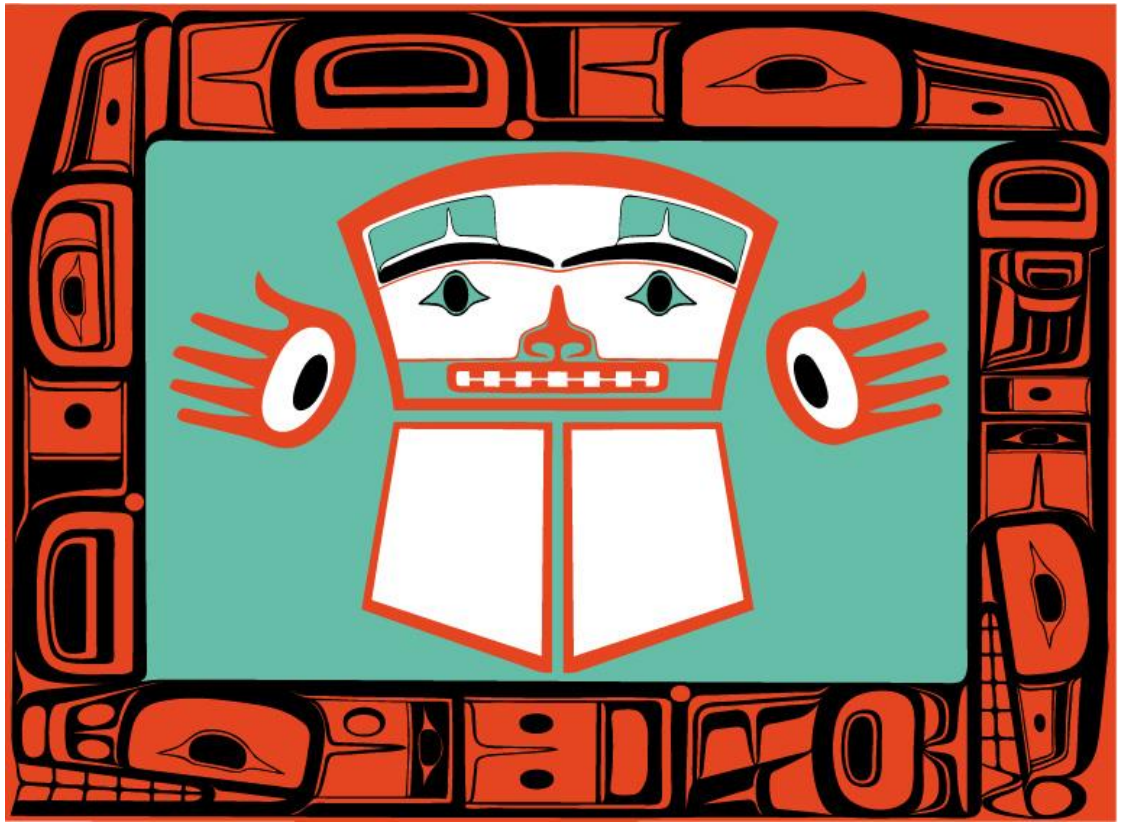
Lax Kw'alaams Fisheries

North Coast Juvenile Salmonid Monitoring Program

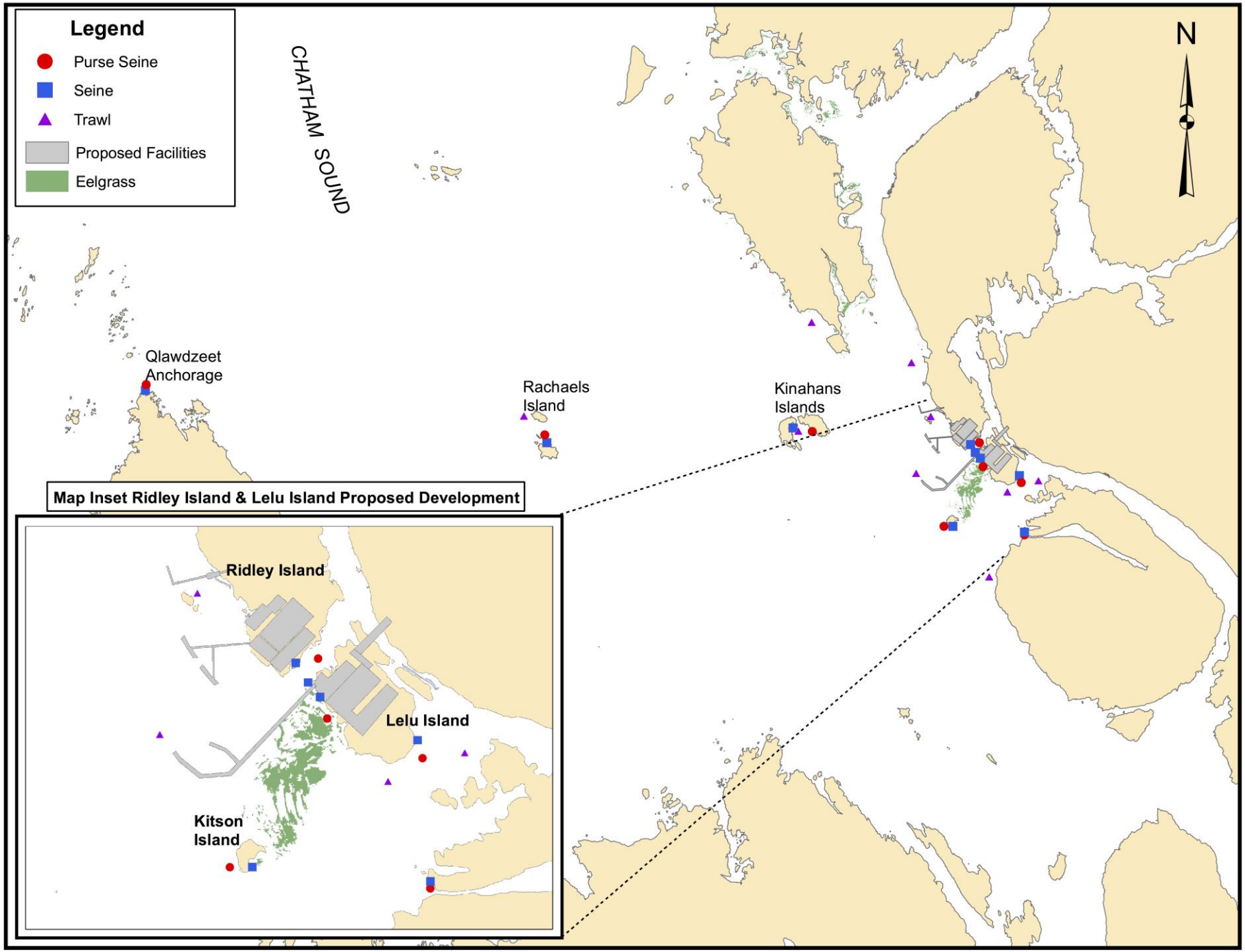


DFO Integrated Salmon Post Season Review
December 5th, 2014

2014 field season update

When are the juvenile salmon getting to the estuary and where do they go?

- 8 main sampling sites
- Beach seine, purse seine, trawl
- Water quality and zooplankton
- Genetics and Stable Isotope Analysis


Legend
Purse Seine
Seine
Trawl
Proposed Facilities
Eelgrass
CHATHAM SOUND
N
Qlawdzeet Anchorage
Rachaels Island
Kinahans Islands
Map Inset Ridley Island & Lelu Island Proposed Development
Ridley Island
Lelu Island
Kitson Island

Beach Seine

- 8 main sampling locations
