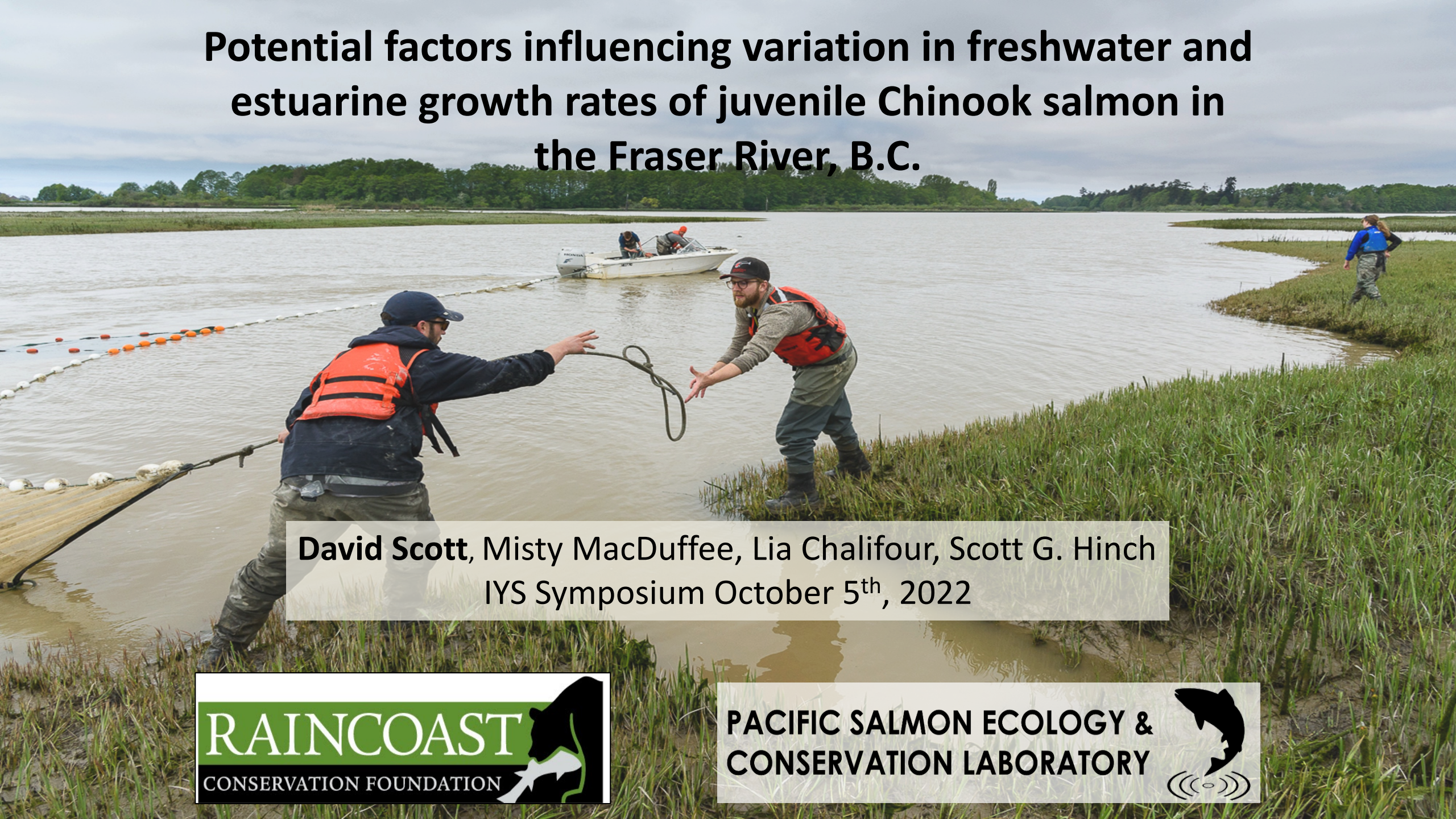
Potential factors influencing variation in freshwater and estuarine growth rates of juvenile Chinook salmon in the Fraser River, B.C.



David Scott, Misty MacDuffee, Lia Chalifour, Scott G. Hinch

IYS Symposium October 5th, 2022

RAINCOAST CONSERVATION FOUNDATION

PACIFIC SALMON ECOLOGY & CONSERVATION LABORATORY

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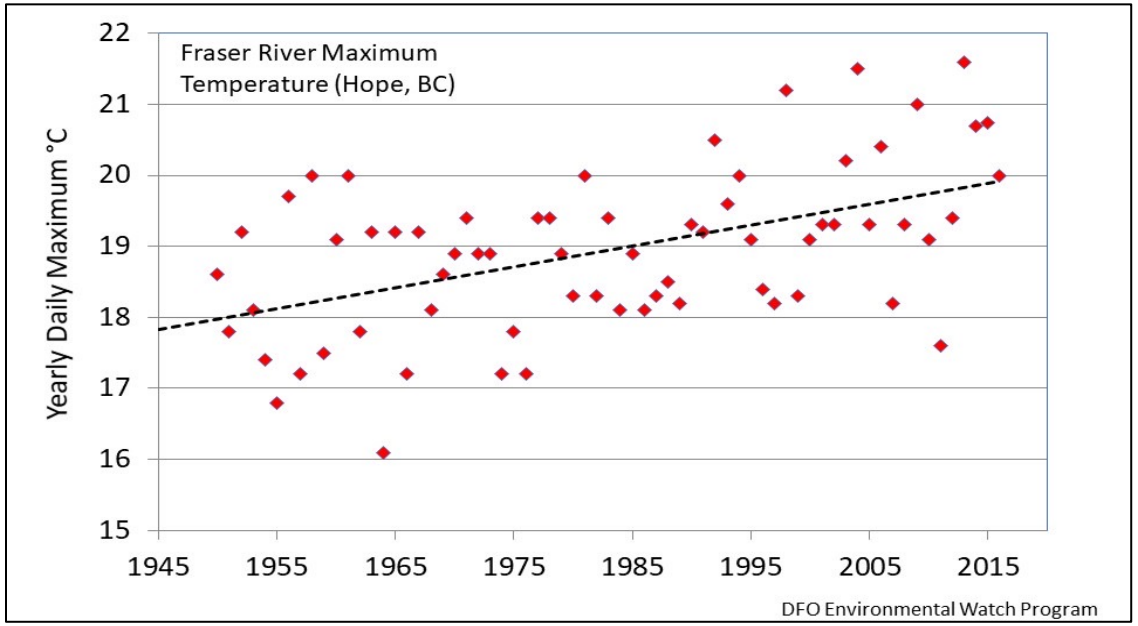
Pacific Salmon Ecology and Conservation Lab

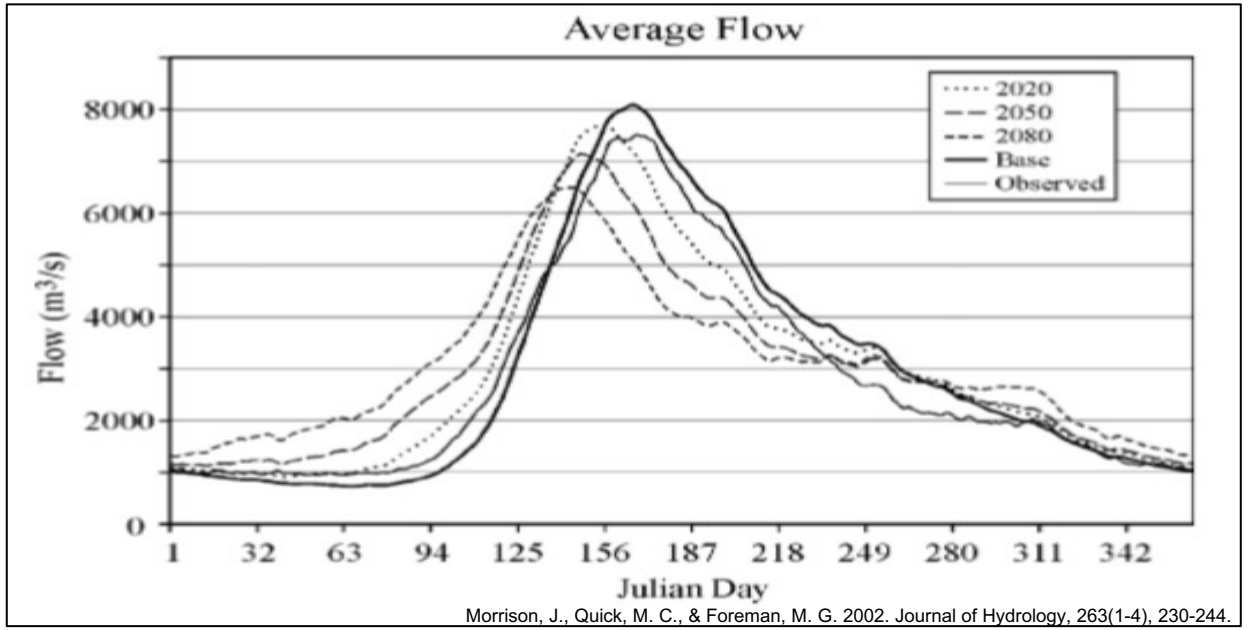
Climate change is already beginning to have profound effects on salmon and there habitats

