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FISHERIES**

# Towards a better understanding of the winter energetic status and fitness of Pacific salmon in the Gulf of Alaska: Results from the 2019 IYS expedition

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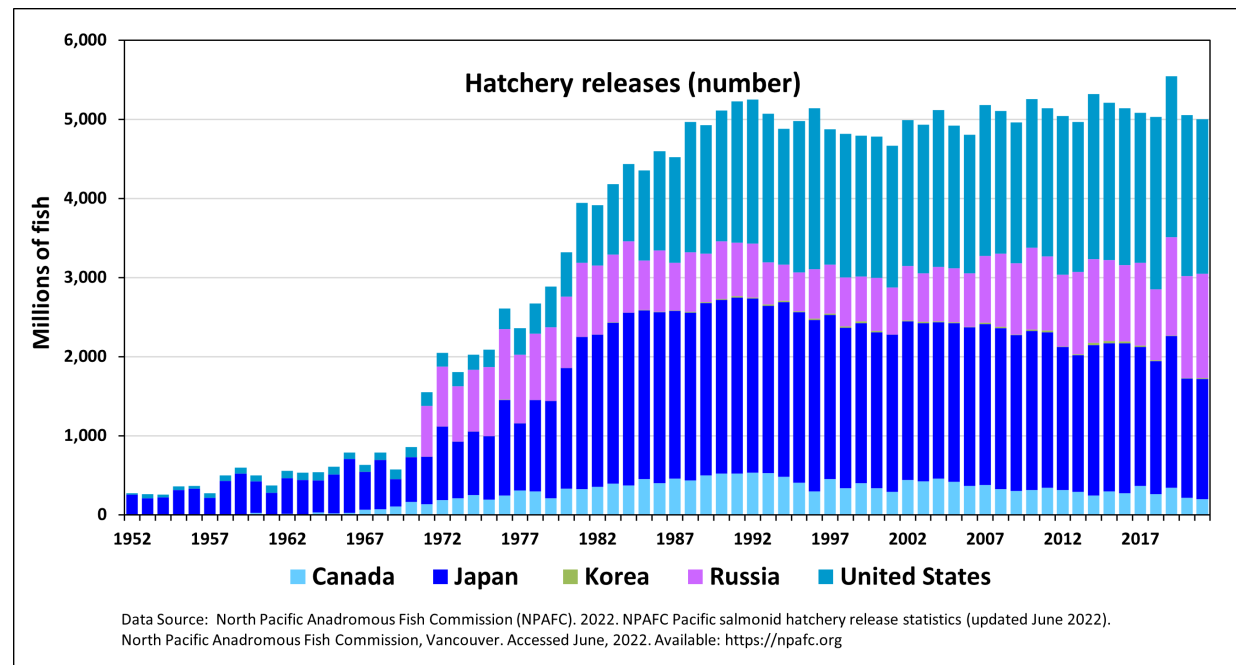


IYS Synthesis Symposium

Oct 6, 2022

# Winter: a critical period

- Prey availability is reduced
- Intensification of intra- and inter-species competition
- Does this contribute to high mortality in the first winter at sea?



# Aim and objectives

**Aim:** Better understand the marine ecology of Pacific salmon in the critical winter period

## **Objectives:**

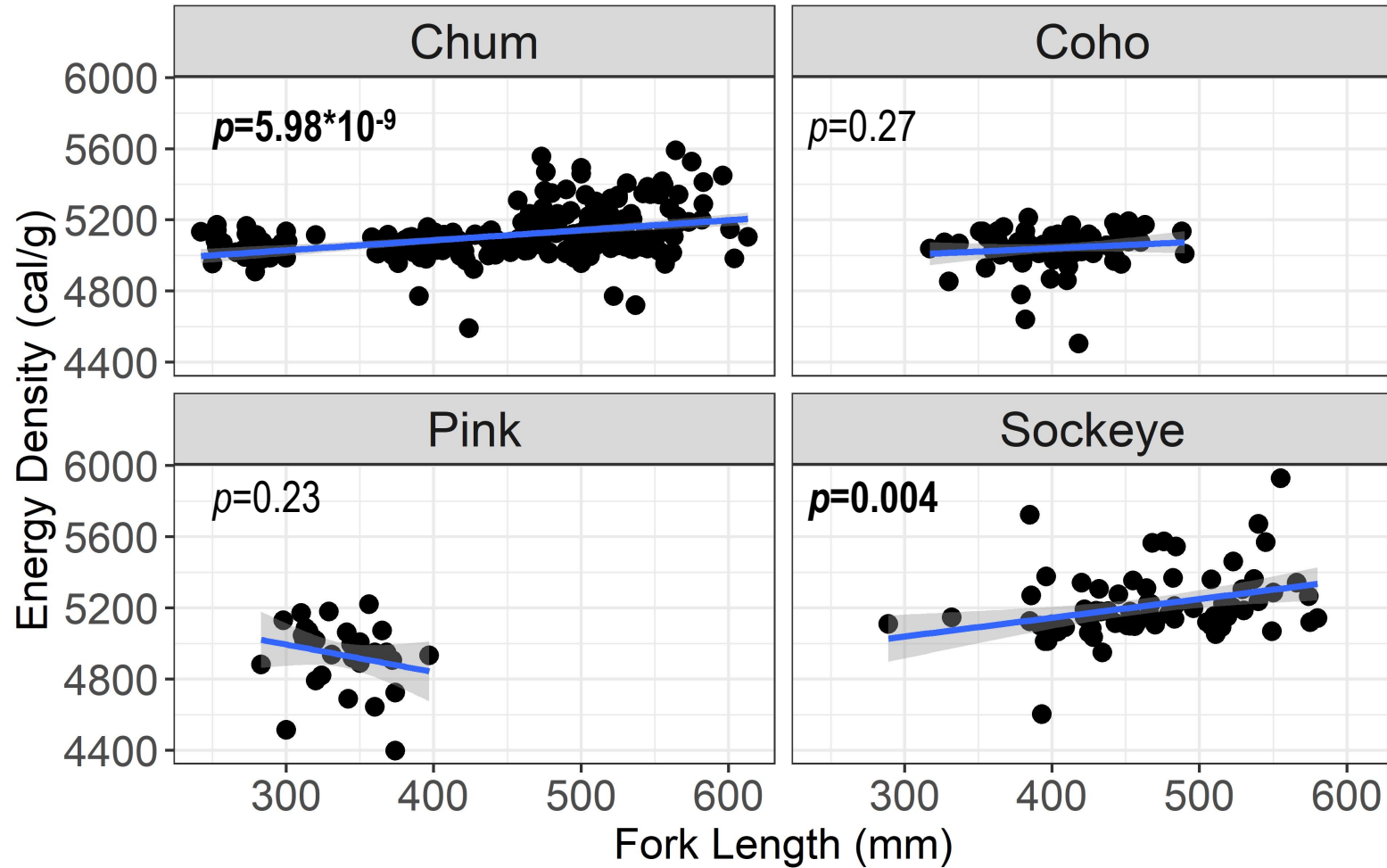
- 1) Assess winter energetic status, fitness (lipid and protein content), and trophic overlap
- 2) Identify hatchery pink and chum; compare to wild fish
- 3) Conduct bioenergetics modeling to assess salmon growth rate potential in Gulf of Alaska in winter

