Effects of temperature regime on juvenile Chinook and Coho salmon growth in three geomorphologically distinct sub-basins of the Kenai River

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INTRODUCTION

- Climate change in Alaska may impact juvenile salmon freshwater rearing habitat differently depending on local watershed characteristics.
- We selected three juvenile Coho and Chinook rearing tributaries of the Kenai River– Beaver Creek, Russian River, and Ptarmigan Creek – to represent a spectrum of watershed types from lowland to montane with differing potential levels of resilience to climate change.
- We're using field sampling and bioenergetics relationships to investigate how growth rates of juvenile Chinook and Coho relate to water temperature regimes and food resources along the lowland to montane spectrum.

STUDY AREA

Kenai Watershed

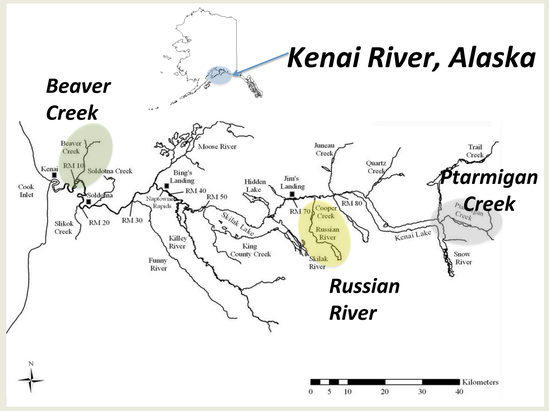

Figure 1- The Kenai River watershed, with the three tributaries selected for study highlighted.

HYPOTHESIS

Landscape mediates the influence of climate change on juvenile salmon growth rates

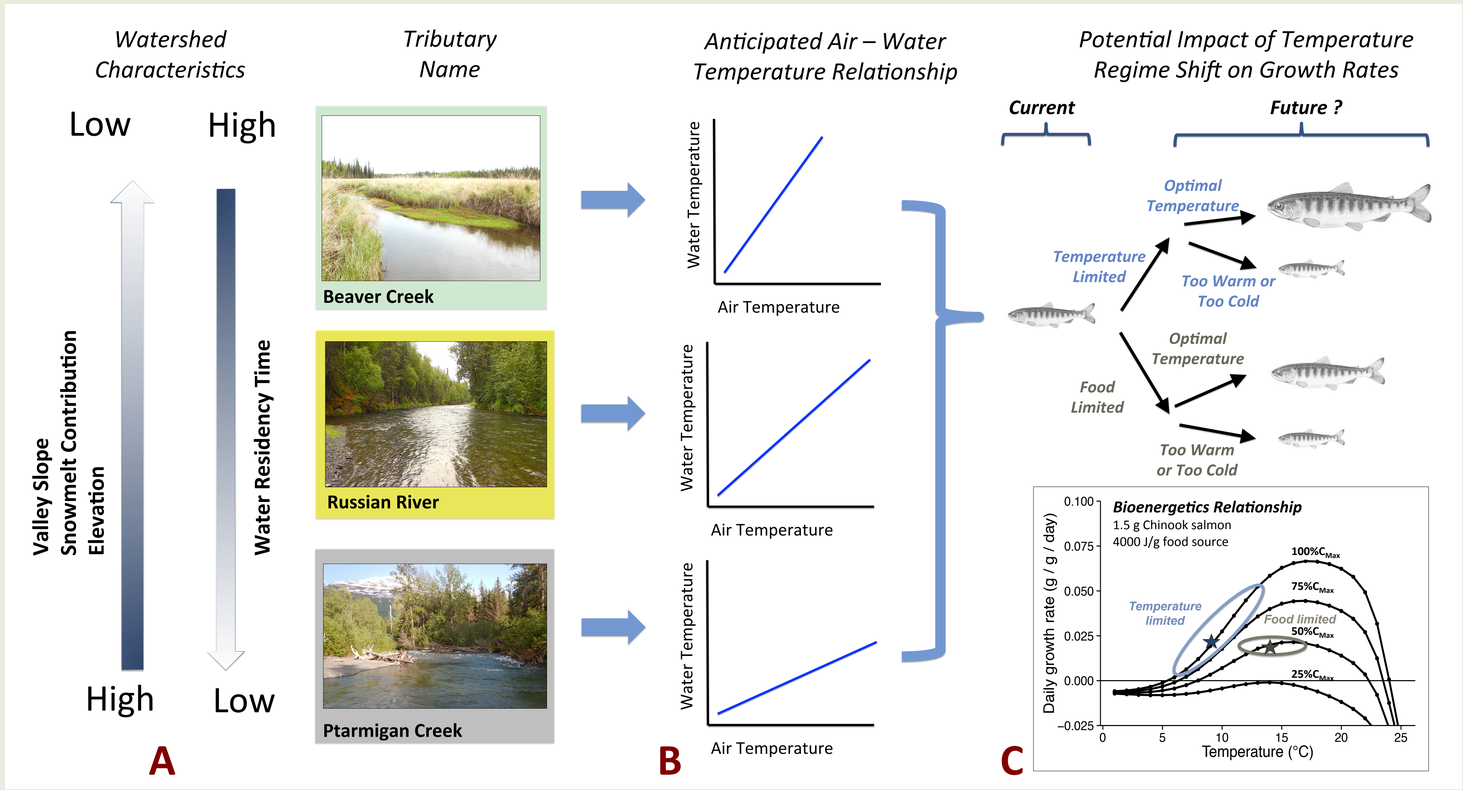

Figure 2- Juvenile Chinook and Coho salmon rear in a range of watershed types from lowland to montane, exemplified here by the three focus tributaries (A). The sensitivity of water temperatures to air temperature in anadromous systems will differ by local geographic setting (B). Water temperature and diet composition both influence growth rates of juvenile salmon. Field data is being used to customize bioenergetics relationships for juvenile Chinook and Coho populations in each of the focus watersheds (C). As ongoing climate warming occurs, shifts in water temperature regime may either enhance or diminish growth rates of juvenile salmon depending on the magnitude and direction of change. The objective of this in-progress study is to investigate the roles of water temperature and food resources in supporting their growth rates in freshwater rearing habitats.

SPECIES OF INTEREST

Chinook Salmon (*Oncorhynchus tshawytscha*)

Coho Salmon (*Oncorhynchus kisutch*)

METHODS

We are collecting field data (2015 – 2016) to provide inputs to bioenergetics models for juvenile Chinook and Coho populations in each of the three study tributaries:

Growth rates – We collected weight/length data and scales from minnow-trapped juvenile Chinook and Coho May - August 2015.

Diet composition– We collected gut contents from juvenile fish using non-lethal gastric lavage (Wipfli 1997) to estimate prey energy density.

Water temperature – We installed water temperature loggers longitudinally in each of the three study tributaries. Instantaneous water temperatures were also recorded at individual fish trap locations.

Measuring fork length.

Chloroperlidae; example prey item.

HOBO® Temp Pro v2 logger

CONCLUSIONS

- Early results from 2015 field season indicate some juvenile Chinook and Coho experience water temperatures above established thermal optima in the study drainages.
- **Implications:** The impact of climate change on growth rates of juvenile Chinook and Coho salmon is likely to be strongest in systems where water temperature is most sensitive to air temperature, but these effects are mediated by food resources and diet composition.

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