- Warming rivers threaten migrating adults
- Low flows and high summer temperatures in tributary streams threaten juveniles
- Extreme events like fires and floods threaten hydrological cycles and can have damaging consequences

Climate change has already drastically altered freshwater systems for salmon in BC

- British Columbia has warmed an average of 1.4°C per century from 1900 to 2013
- The average temperature increase in winter across the province is 2.2°C per century.
- Freshet flows coming earlier and lower leading to late summer low flows

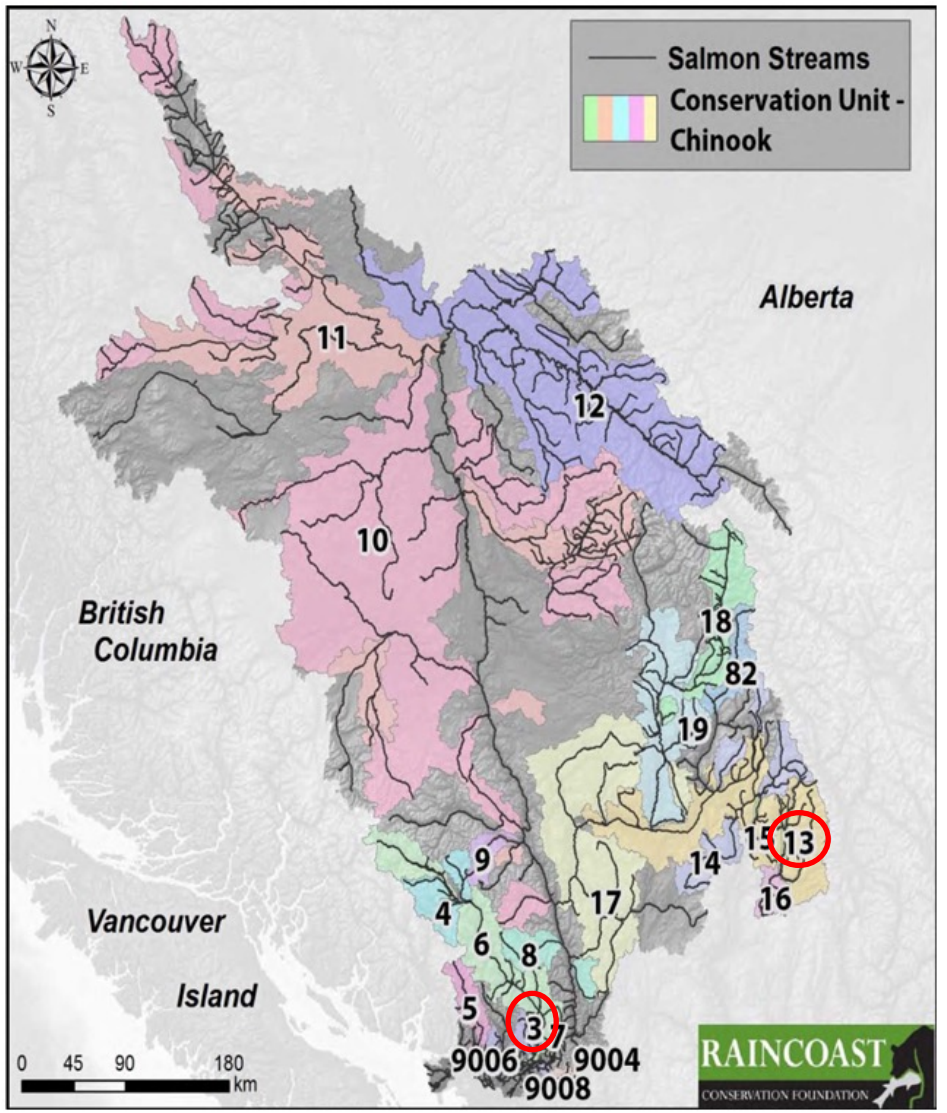




Morrison, J., Quick, M. C., & Foreman, M. G. 2002. Journal of Hydrology, 263(1-4), 230-244.