# Sample sizes: 2019 survey

Species	Ocean Age						Total
	1	2	3	4	5	NA	
Chum	36	56	93	30	1	7	223
Coho	85						85
Pink	31						31
Sockeye	5	39	27			2	73
							412

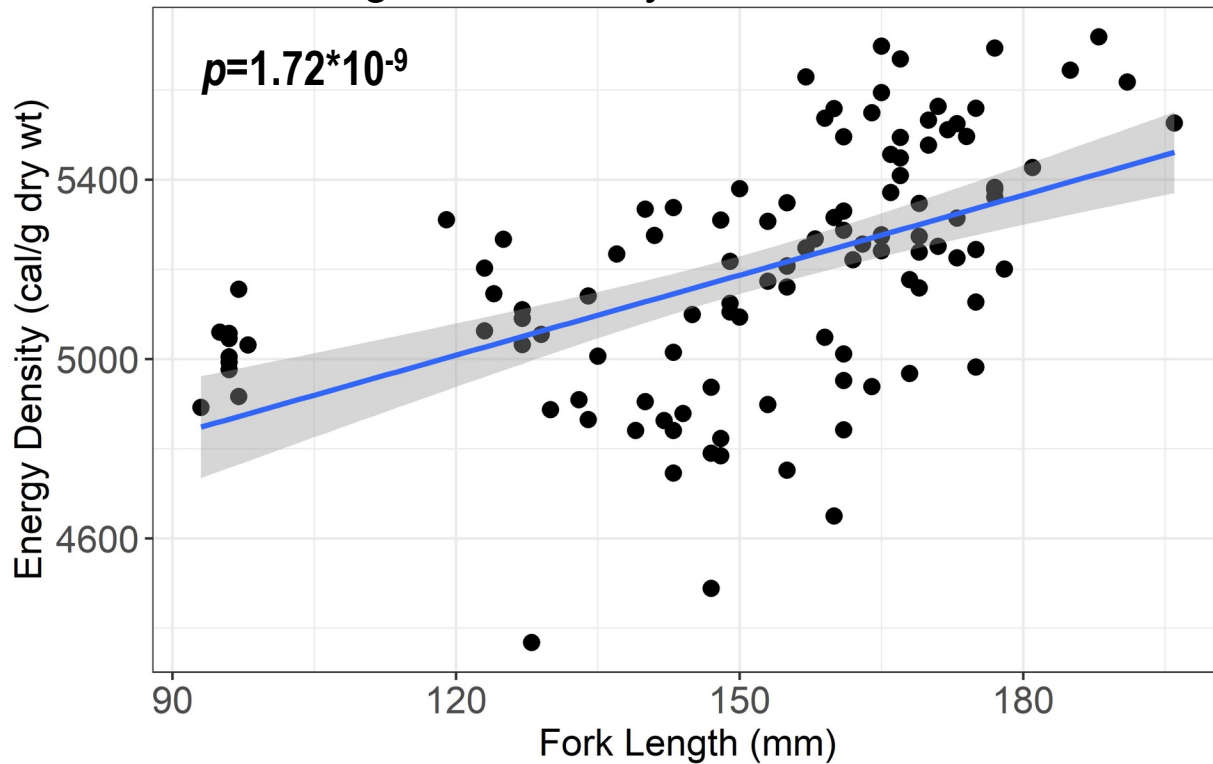


# Effect of length on energy density

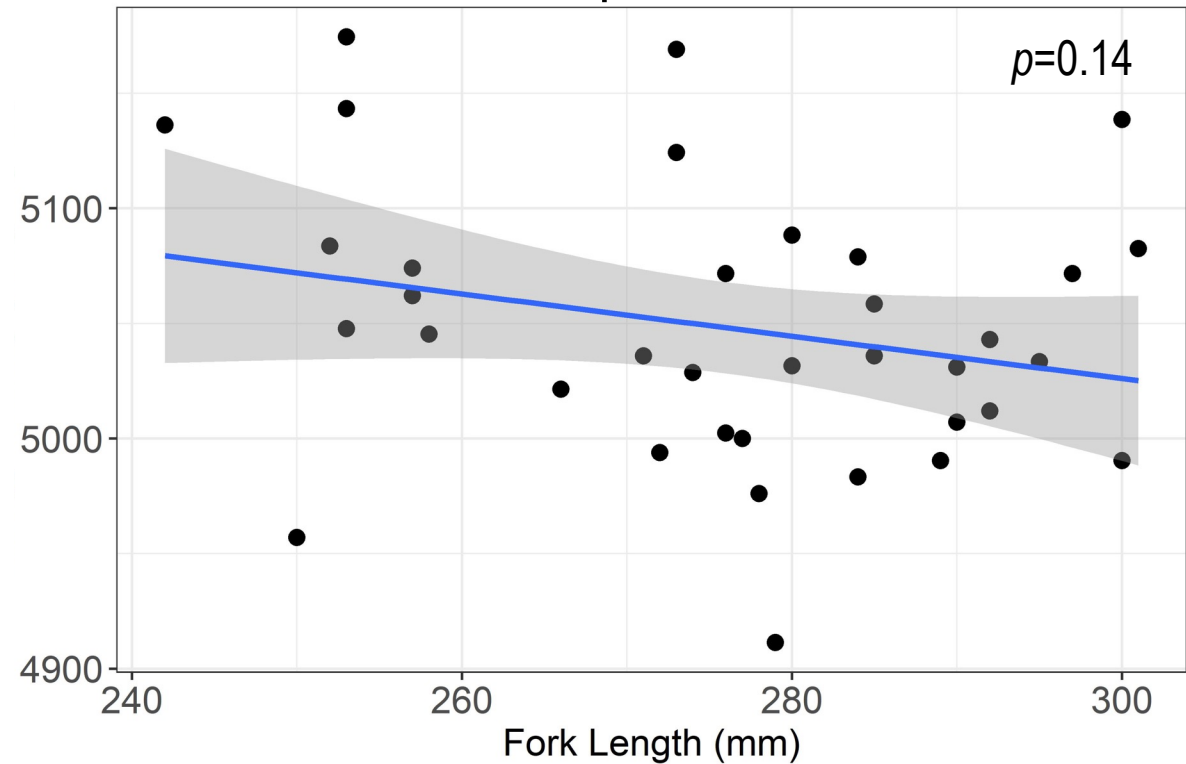