- 89 beach seine sets

Captured:

Pink – 68 543
Chum – 250
Coho – 71
Chinook – 1
Sockeye – 10

+ <16 other species

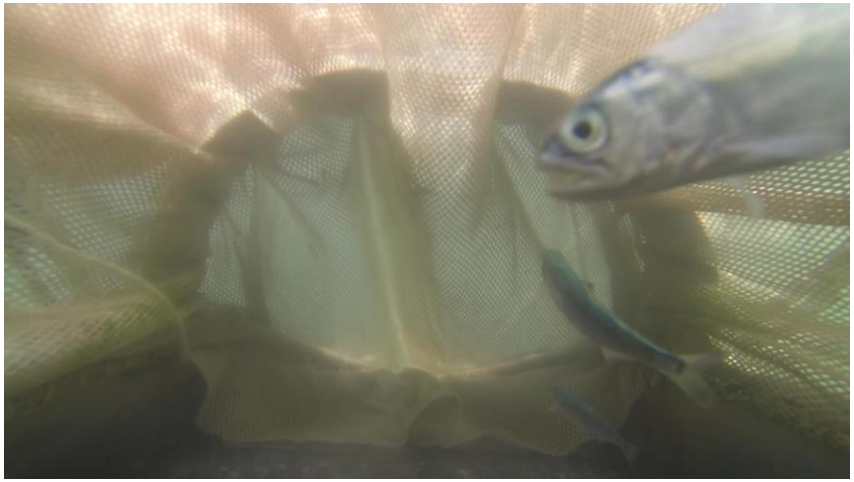
Trawl

- 6 main sampling locations
- 64 trawling events
- 20 minute tows
- Pelagic/offshore species

Captured:

Pink – 37
Chum – 1
Coho – 174
Chinook – 37
Sockeye - 768

+ 9 other species

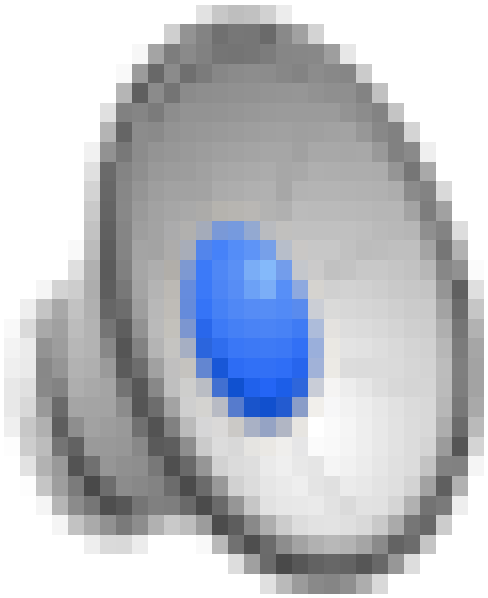


Purse Seine

- 6 main sampling locations
- 67 purse seine sets
- 5 min tows
- Intended to replace the chartered trawl in future years

Captured:

Pink – 22 055	Chinook – 29
Chum – 80	Sockeye – 3158
Coho – 169	+ 10 other species



Stable Isotope Analysis

How long are juvenile salmon staying in the estuary?