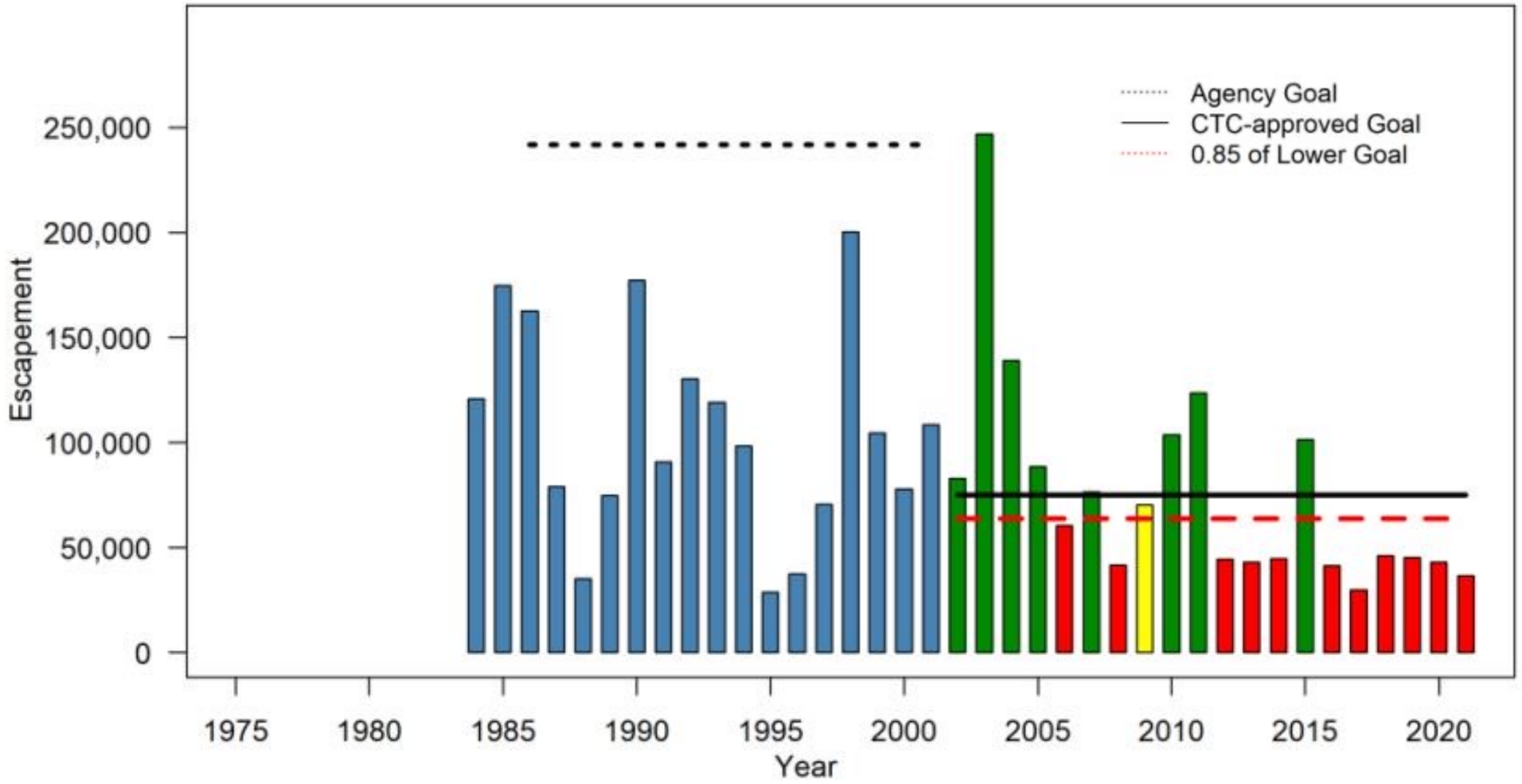
Chinook Salmon of the Fraser River

- 15 CU's in the Fraser
- 4 CU's of ocean-type populations
- Chinook are thought to be the most estuary reliant



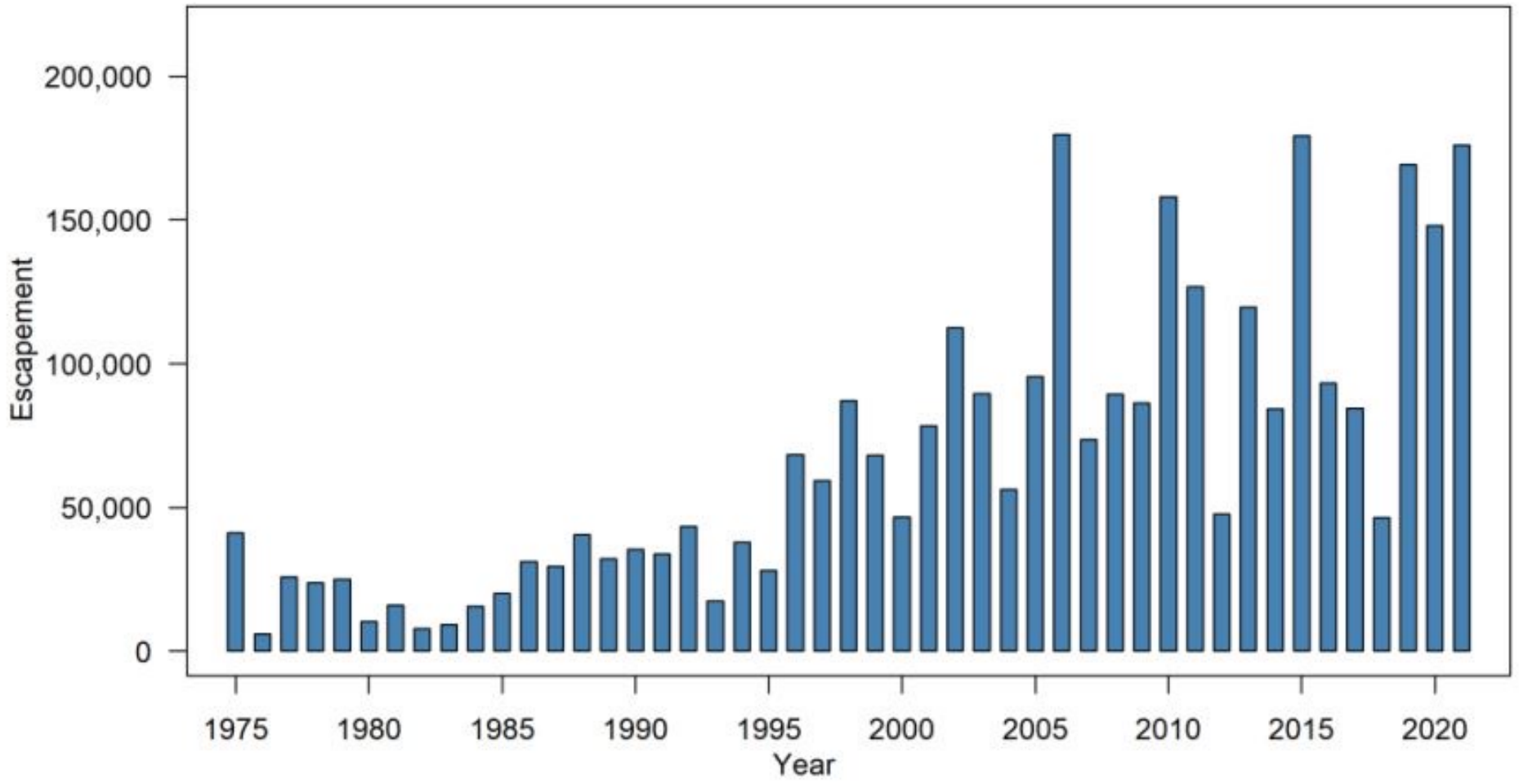
Chinook Salmon of the Fraser River

- Harrison Chinook have failed to meet the escapement target in most recent years



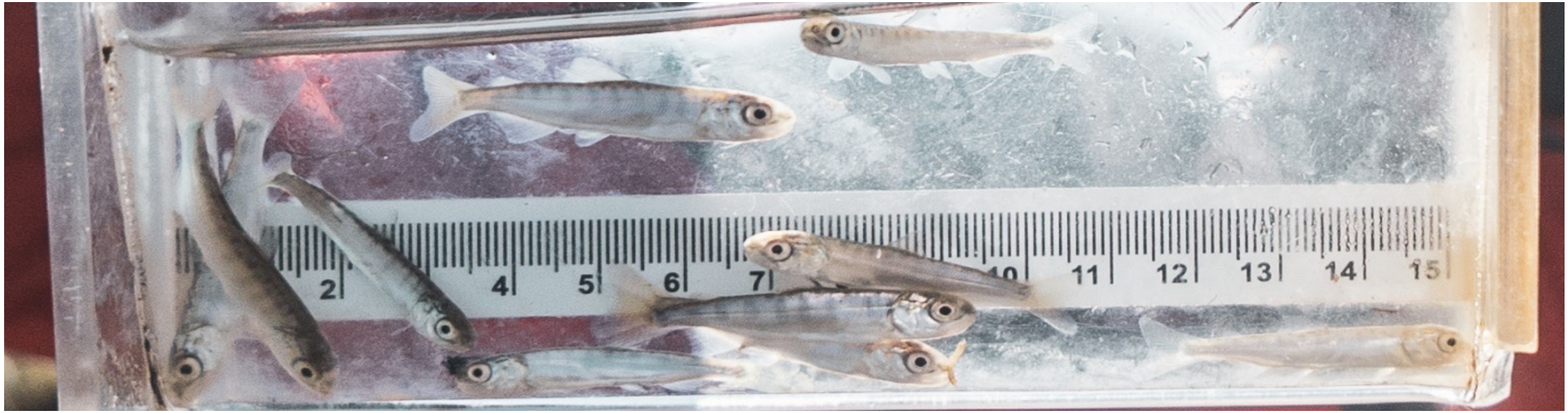
Chinook Salmon of the Fraser River

- South Thompson Chinook have followed a unique trend, increasing in abundance over recent decades

