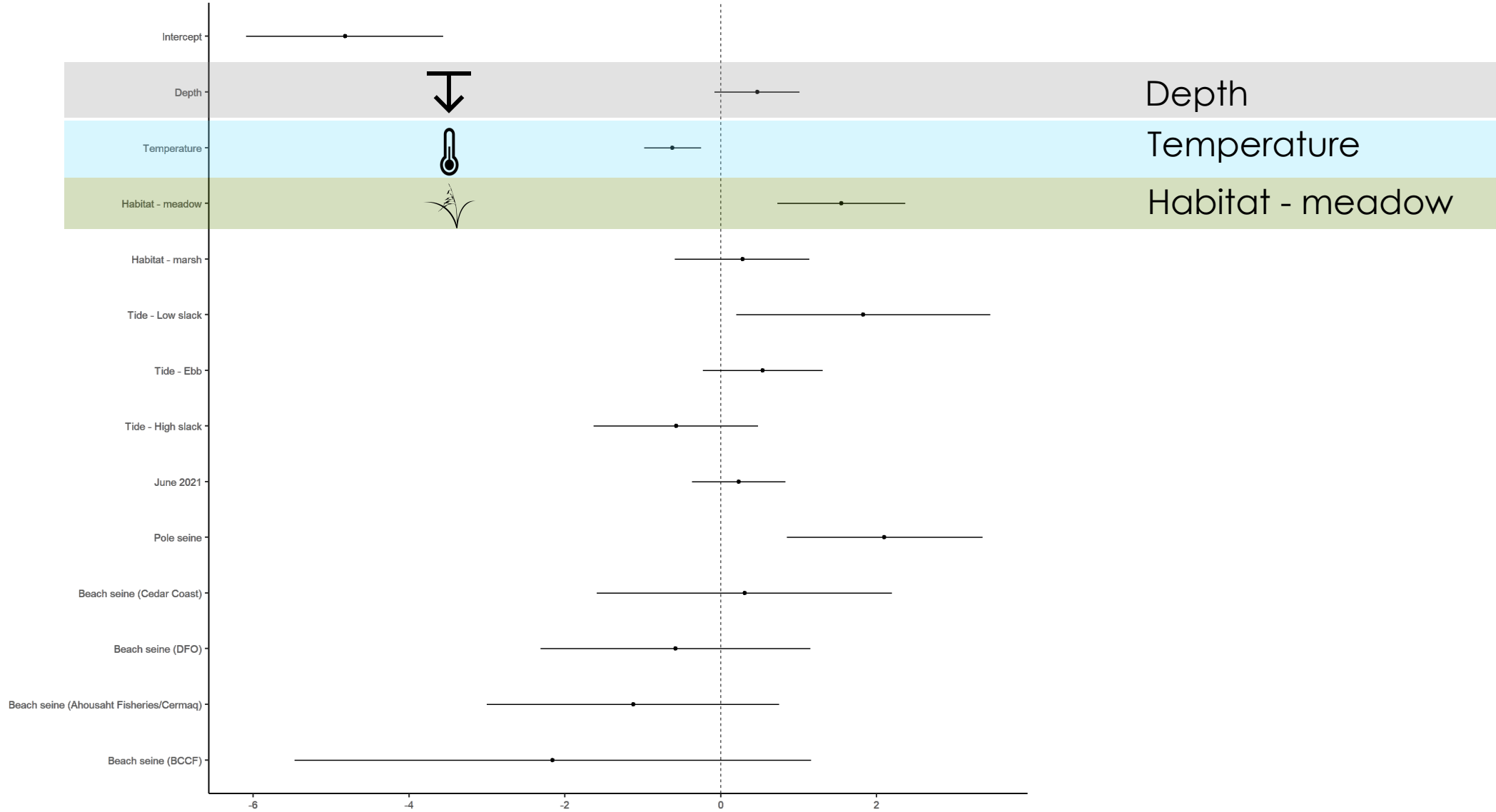**Other fixed effects:**

- Tide state

- Gear type
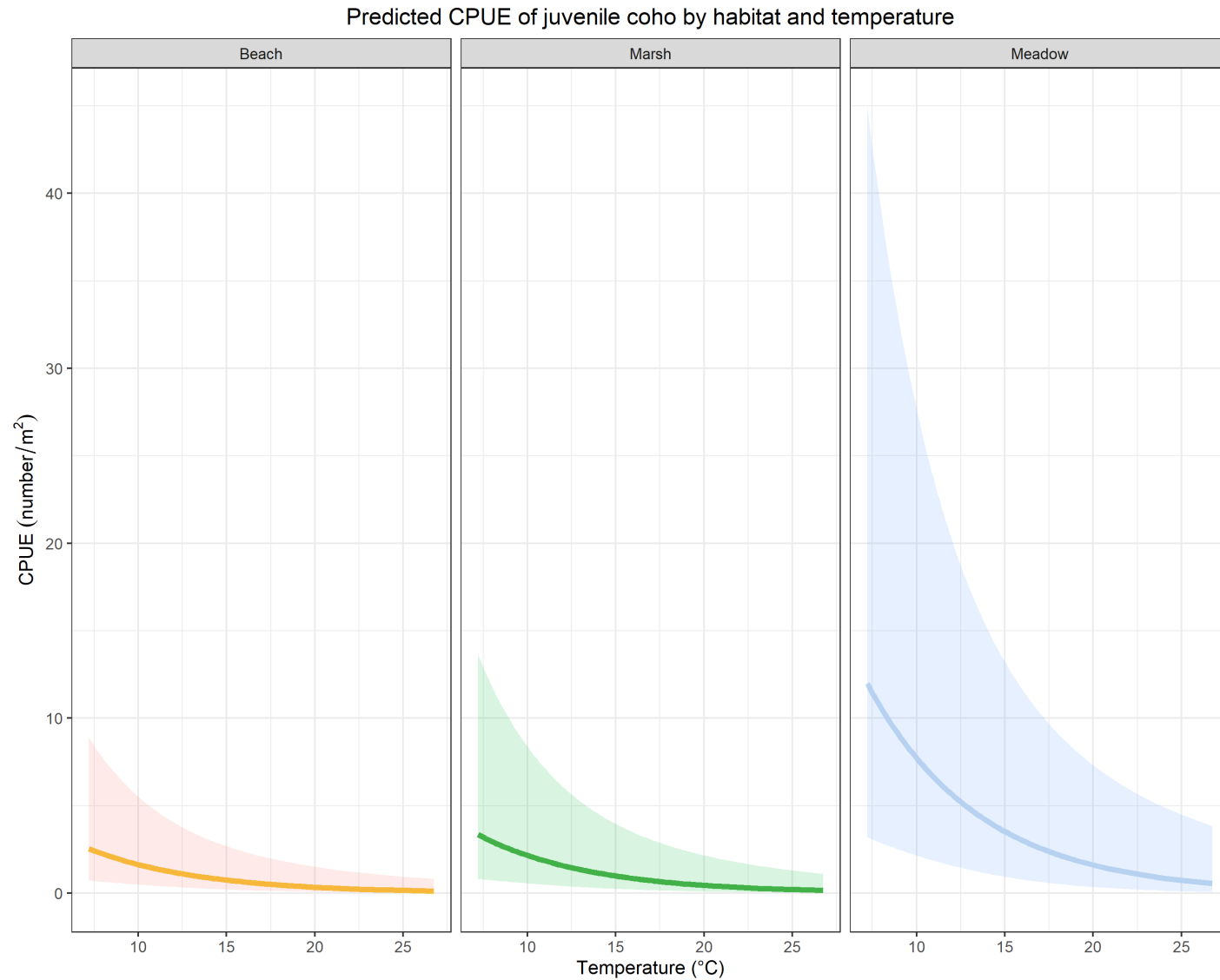
- Sampling month

Random effect:

- Estuary / site

Results: Habitat distribution of juvenile coho

Relative proportions of juvenile coho
caught in different estuarine habitats from May-June, 2021