- Stable isotopes = chemical tracers that can be used to learn about feeding and migratory behavior

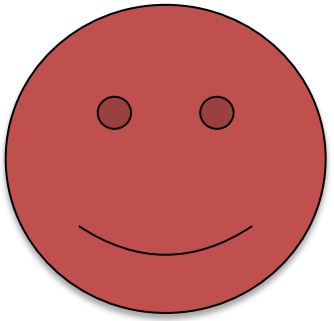
www.hlntv.com

- Nitrogen (N) and Sulphur (S) are of particular interest because they differ in terrestrial and marine environments.
- Carbon (C) strengthens the interpretation of results.

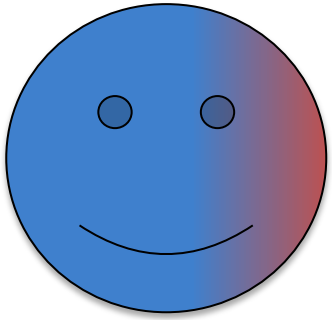
freshwater

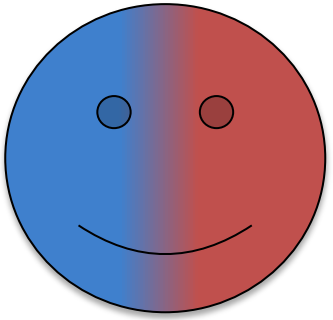
$^{14}N/^{15}N$

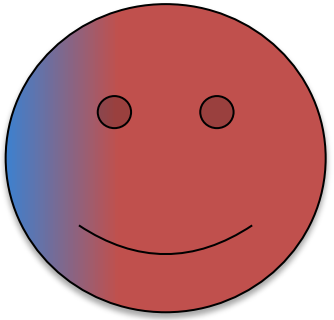
marine



estuary



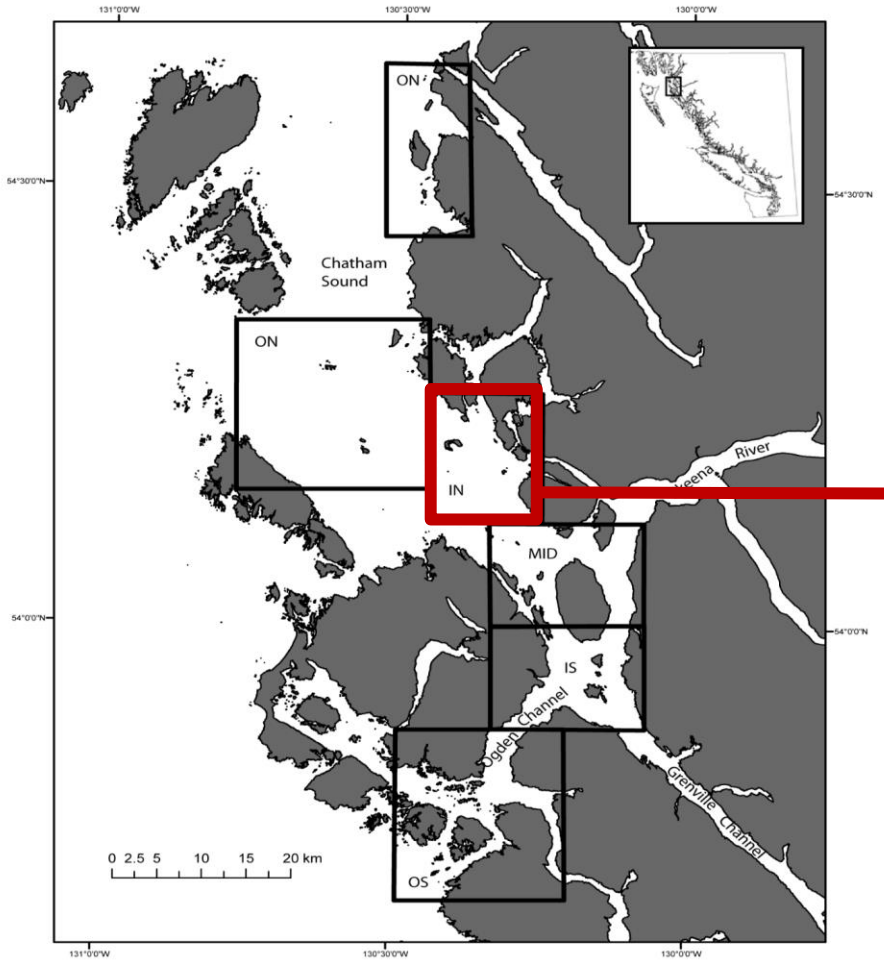


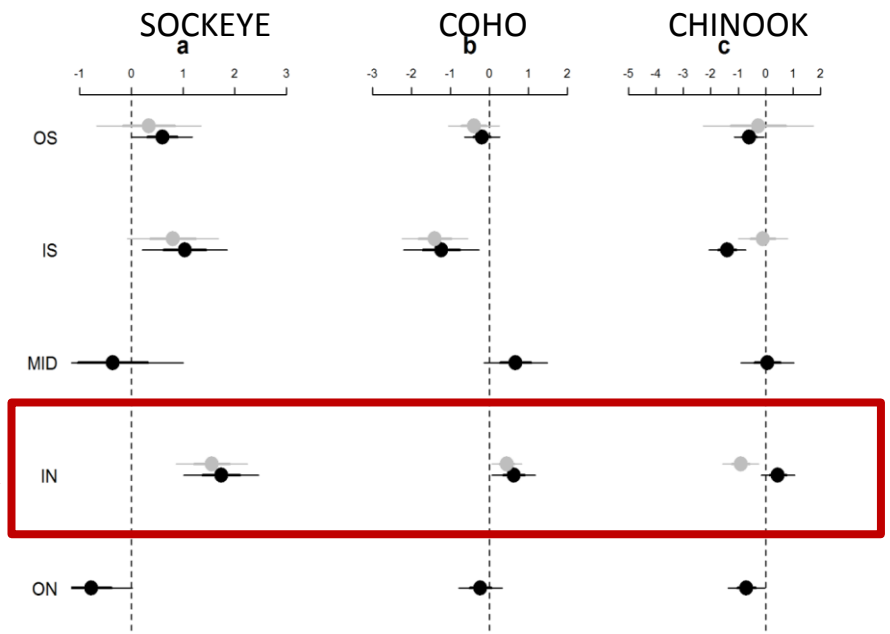