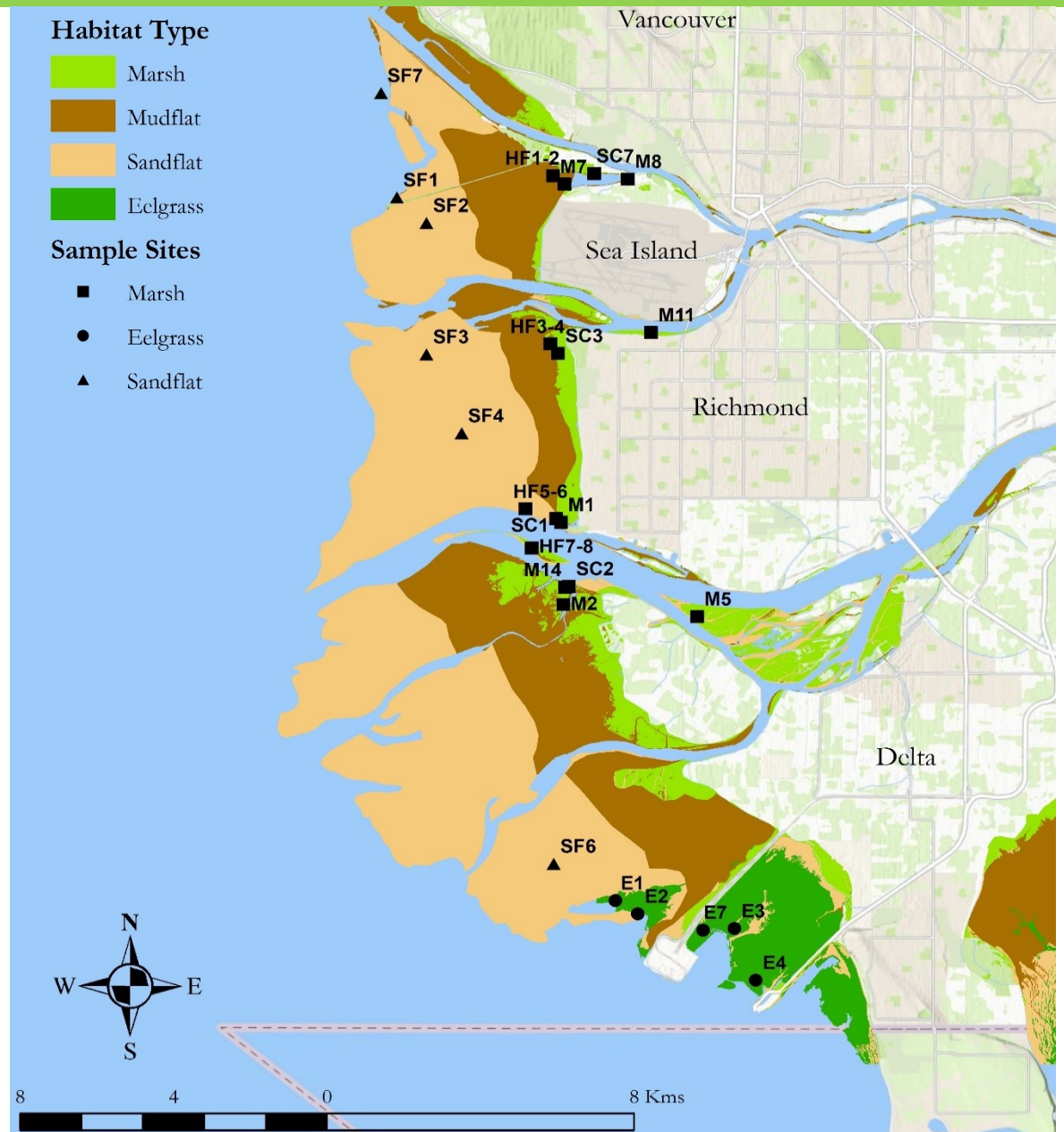


Research Questions

- **Does the size of juvenile Chinook captured in the estuary vary between populations and across years?**
- **How do environmental and other variables relate to variation in the size of juvenile ocean type Chinook in the estuary?**



Fraser estuary sampling sites and habitat areas



Beach, purse seine and fyke net methods

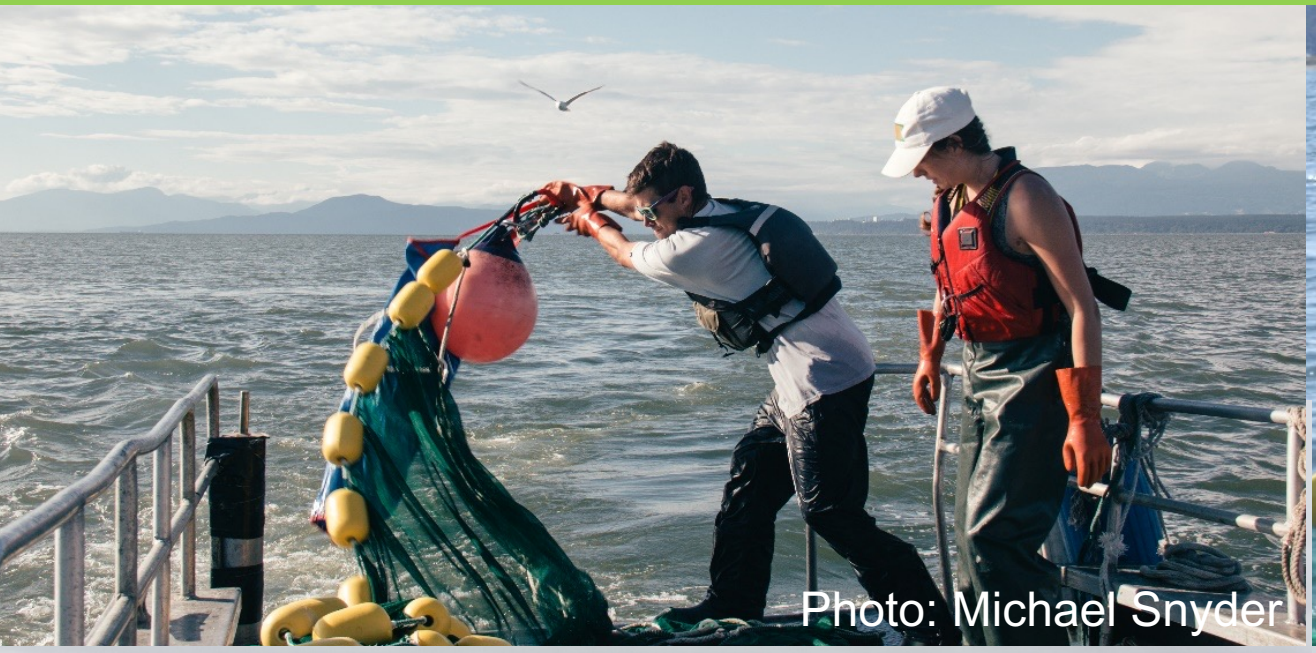
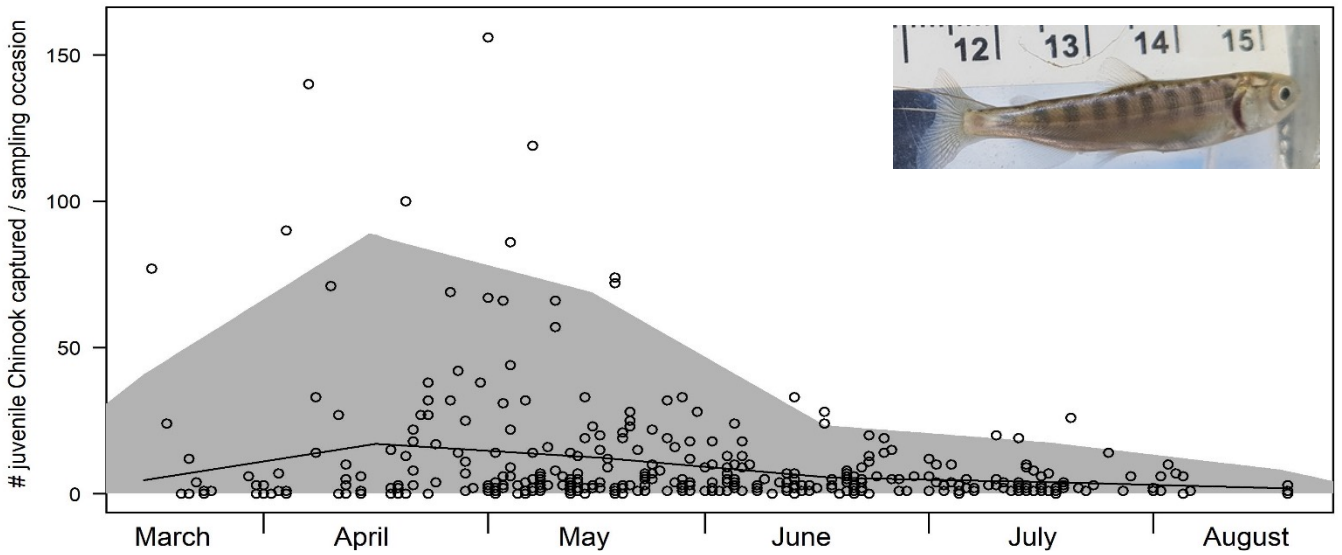


