Energy and the Role of Shallow Tidal Freshwater Habitats for Juvenile Chinook Salmon

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Background

- Shallow water habitats in the tidal freshwater portion of the LCRE are thought to be important

- Empirical evidence has been sparse

- Energetic implications have received little attention…
Project Goal and Objectives

Goal:

- Identify energetic implications of residence in tidal freshwater habitats in the LCRE

Objectives:

- Growth
- Conversion
Sampling Design

Legend
- Main channel site
- Off channel site
Approach: bioenergetics

Input data
- diet composition
- water temp.
- prey energy

\[ P(C_{\text{max}}) = (G) = (C) - (\text{metabolic losses} + \text{waste}) \]

Sim. Cohort 1: \( G = C - \text{losses} \)
Sim. Cohort 2: \( G = C - \text{losses} \)
...  
Sim Cohort n: \( G = C - \text{losses} \)
Approach: simulation cohorts

Residence period:

\[ FL_i + (GR \cdot RP) = FL_f \]

\[ Biomass_i = \beta_0 + \beta_1 \cdot FL_i \]

Sim. Duration

Beg. And End Mass (P[C_{max}])
Metrics

\[ \frac{\Delta B}{C_{total}} \cdot 100 = \text{Gross Conversion Efficiency (GCE)} \]

\[ \text{Specific Growth Rate (SGR)} \]
Results (SGR – main channel)

- **Main Channel**

  - Temperature \( (^\circ C) \)
  - Simulation Day

| Mean Specific Growth Rate (g·g\(^{-1}\)·d\(^{-1}\)) |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0.00            | 0.01            | 0.02            | 0.03            |

- **Inst. Daily Temperature**

- **Simulated P(C\(_{max}\))**

- **±10% Simulated P(C\(_{max}\))**
Results (SGR – off channel)

- Mean Specific Growth Rate (g·g⁻¹·d⁻¹)
- Temperature (°C)
- Simulation Day

Graph showing the relationship between simulation day and mean specific growth rate, with temperature plotted on the secondary y-axis.
Results (GCE – off channel)

![Graph showing the relationship between simulation day and gross conversion efficiency with temperature on the y-axis and simulation day on the x-axis. The graph displays fluctuations in efficiency and temperature throughout the simulation days.]
Conclusions

- Positive growth
- Favorable efficiency
- Temperature effect
- Variability among strata
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Questions
Results (daily ration)

Main Channel

Simulation Day

P($C_{max}$)

Temperature (°C)
Results (daily ration)

Main Channel

Simulation Day

$P(C_{\text{max}})$

Temperature (°C)

0.0 0.2 0.4 0.6 0.8 1.0


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Presentation Outline

- Background
- Goal and objectives
- Sampling Design
- Approach
- Results
- Conclusions