time

Stable Isotope Analysis

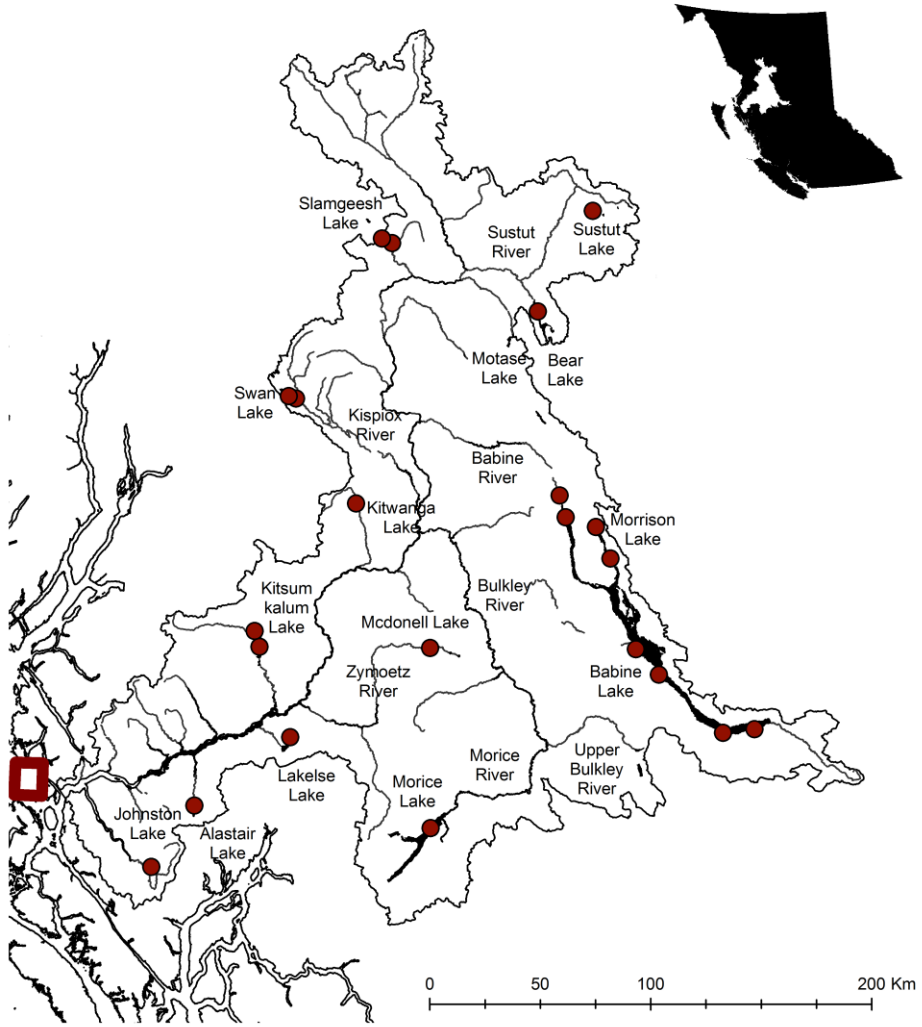
- Focused on mid and inner estuary
- Chum, Chinook, sockeye, pink, and coho
- Muscle and liver tissues (different turnover rates)
- ~1200 samples sent for analysis, results expected early 2015.
- Testing for C, N, and S.





log-CPUE (trawl, normalized). black=2013, grey=2007

2007 & 2013: Highest abundances of juvenile sockeye captured in the Inside North region



Genetic diversity

Juvenile sockeye captured in the Skeena estuary in 2007, 2013 and 2014 came from throughout the Skeena watershed and beyond