Photo: Michael Snyder

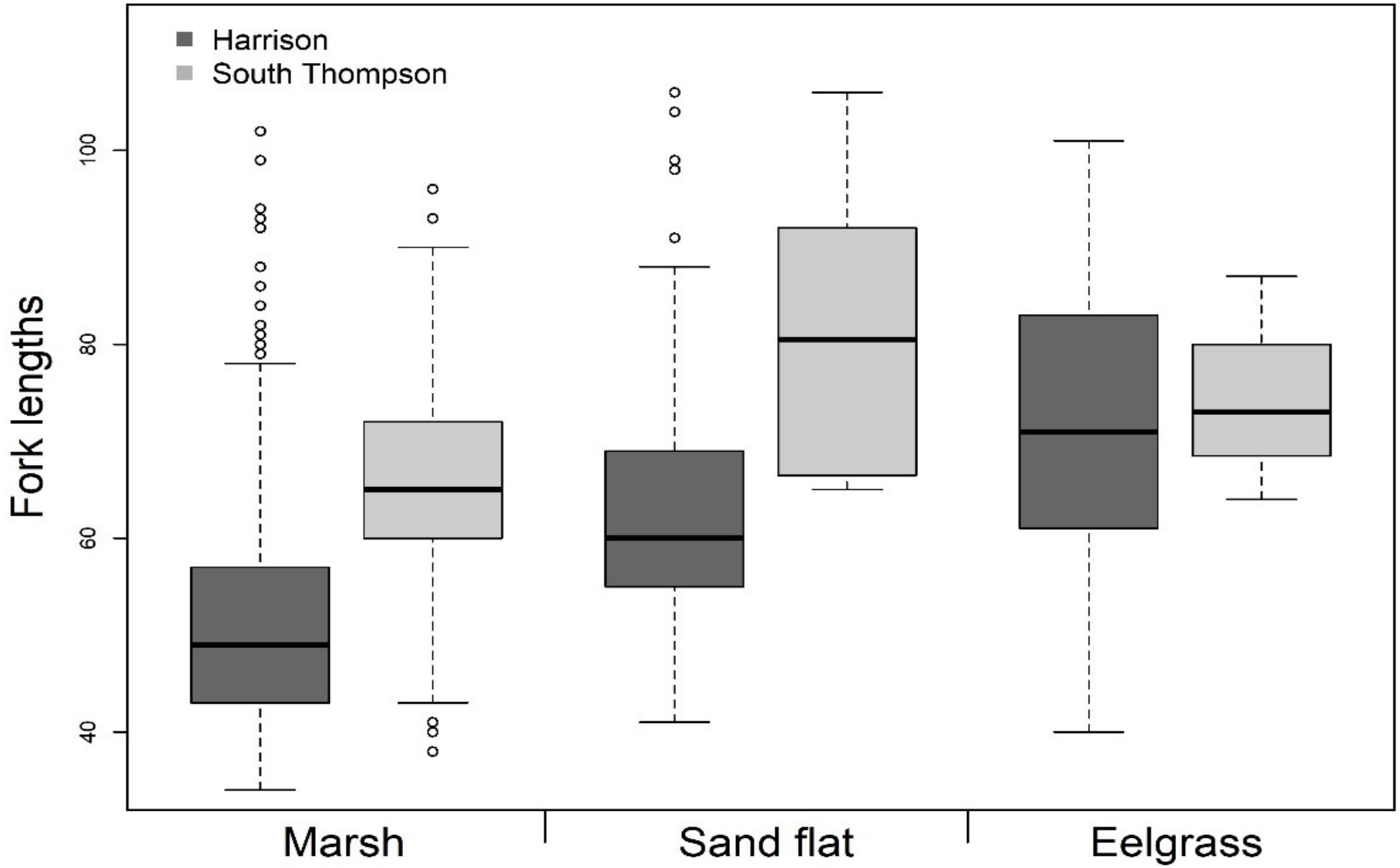

Photo: Yuri Choufour


Photo: Fernando Lessa

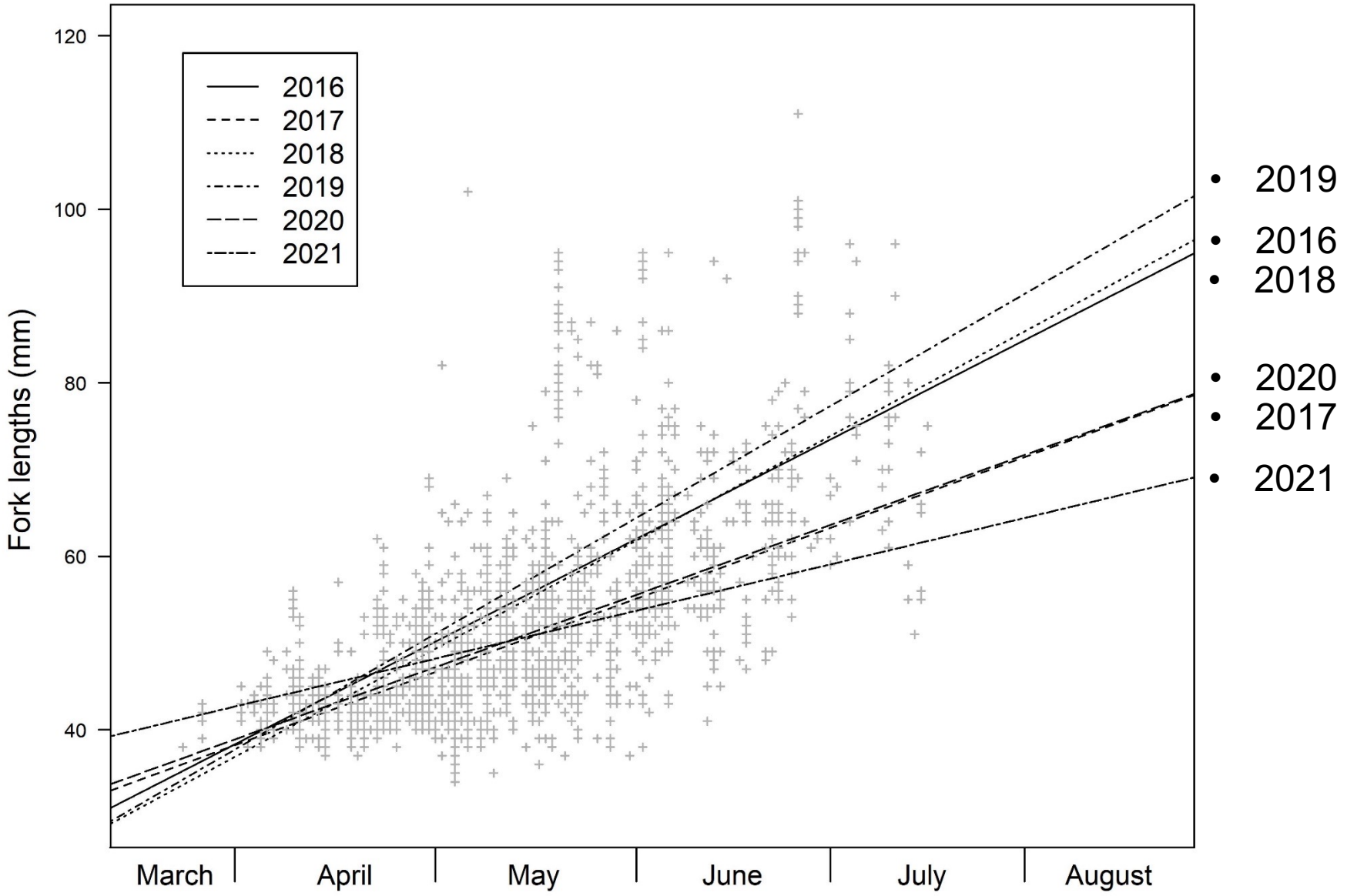
Juvenile Chinook utilize estuary habitats throughout spring and summer



