



Apr 26th, 4:30 PM - 5:00 PM

Taking Stock of Chinook Salmon Energy Densities has Implications for Resident Killer Whales Meeting Their Energy Needs

Jacob E. Lerner
University Of British Columbia

Brian P. V. Hunt
University of British Columbia

Follow this and additional works at: <https://cedar.wwu.edu/ssec>



Part of the [Fresh Water Studies Commons](#), [Marine Biology Commons](#), and the [Natural Resources and Conservation Commons](#)

Lerner, Jacob E. and Hunt, Brian P. V., "Taking Stock of Chinook Salmon Energy Densities has Implications for Resident Killer Whales Meeting Their Energy Needs" (2022). *Salish Sea Ecosystem Conference*. 274.
<https://cedar.wwu.edu/ssec/2022ssec/allsessions/274>

This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.



Taking Stock of Chinook Energy Density: Quantifying the Lipid Content of SRKW Priority Chinook Stocks

Jacob E. Lerner^{1,2} and Brian P. V. Hunt^{1,2,3}

¹University of British Columbia, Institute for the Oceans and Fisheries, Vancouver, BC, Canada

²University of British Columbia, Department of Earth, Ocean and Atmospheric Sciences, Vancouver, BC, Canada

³Hakai Institute, Heriot Bay, BC, Canada



j.lerner@oceans.ubc.ca

Background:

Chinook salmon are the **main prey source** for Southern Resident killer whales (SRKW)

- The Fraser River is the largest source of Chinook for SRKWs

Not all Chinook are created equal

- Chinook stocks vary in energy density
- Life history differences drive this variation

SRKWs consume diverse stocks of Chinook

Methods Cont'd: The Distell fat meter

- The Distell fatmeter is a handheld device with a sensor that can provide a **rapid assessment of lipid content** of the muscle tissue below.
- This measurement has been calibrated to determine **Chinook whole-body lipid content** with high accuracy.