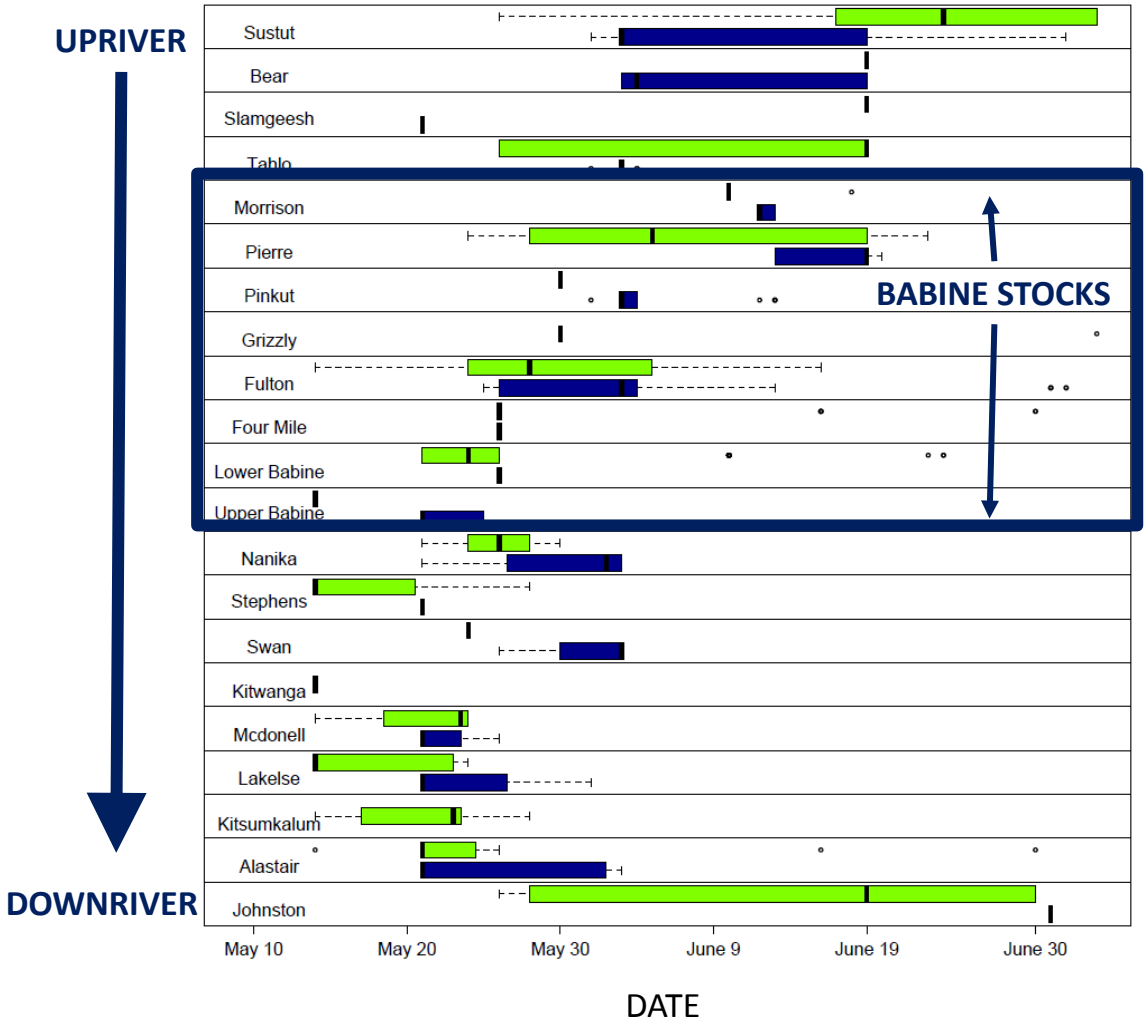
22 Skeena sockeye populations

- Different populations are locally adapted to freshwater rearing environments
- Small lake sockeye populations: most diversity

2014 research questions

Photograph: Ocean Rutherford

- Do different sockeye populations have different smolt migration timing?
- How does smolt migration timing relate to food availability in estuary?

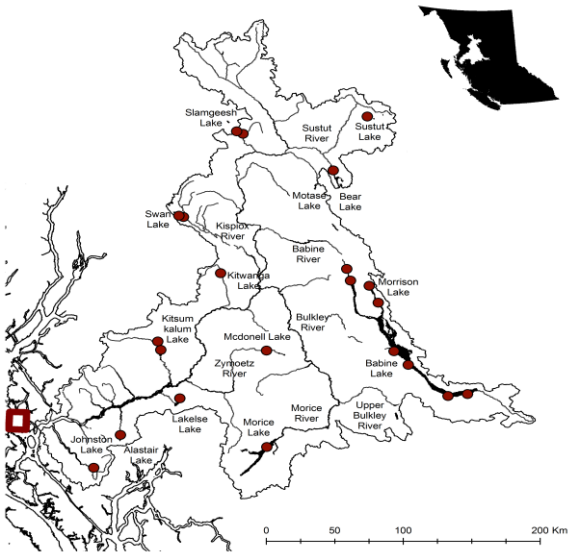


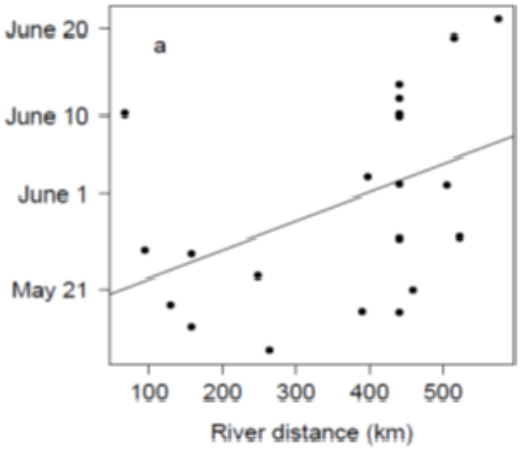
Different sockeye populations have different migration timing