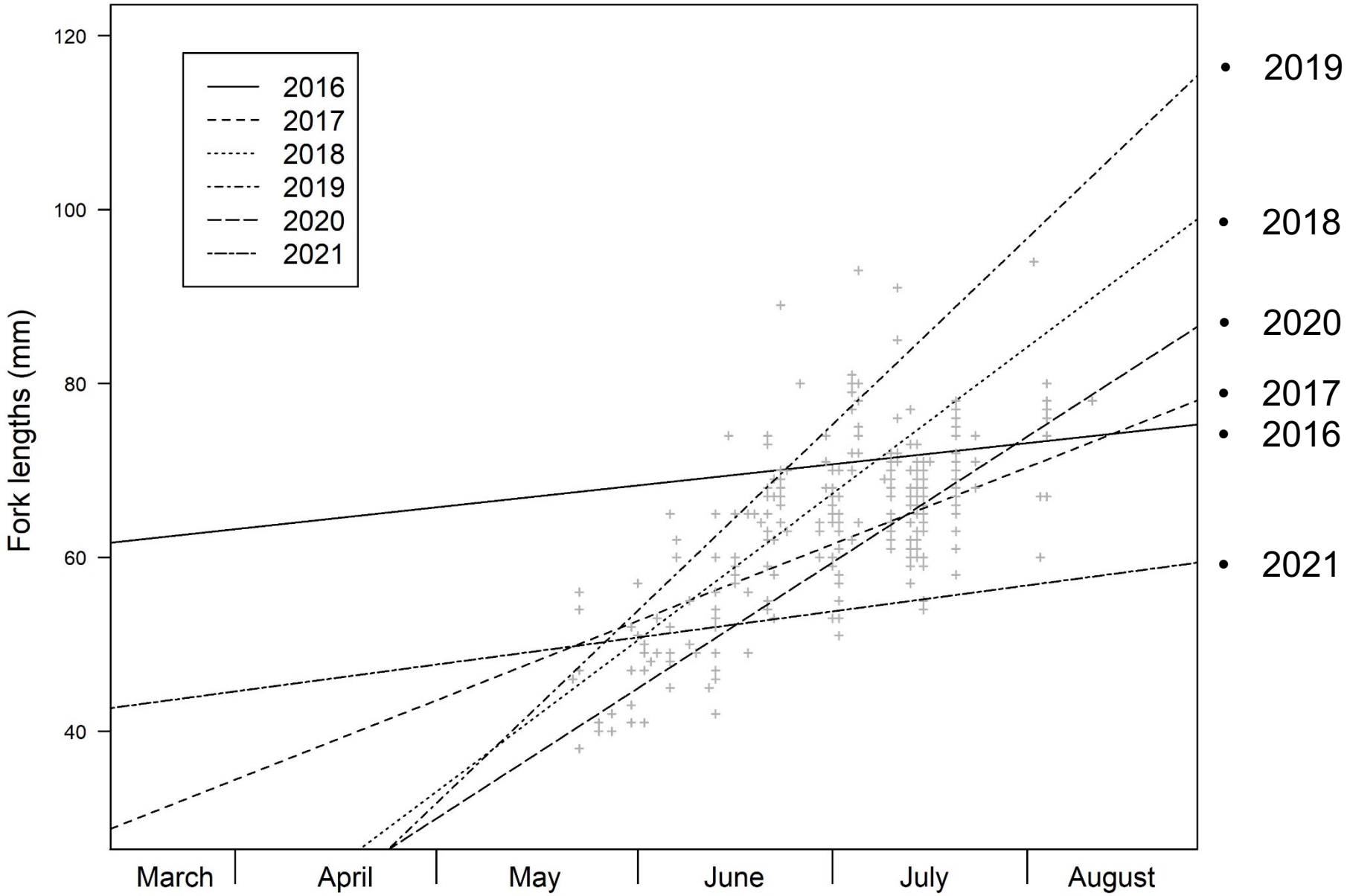
South Thompson Chinook arrive much later, are larger on average



Juvenile Harrison Chinook varied significantly in fork length across years



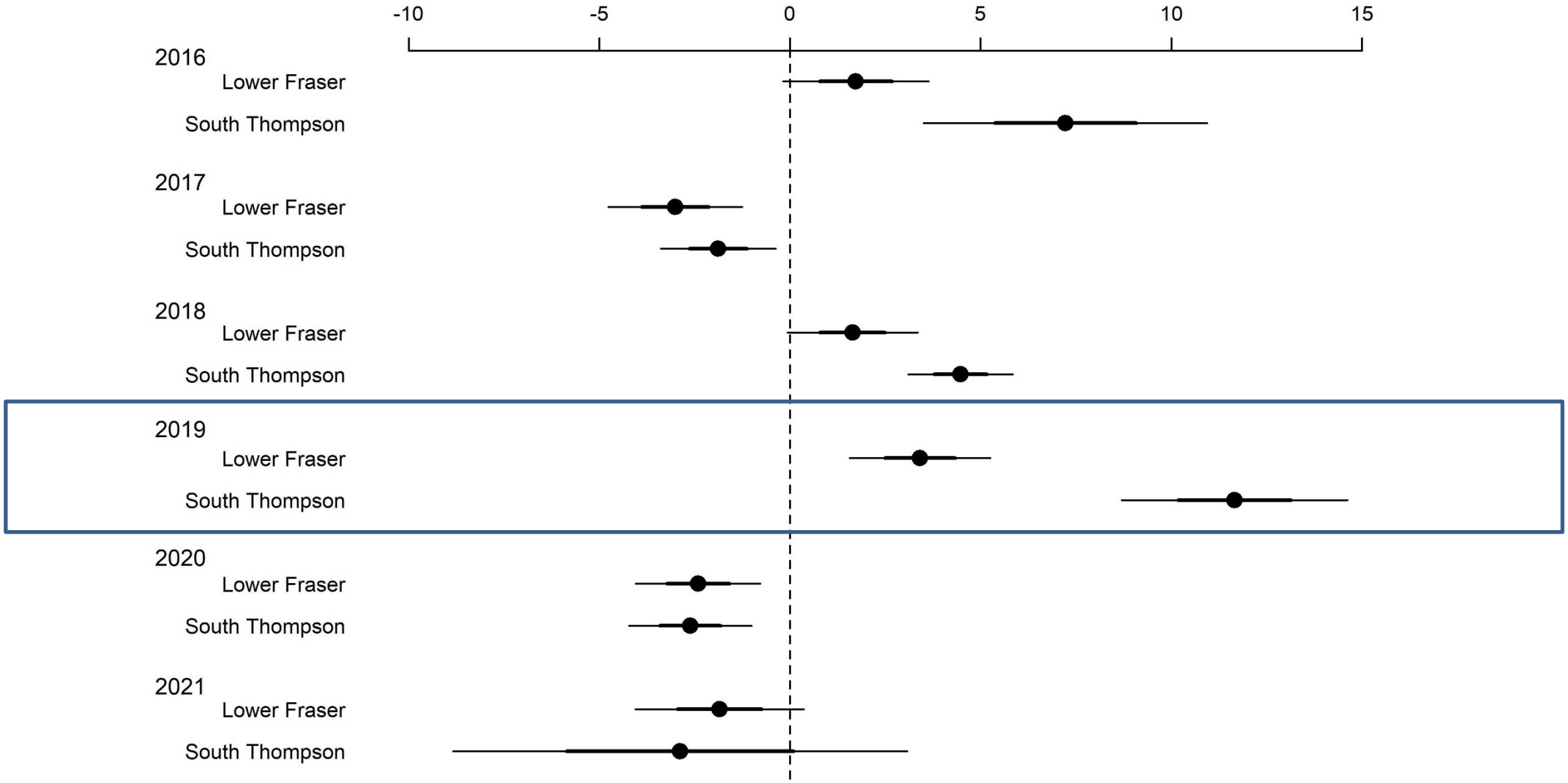
Juvenile South Thompson Chinook varied in fork length across years