# Seasonal comparison: Chum

Juvenile Chum from Southeast Alaska and Bering Sea surveys, summer/fall 2018

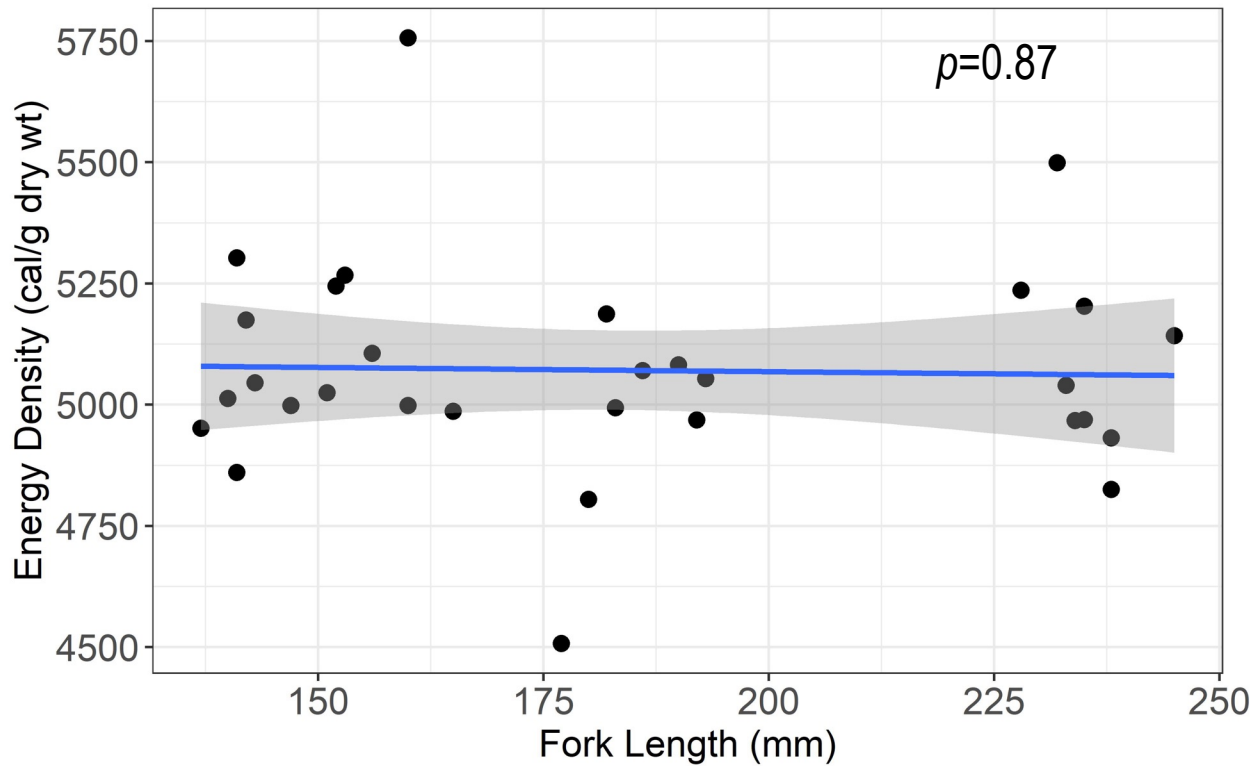


Ocean age 1 Chum from Winter 2019 IYS expedition

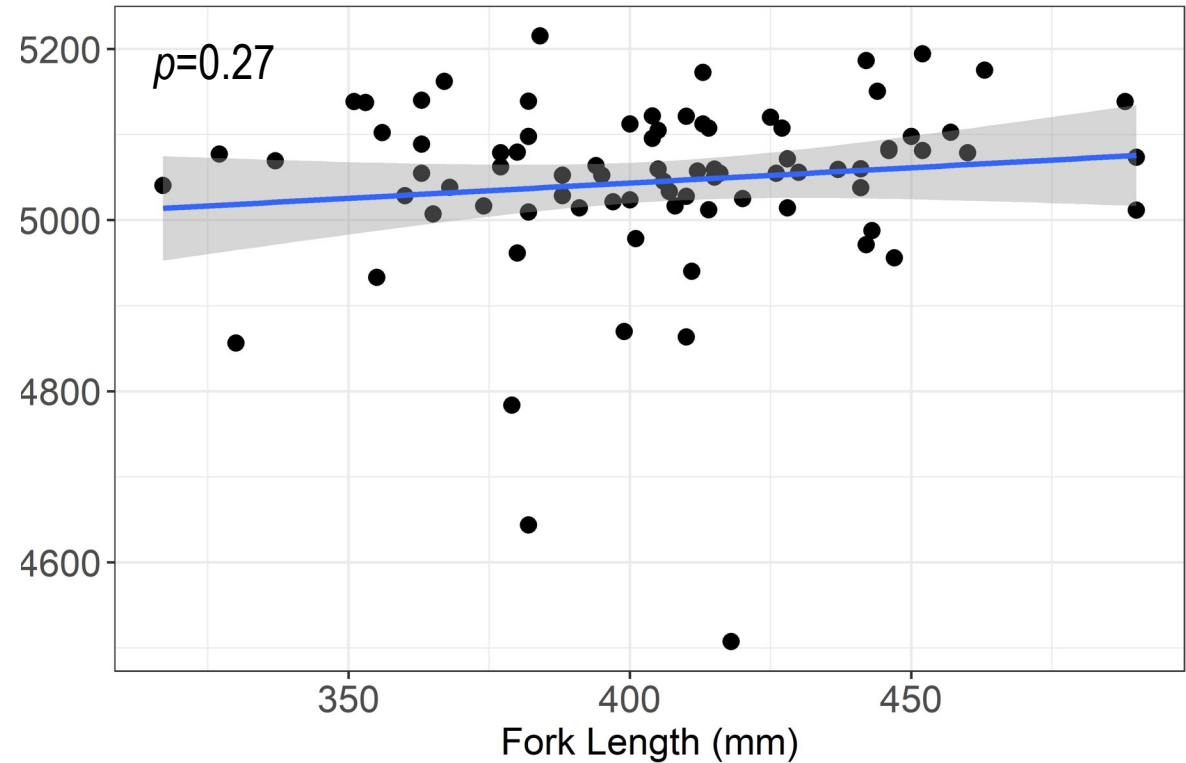