Results

Model estimates

coho ~ [grass] + [↓] + [thermometer]
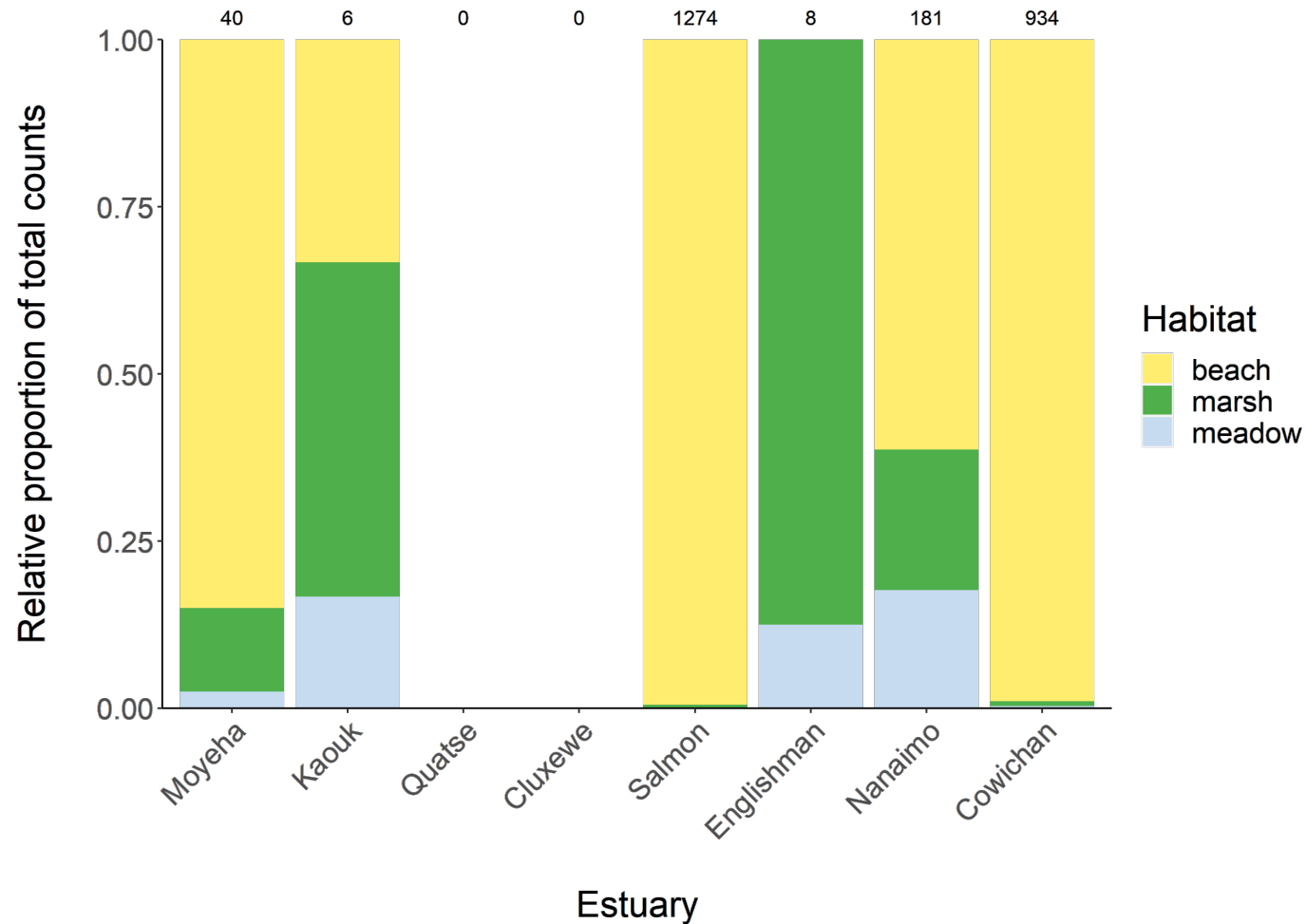

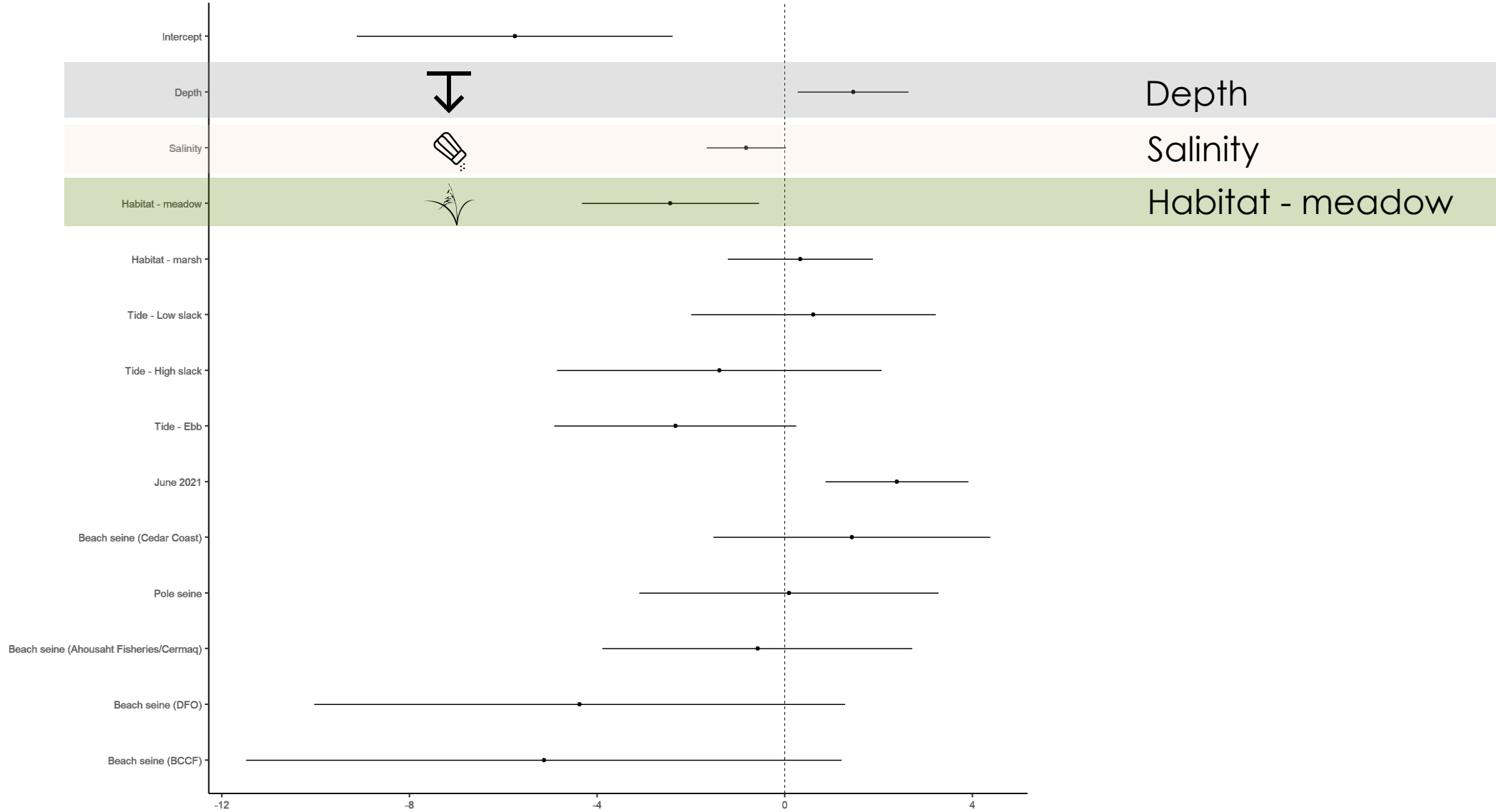Predicted CPUE of juvenile coho by habitat and temperature

Results: Habitat distribution of juvenile chinook

Relative proportions of juvenile chinook
caught in different estuarine habitats from May-June, 2021