Juvenile Chinook varied significantly in fork length across years but populations followed similar trends

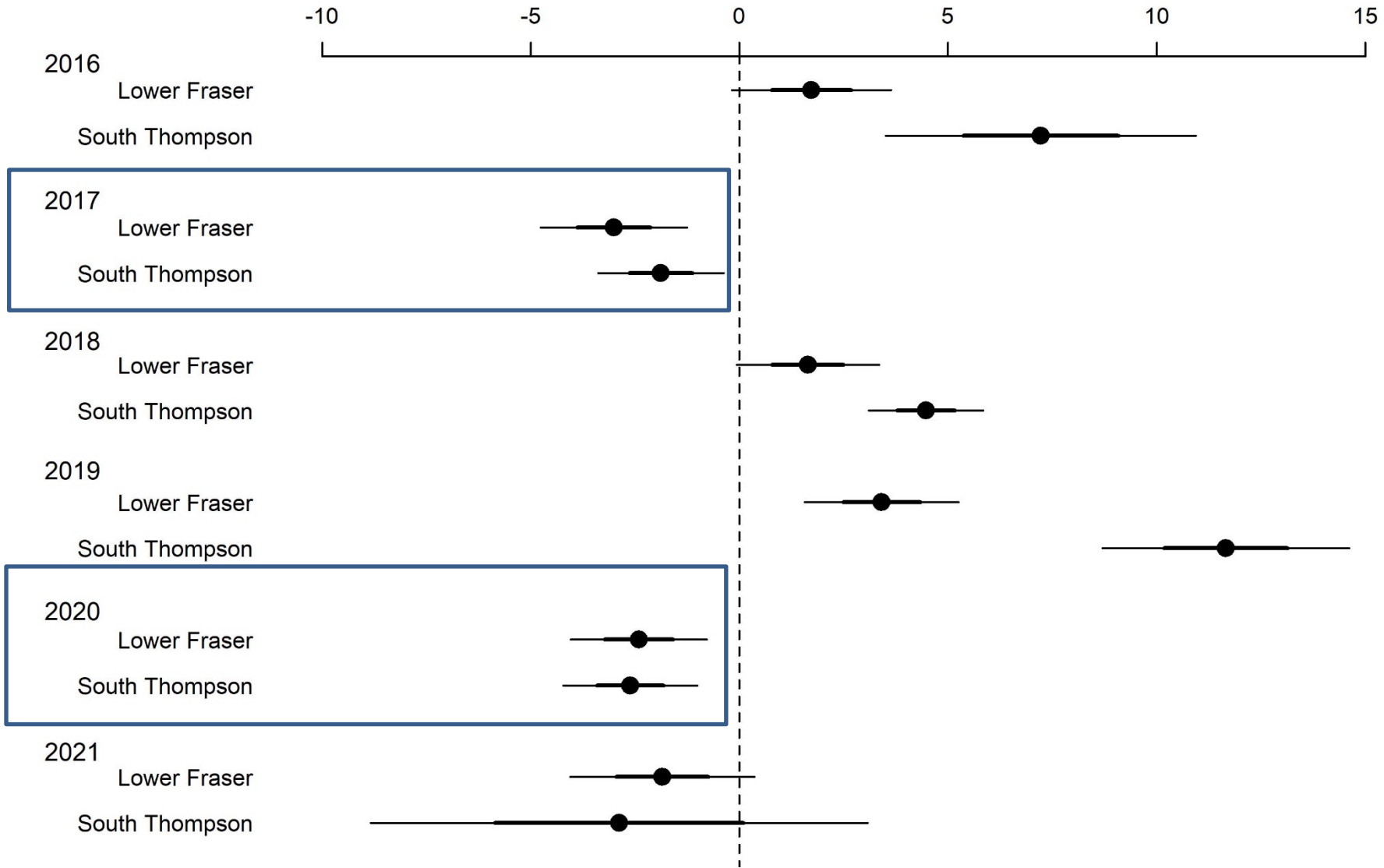
Juvenile Chinook varied significantly in fork length across years but populations followed similar trends

- Largest Chinook were observed in both populations in 2019



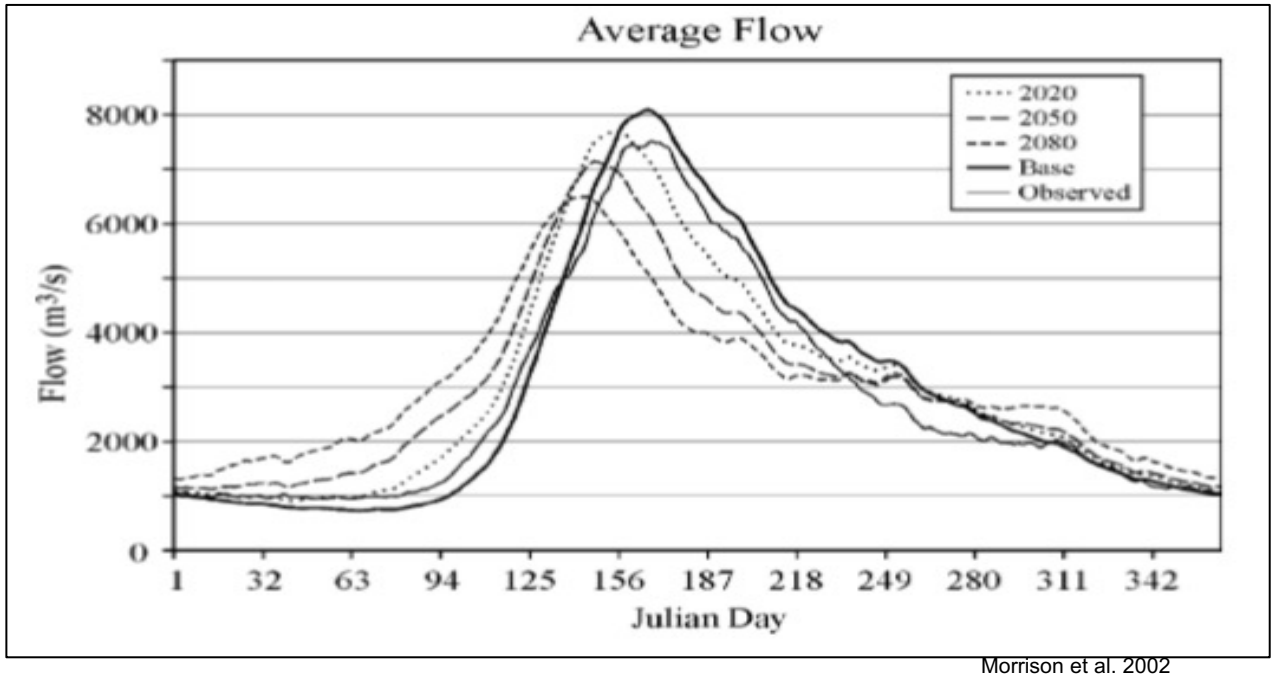
Juvenile Chinook varied significantly in fork length between years but populations followed similar trends