# Seasonal comparison: Coho

Juvenile Coho from Southeast Alaska, summer/fall 2018

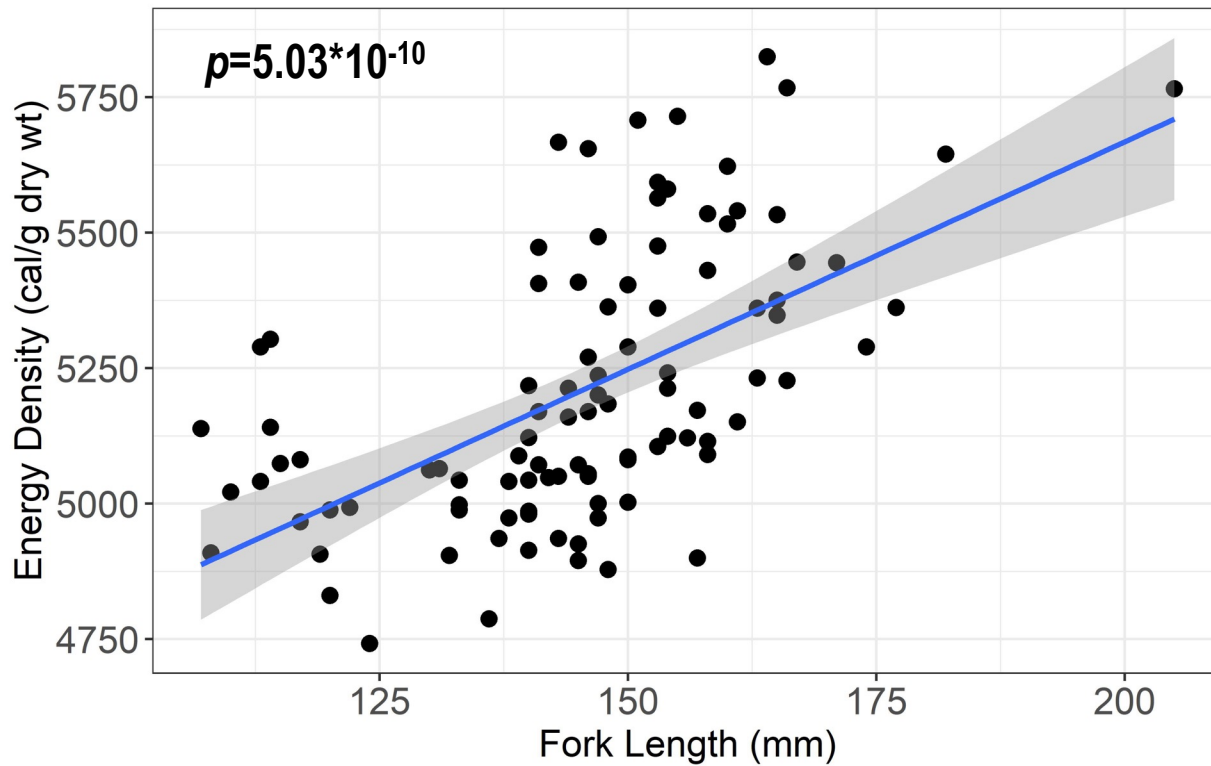


Coho from Winter 2019 IYS expedition

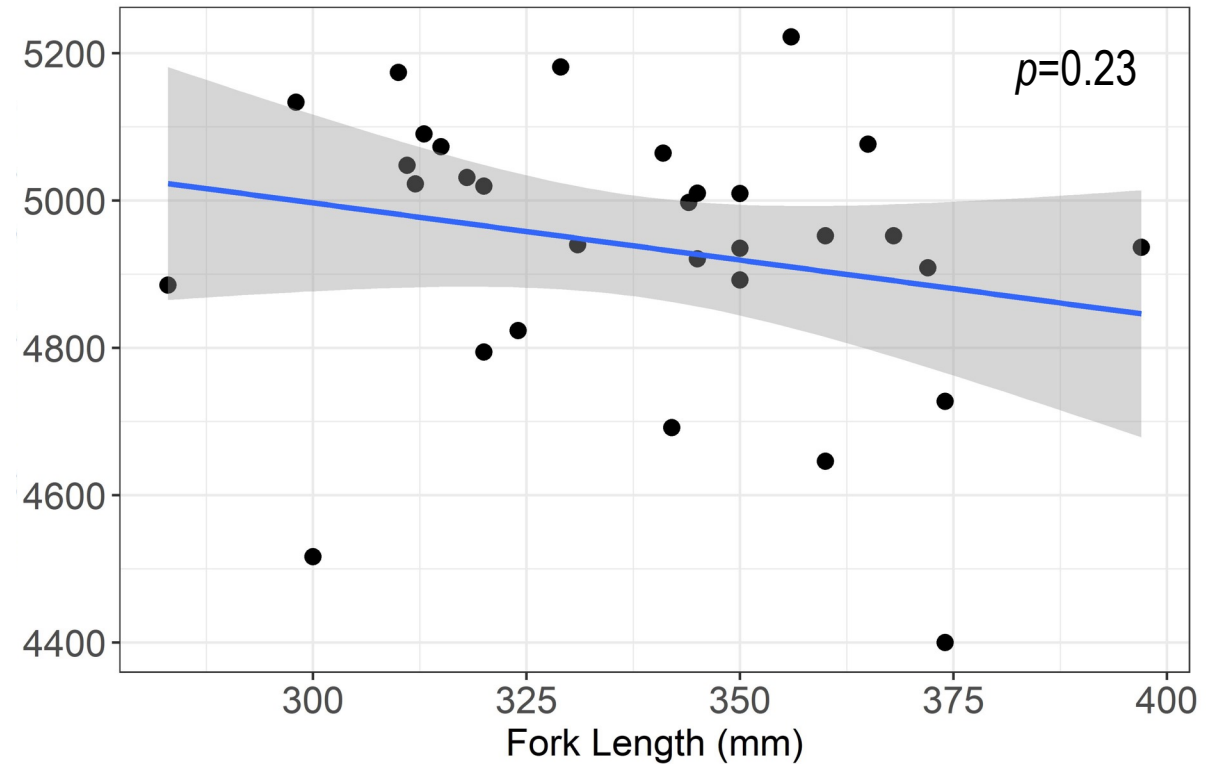


# Seasonal comparison: Pink

Juvenile Pinks from Southeast Alaska and Bering Sea surveys, summer/fall 2018