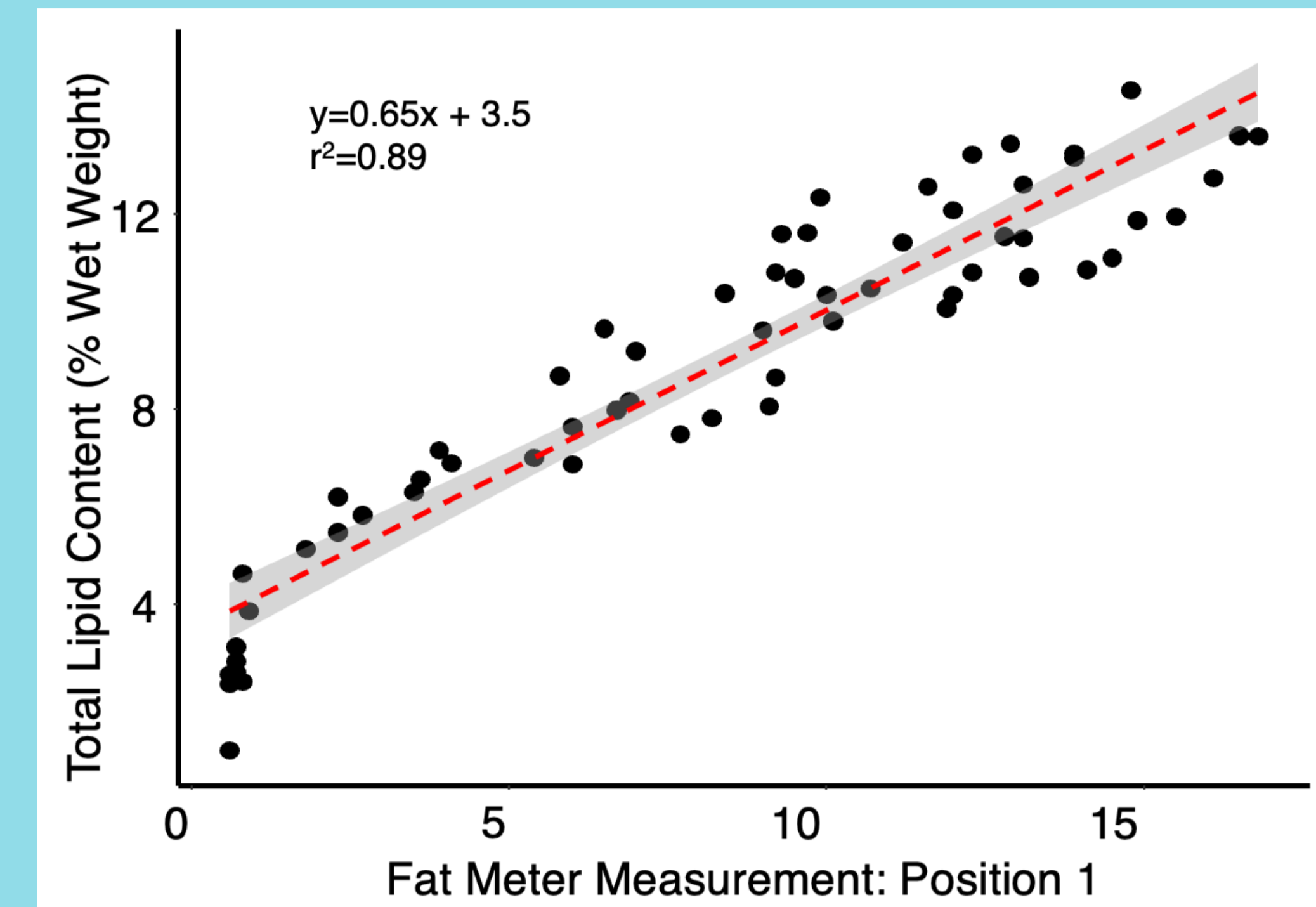
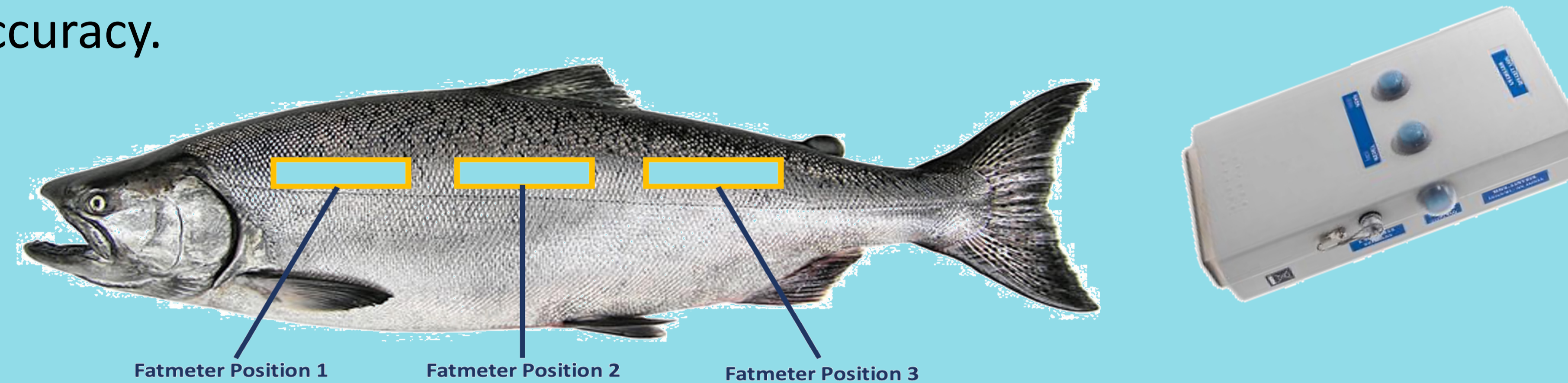


Figure 2: Plot of regression between Chinook total lipid content and fat meter measurement 1.

Research Question

- What is the average energy content of the different stocks of Fraser River Chinook?

Methods

Measure the lipid content of the **four main Fraser Chinook stock groupings** (management units, MUs) at **freshwater entry** with a Distell fat meter.

- Chinook measured at Albion Test Fishery, Maple Ridge, BC
- 4 main management units: Spring 5₂; Summer 5₂; Summer 4₁; Fall 4₁.

Why Measure Lipid Content?

Lipids are the main form of energy storage in Chinook and whole body lipid levels are strongly correlated ($r^2=0.97$) with whole body energy density.