* Cowichan estuary catch data for June sampling provided in part by BCCF

Results

Model estimates

chinook ~ [rice plant] + [downward arrow] + [pencil]
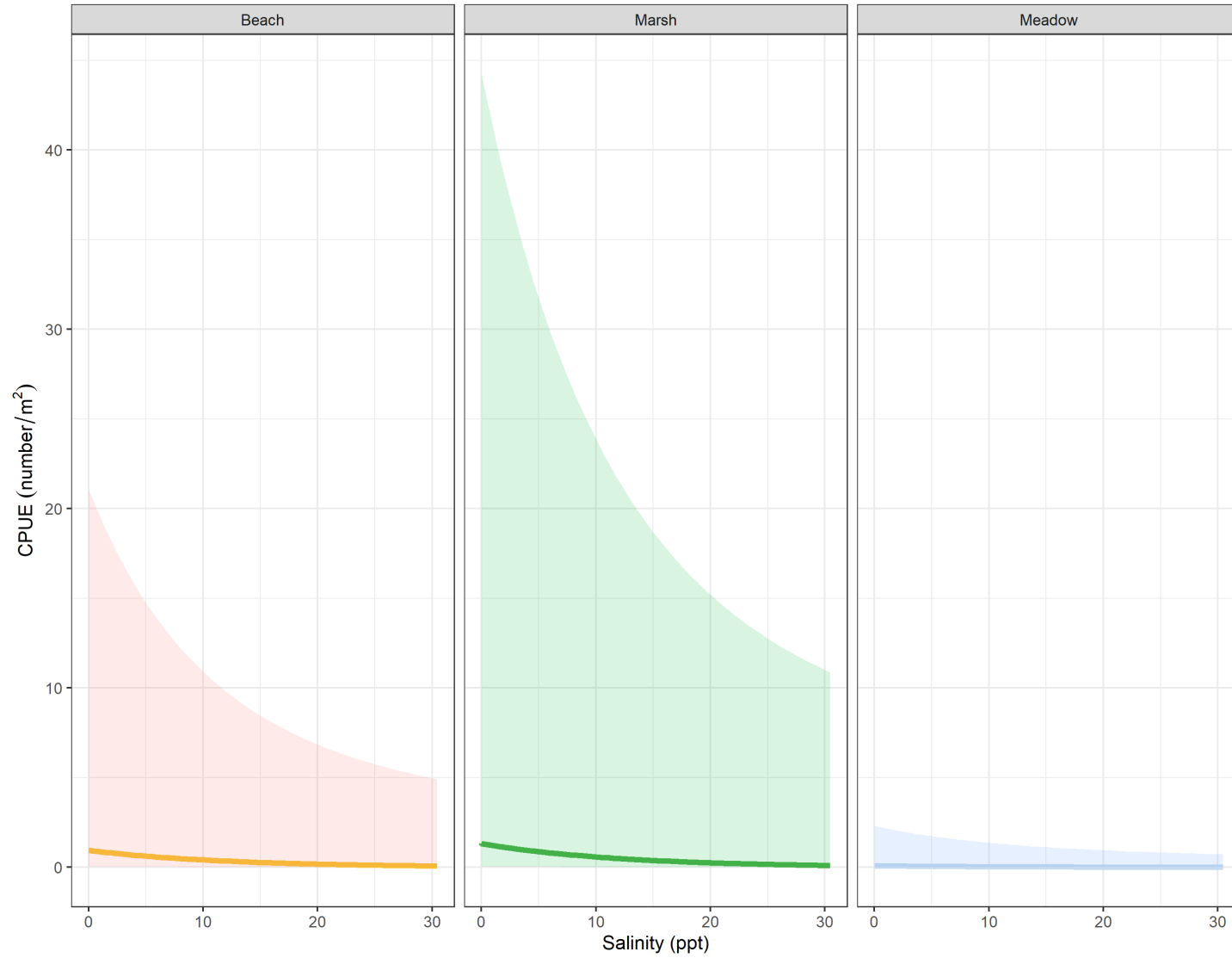

Predicted CPUE of juvenile chinook by habitat and salinity

What does this all mean?