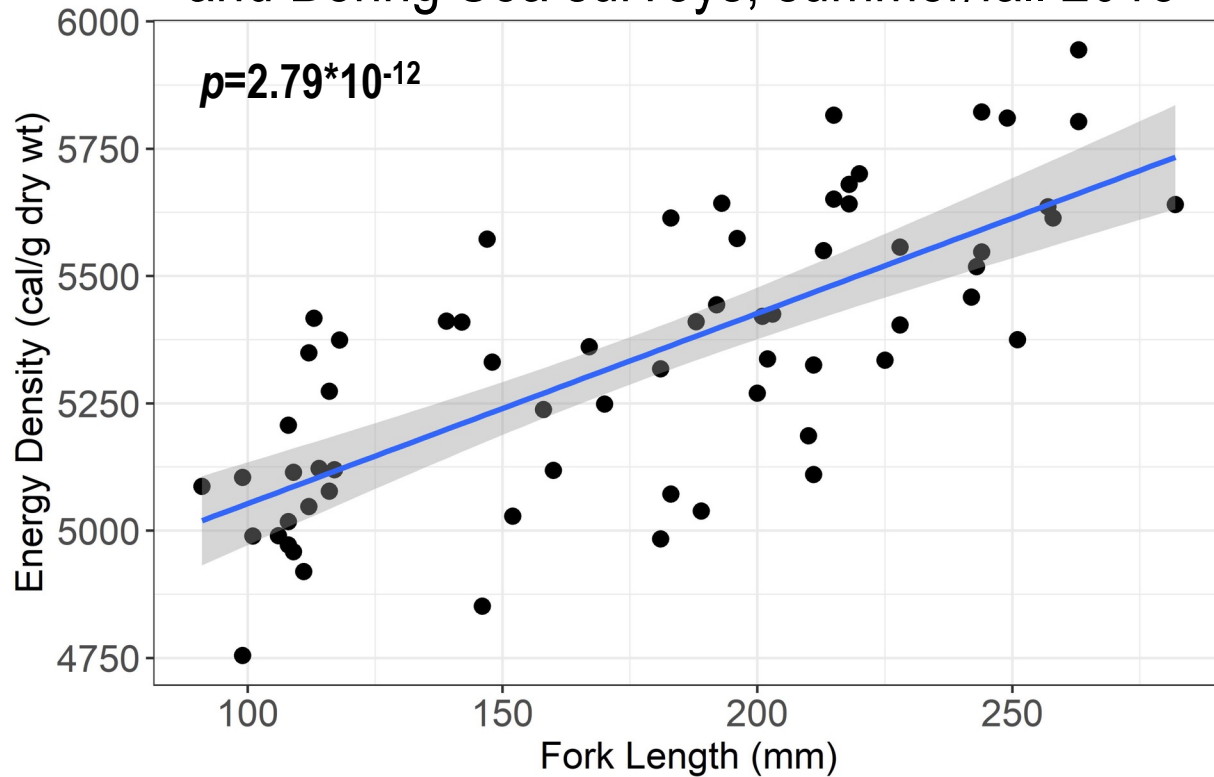


Pinks from Winter 2019 IYS expedition

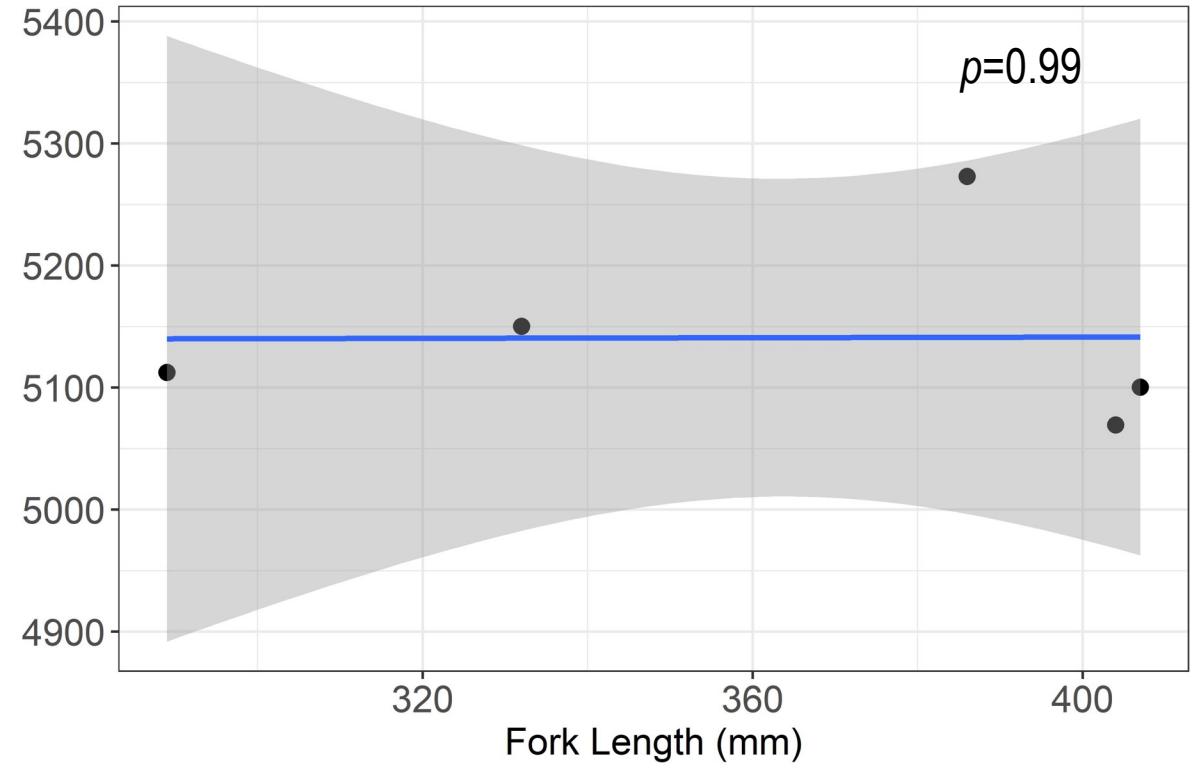


# Seasonal comparison: Sockeye

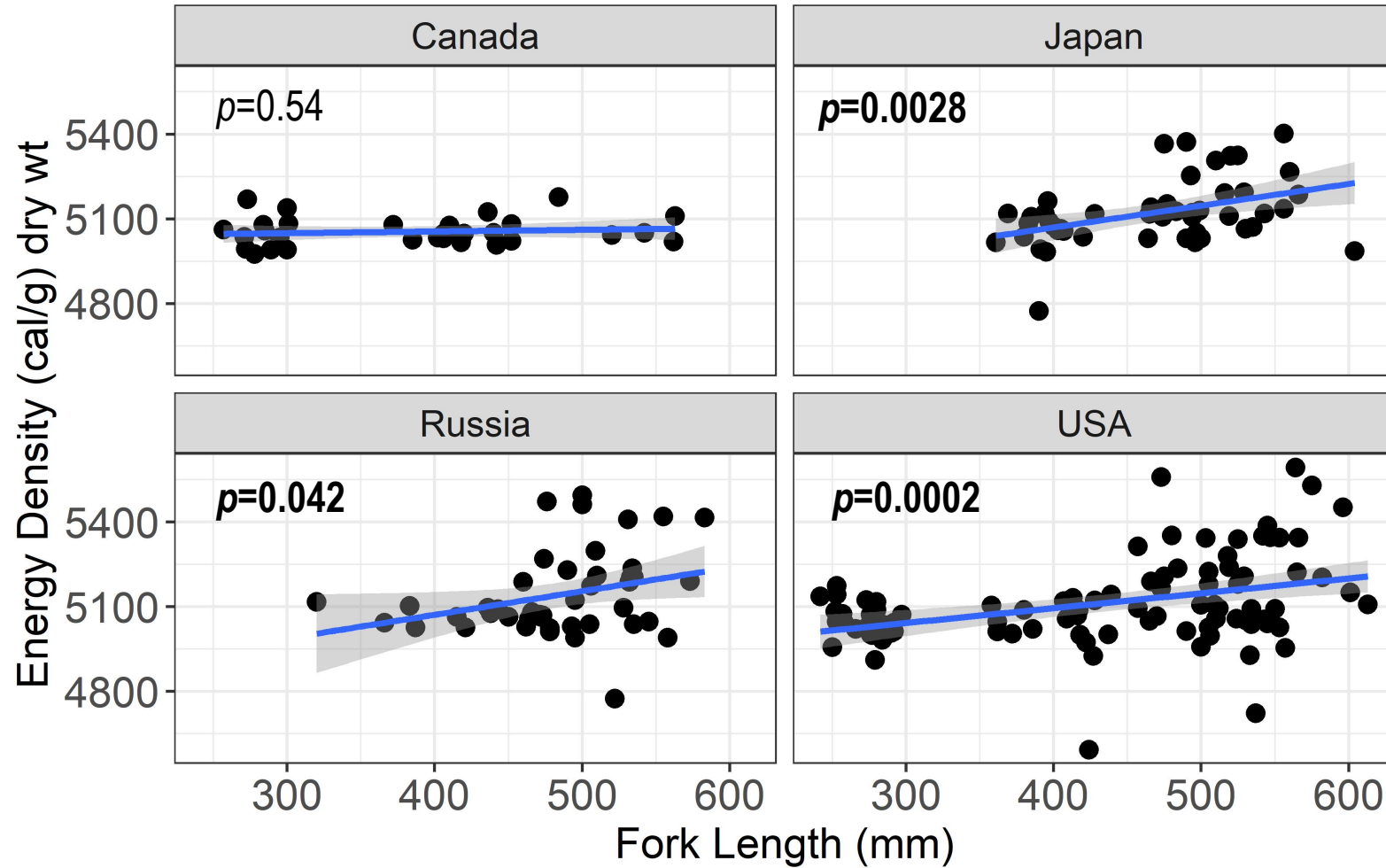
Juvenile Sockeye from Southeast Alaska and Bering Sea surveys, summer/fall 2018