Timing for different populations is consistent across years

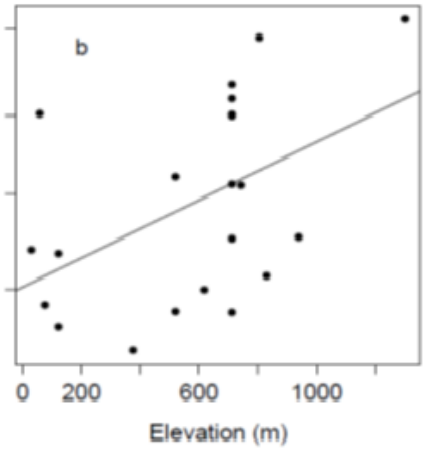
Boxplots show individuals with probability of genetic assignment >90%
Blue=2013, green=2014

Smolt migration timing for different Skeena sockeye populations is related to geographic factors

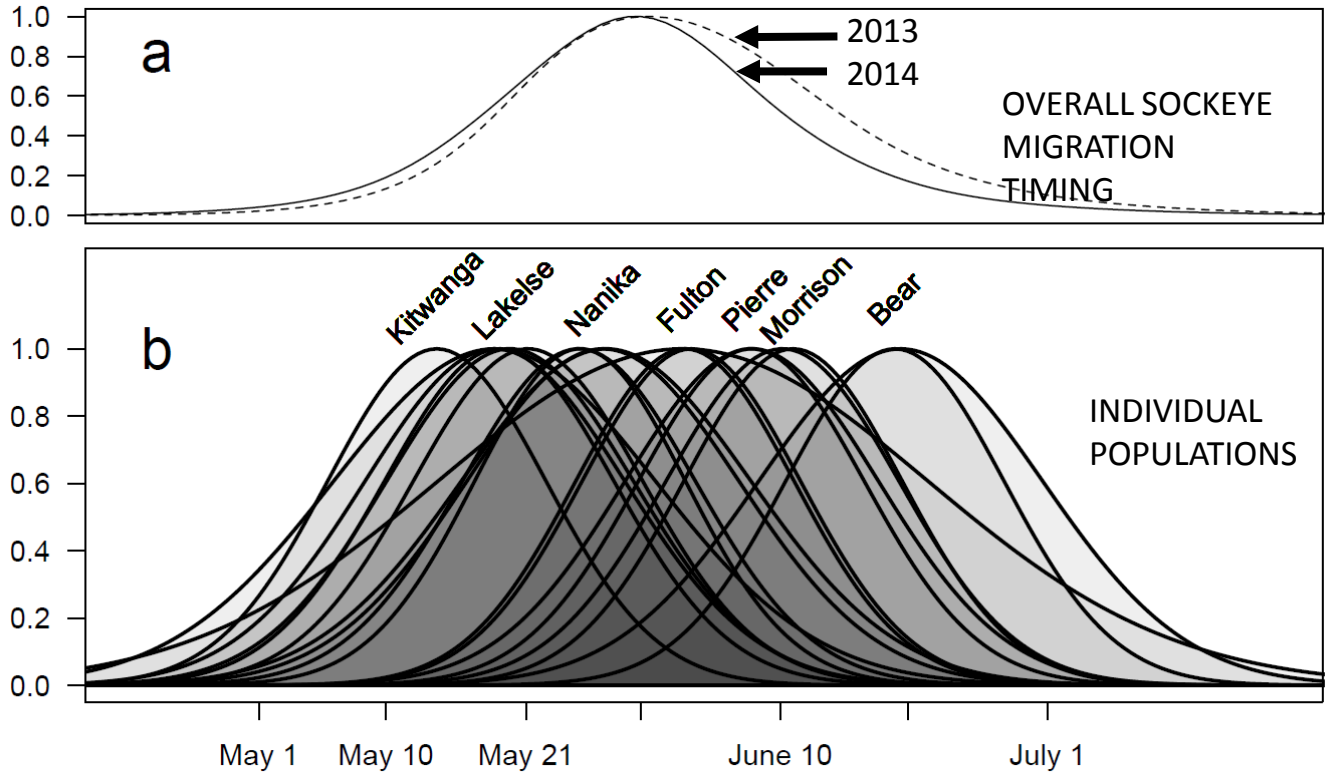




River distance (best model):
Migration timing is **4.4 ± 2.5** days later for every 100 km of river distance (p=0.042)



Elevation:
1.9 ± 1.1 days later for every 100 m of elevation (p=0.017)