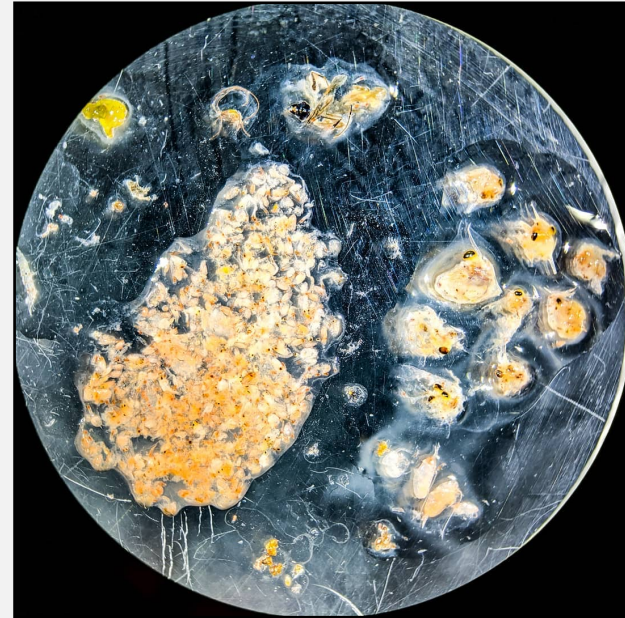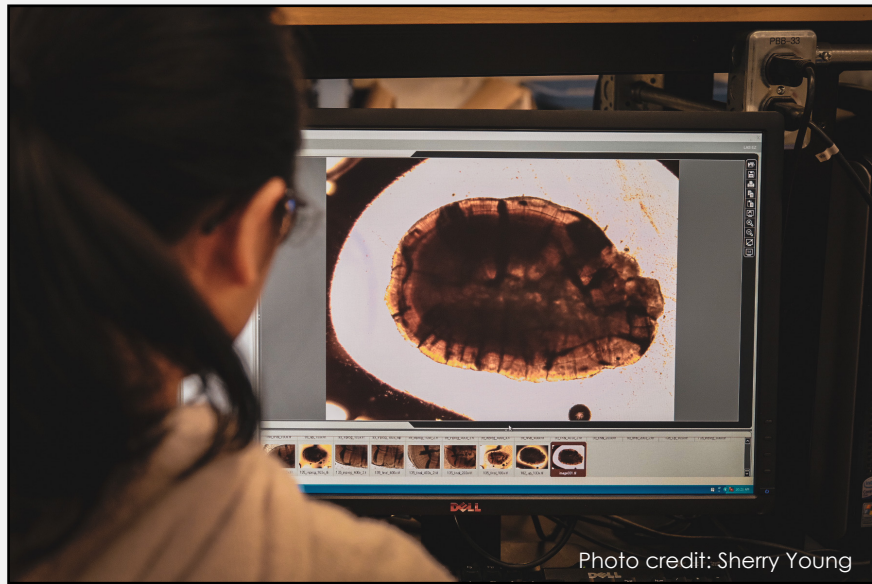- Species-specific habitat associations suggest different vulnerabilities to climate change & SLR

- Focus on increasing & maintaining habitat connectivity to increase ecosystem resilience

Sea level rise

Ongoing & future work

- How do different estuaries contribute to juvenile salmon growth and health?

Photo credit: Sherry Young

- Predicting habitat shifts using sea-level rise projection models
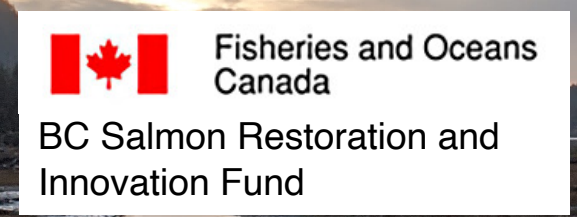
Thank You

Funders

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NATURE TRUST BRITISH COLUMBIA

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SFU SIMON FRASER UNIVERSITY

sitka foundation

K'ómoks First Nation
KWAKIUTL FIRST NATION
Ka:'yu:'k't'h'/Che:k:tles7et'h' First Nations
MAAQUTUSIIS HAHOULTHEE STEWARDSHIP SOCIETY
SNAW-NAW-AS NANOOSE FIRST NATION
Uu-a-thluk TAKING CARE OF
HA'OOM NUU-CHAH-NULTH WILD SEAFOOD
REDD FISH RESTORATION
CEDAR COAST FIELD STATION
BRITISH COLUMBIA CONSERVATION FOUNDATION
PACIFIC SALMON FOUNDATION
Hakai Science on the Coastal Margin
MVIHES Mid Vancouver Island Habitat Enhancement Society

Title banner credit: Jon Moore