Ocean age 1 Sockeye from Winter 2019 IYS expedition

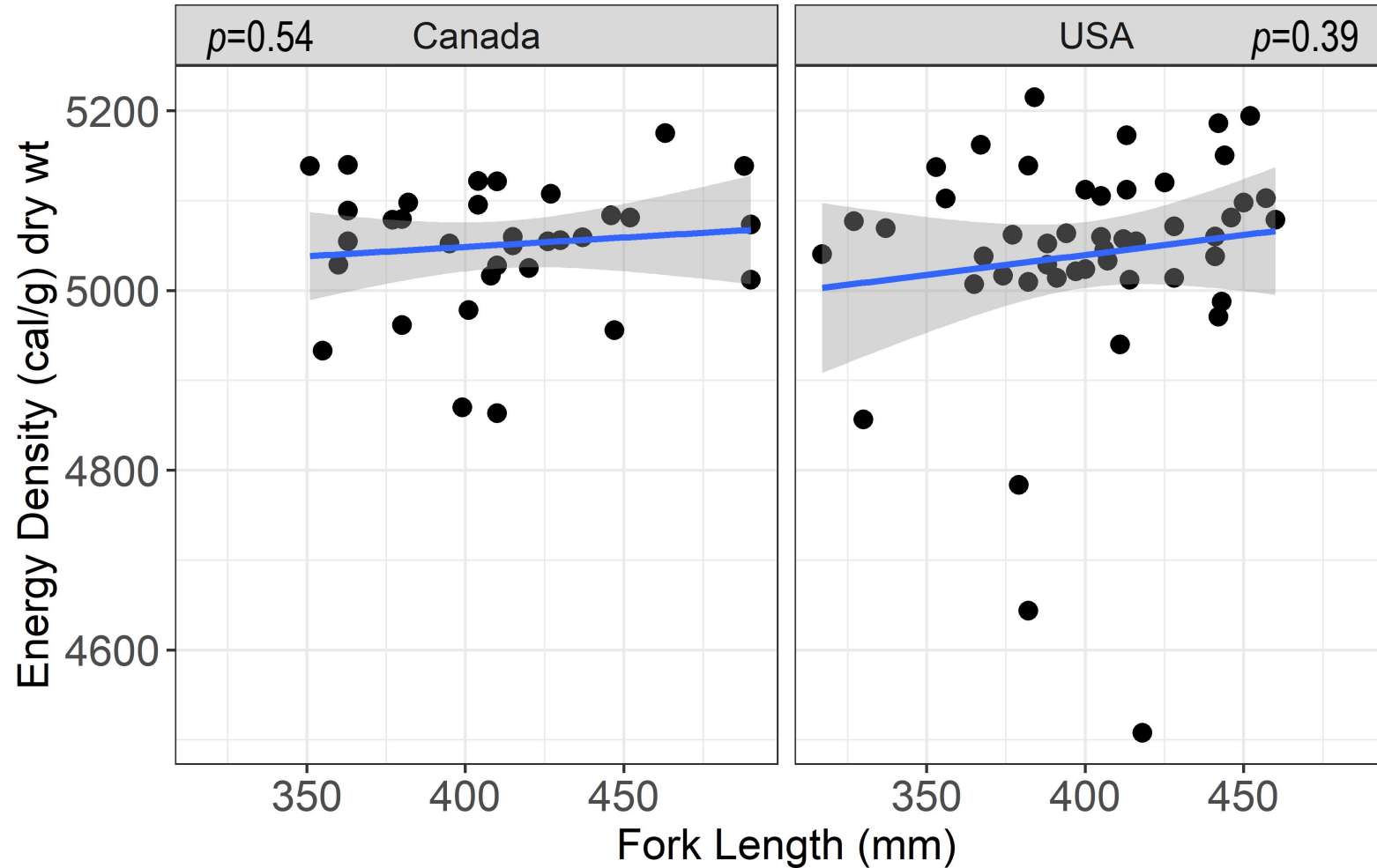


# Energy density by country of origin: Chum

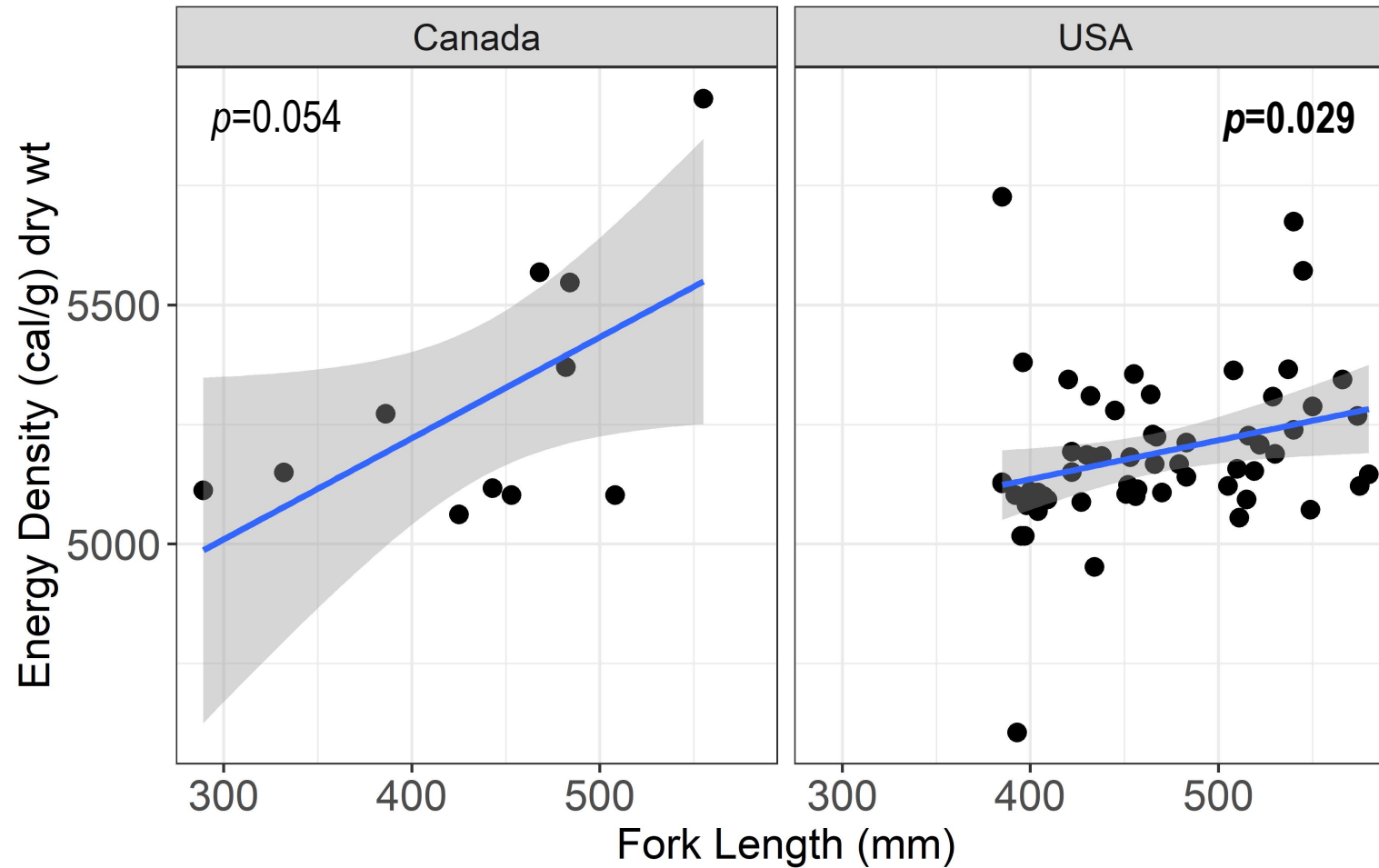




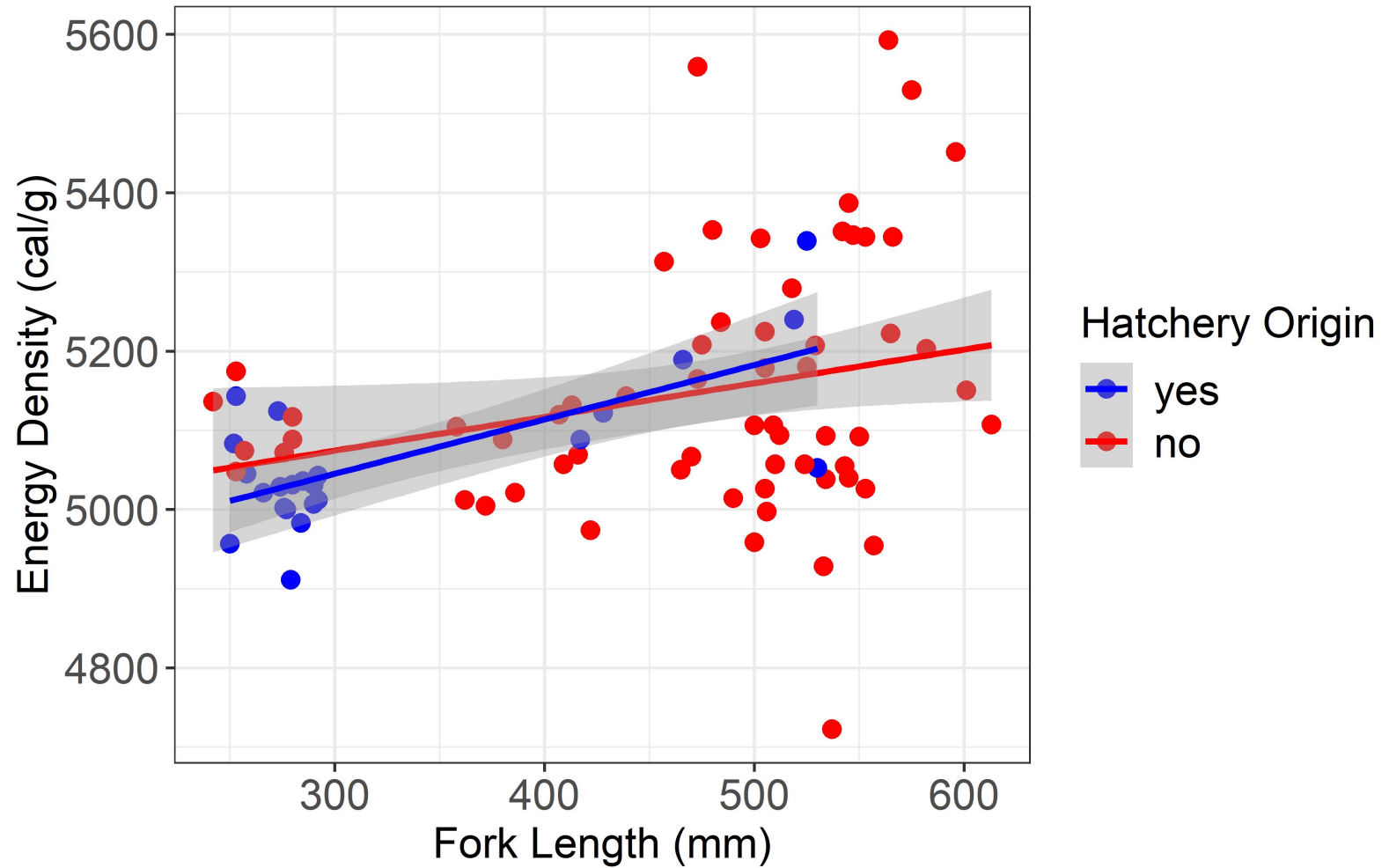
# Energy density by country of origin: Coho