No difference in overall timing across years

High variability in migration timing among different Skeena sockeye populations

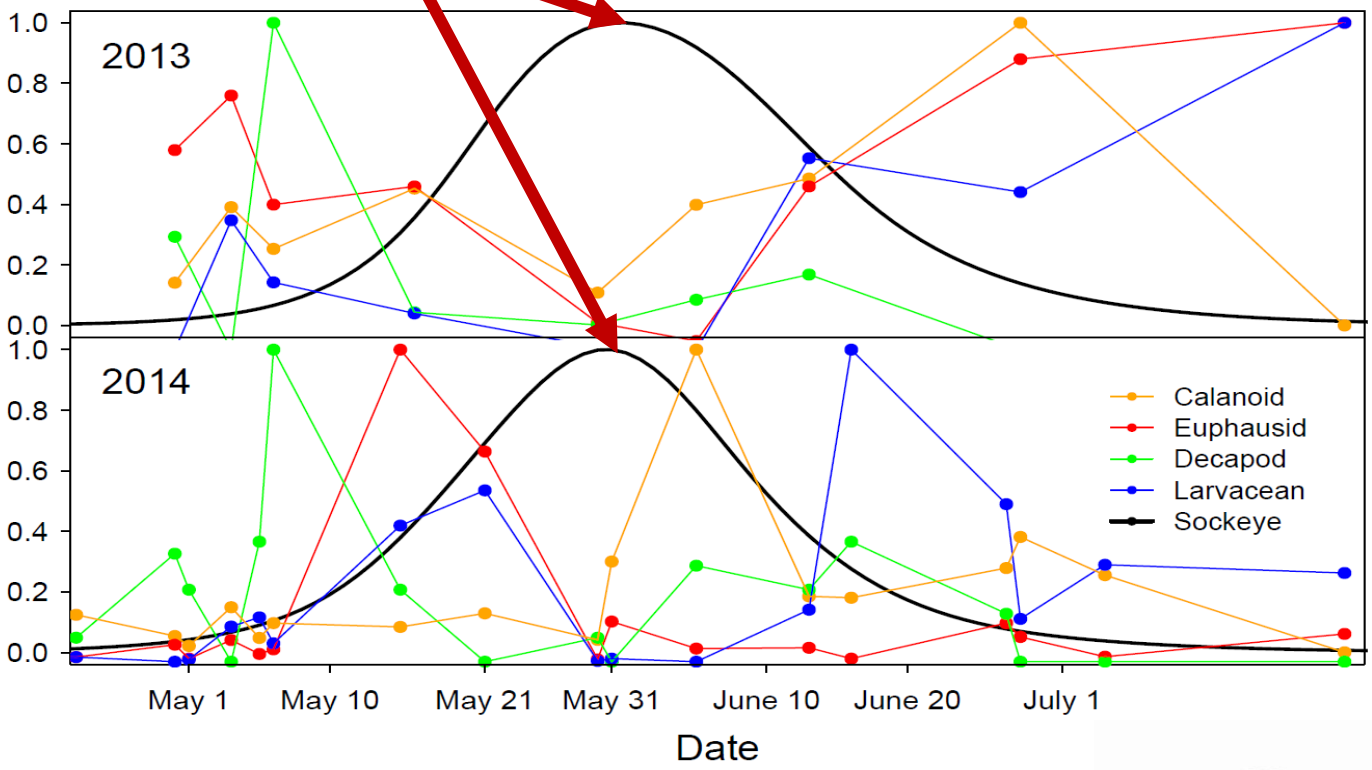
a. Temporal trend for sockeye CPUE (trawl) from fitted generalized additive model.
b. Normalized distributions using mean and standard deviation from linear model coefficients

Question 2: How does smolt migration timing relate to food availability in estuary?

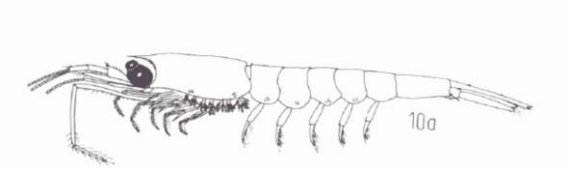
ZOOPLANKTON SURVEYS (NCJSM)

Comparing the temporal dynamics of juvenile salmon with potential food items in the early marine environment