- Smallest fish occurred in both populations in 2017 and 2020

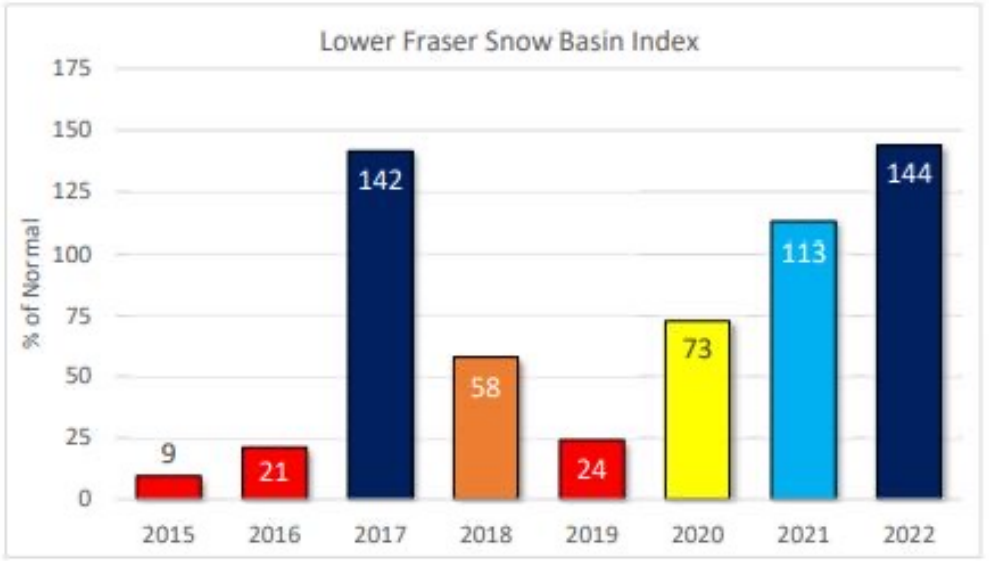


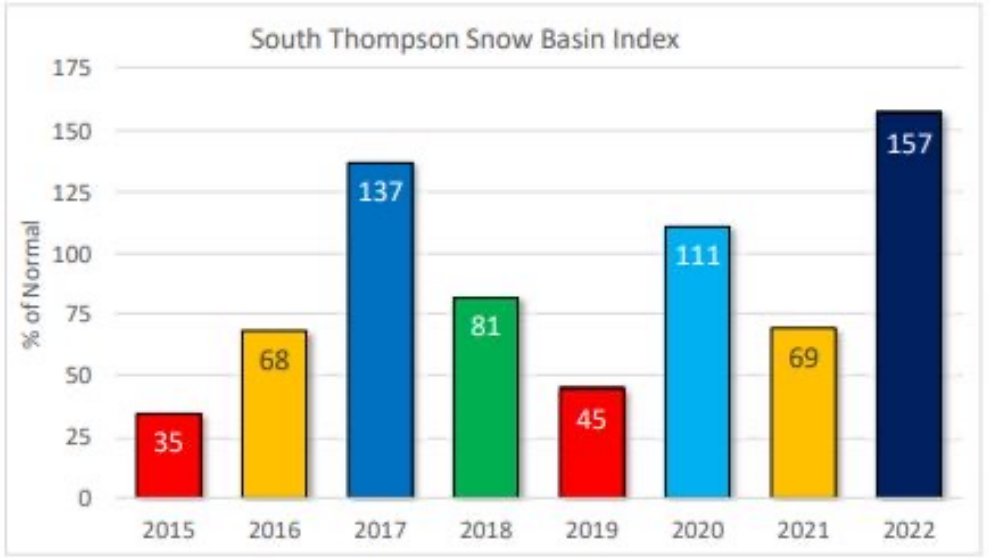
Potential factors influencing growth rates

- Temperature – local, SST
- Flow rates
- Snowpack
- Spawner abundance



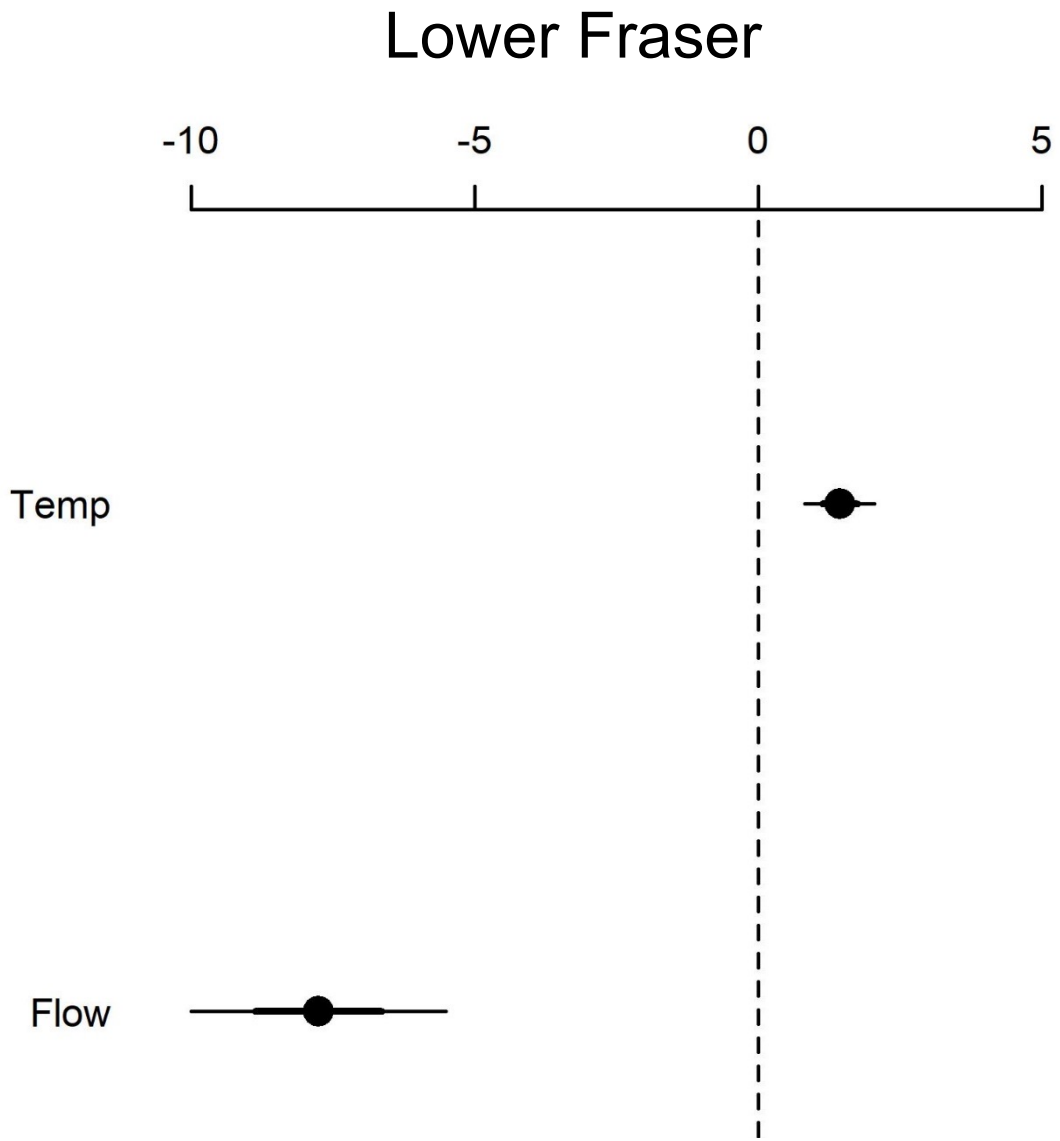
Morrison et al. 2002





Province of BC Snow Survey Data

Local spring temperature was positively related to fork lengths for both populations



Results summary

- Ocean type Chinook captured in the Fraser estuary showed considerable variation in size across years
- Both populations followed the same trends across years with the smallest individuals occurring in 2017, 2020 and 2021 and the largest in 2019
- Fork lengths related to average local spring temperatures and flow for both populations
- South Thompson fork lengths also related to spawner abundance

Potential implications for freshwater growth

- **Both populations appeared to grow faster in warmer years with lower early flows, slower in colder years**
- **South Thompson Chinook saw greater growth benefits in warm years relative to Lower Fraser Chinook**
- **South Thompson may be benefitting from general warming trend in freshwater environment**

Thanks for listening!

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Pacific Salmon Ecology and Conservation Laboratory

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Photo: Fernando Lessa