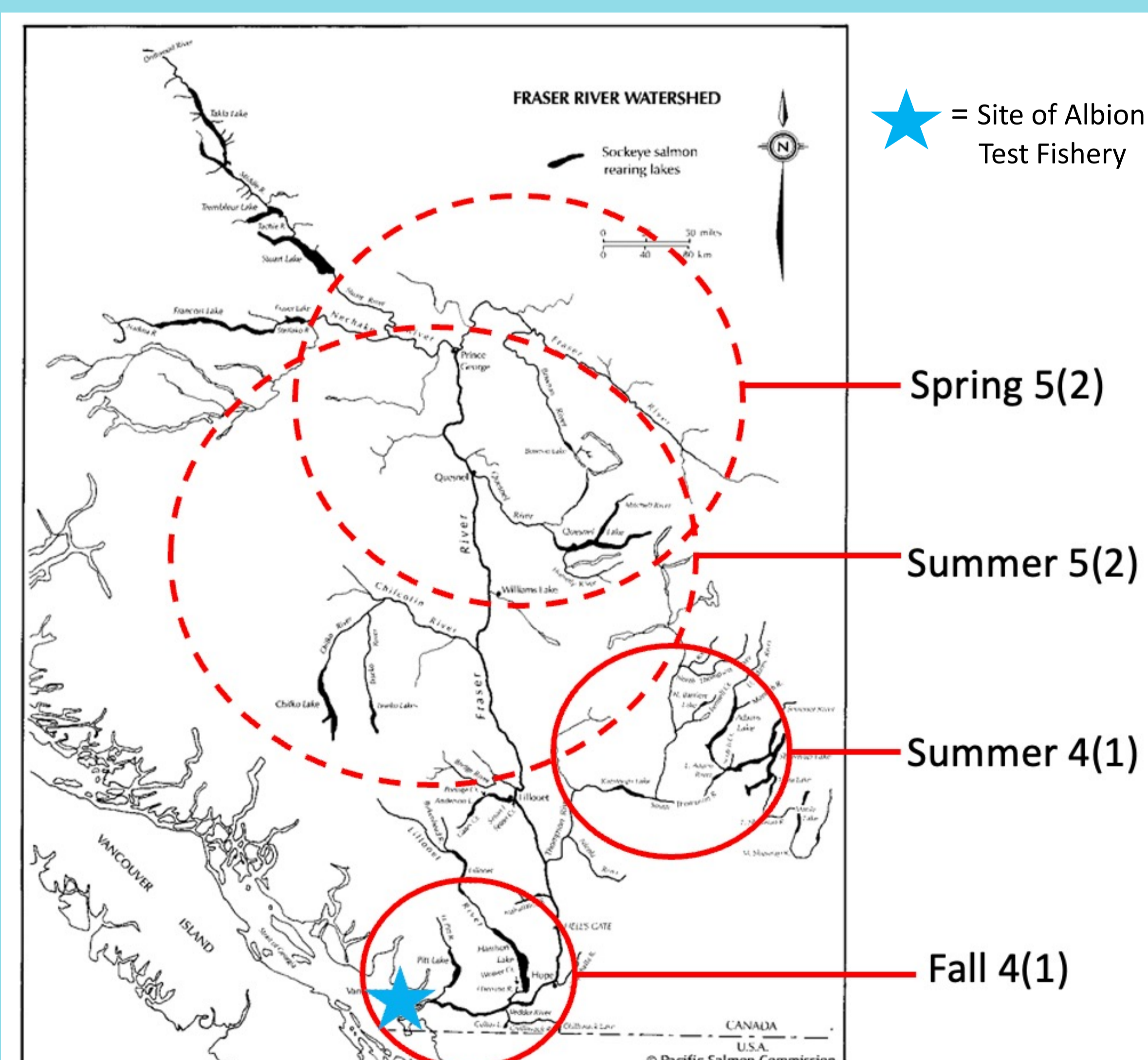


Figure 1: Map showing the main spawning areas of four major Chinook stock groupings and the location of the Albion test fishery within the Fraser River watershed.