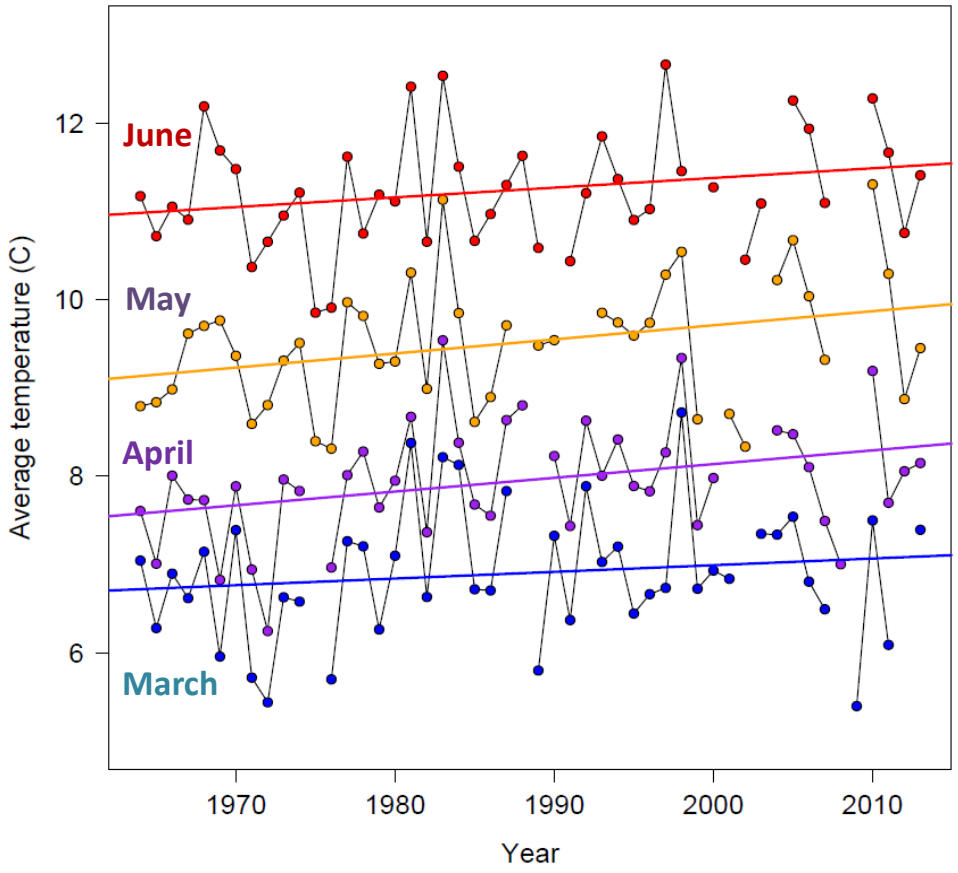
PEAK JUVENILE SOCKEYE ABUNDANCE COINCIDES WITH MINIMUM ZOOPLANKTON



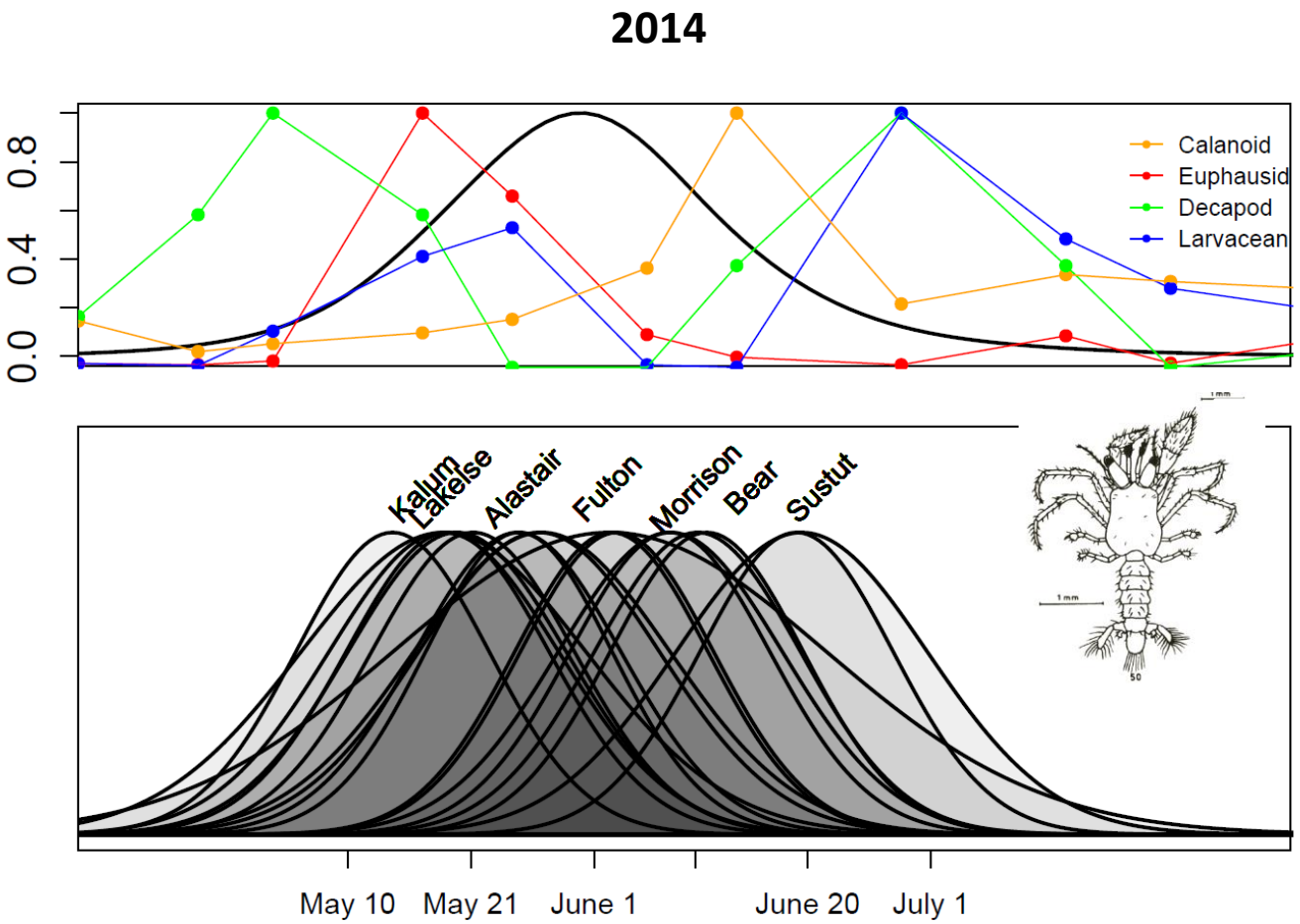
Relative abundance of key juvenile sockeye and zooplankton prey at Kinahan Islands sample station



Mean monthly SST,
Bonilla Island lighthouse 1964 - 2013



- Significant local increases of >0.7 degrees C in April and May ($p<0.05$)
- Warming temperatures accompany phenological advances for may zooplankton species
- Increasing potential for mismatch between outmigrating salmon and zooplankton prey



Different populations encounter different prey fields in the estuary…

Phenotypic diversity may increase metapopulation potential to respond to shifting environmental conditions

THANK YOU!!!

- Metlakatla Fisheries
- Gitxaala Environmental Monitoring
- Gitksan Waterhed Authorities
- Lake Babine Nation
- Active Pass Charters
- Bill Shepert, James Henry Jr., James Russell, Wade Helin, Dave Doolan, Greg McKay and Colin Nelson, Eugene Bryant, Thomas Bryant, Ocean Rutherford & Shireen Ree-Hembling
- PBS Genetics Lab
- Earth to Ocean Research Group
- Moore Lab
- Coast Opportunity Funds
- SkeenaWild Conservation Trust
- MITACS

Environment Canada

SFU
SIMON FRASER UNIVERSITY

SkeenaWild
CONSERVATION TRUST