Results:

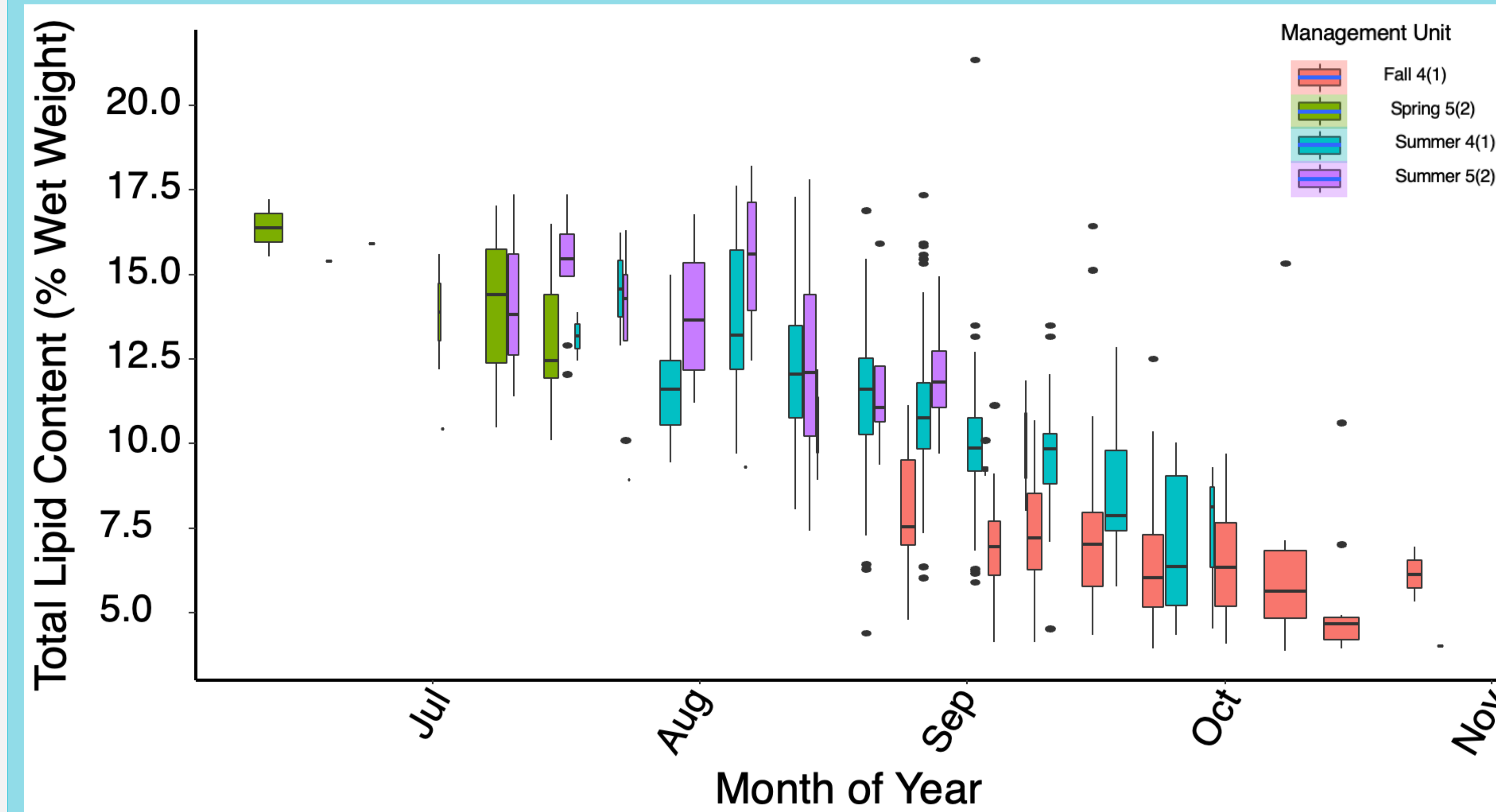


Figure 3: Plot of average weekly total lipid content of all Chinook caught at the 2021 Albion test fishery by management unit.

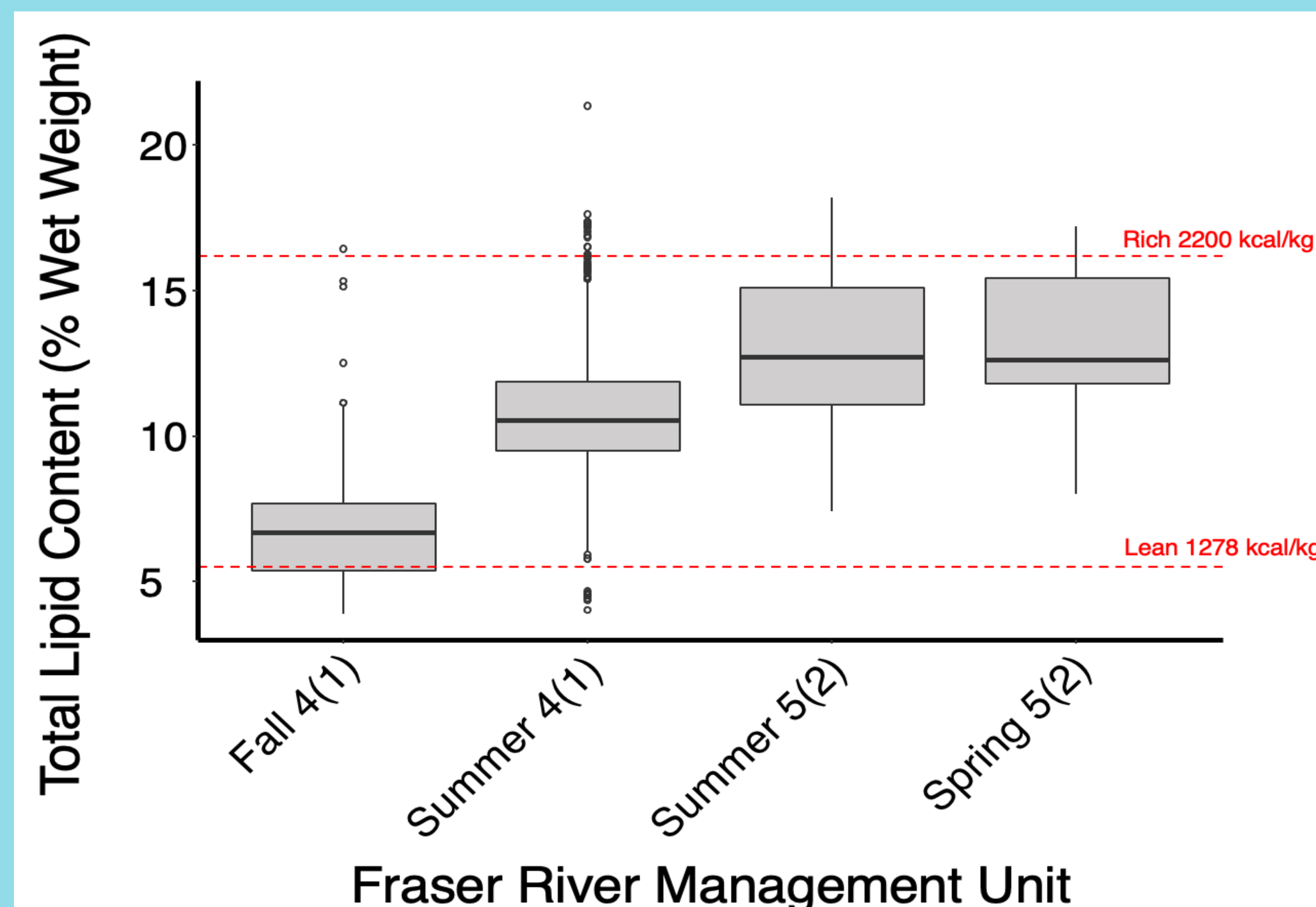


Figure 4: Boxplot of overall total lipid content for each of the four main Chinook management units on the Fraser River. Red lines represent rich/lean bounds of energy density of Chinook with different levels of total lipid content.

Main Findings

1. Fraser River Chinook exhibit variation in lipid content across the season

- **Salmon with higher lipid levels arrive earlier**

- This variation driven by **different MUs/life history types** likely due to differences in spawning ground elevation/distance

❖ Chinook MUs form **three significant groups** based on lipid content:

- Spring 5₂/Summer 5₂—12.8% ± 2.2
- Summer 4₁—10.7% ± 2.1
- Fall 4₁—6.7% ± 1.8

2. Seasonal variation **within** MUs

❖ **Fatter fish arrive earlier** within Mus

3. Differences between MUs can be used to **quantify prey requirements for SRKW**

- Difference between diet of 100% Spring 5₂ and Summer 5₂ Chinook and 100% Fall 4₁ Chinook is 93,000 fish (Williams et al 2011).

4. Implications for energy available to SRKW

- Less lipid rich Fall 4₁ and Summer 4₁ are the largest Chinook runs on the Fraser
- ❖ **Less energy dense Fall 4₁ Chinook are more available to SRKWs year round**

Acknowledgements

We would like to acknowledge the critical help of Captain Kevin Buxton and the DFO test fishery crew and Brittany Jenewein. This work was supported in part through a BCSRIF grant.