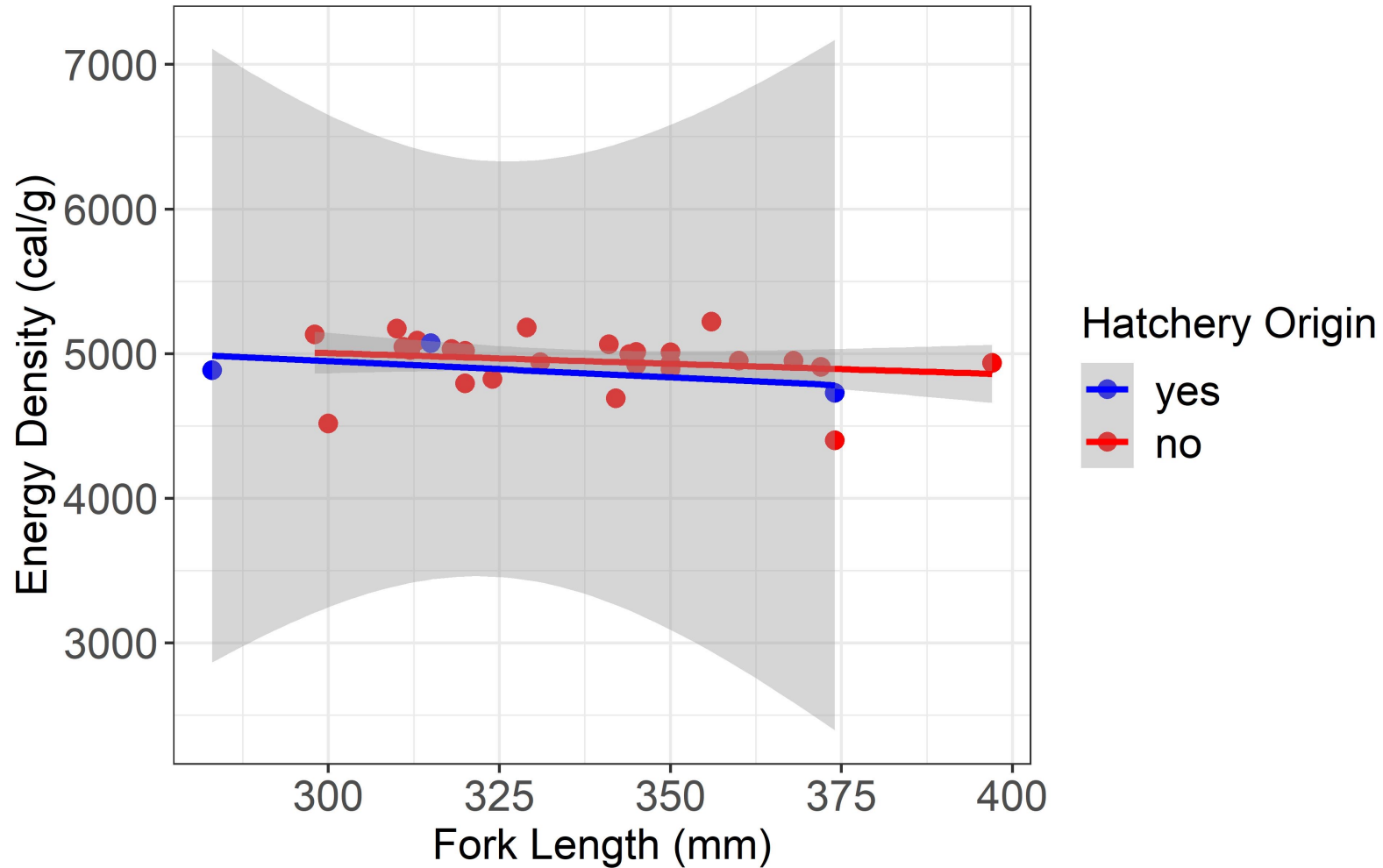
# Energy density by country of origin: Sockeye



# No difference between hatchery and wild chum from Alaska



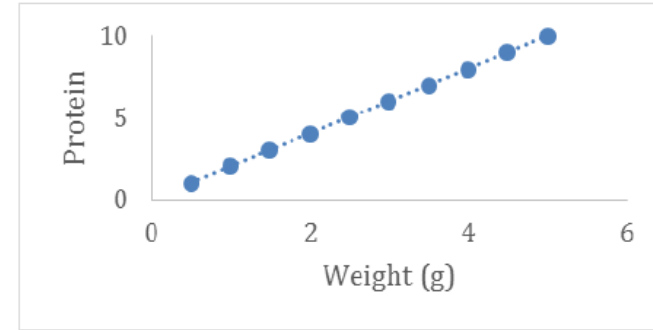
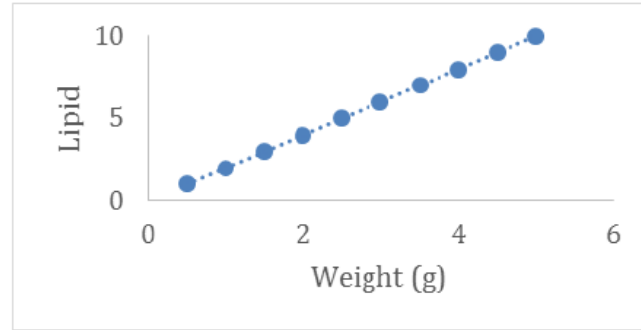
# No difference between hatchery and wild pinks from Alaska



# Winter fitness: lipid and protein content

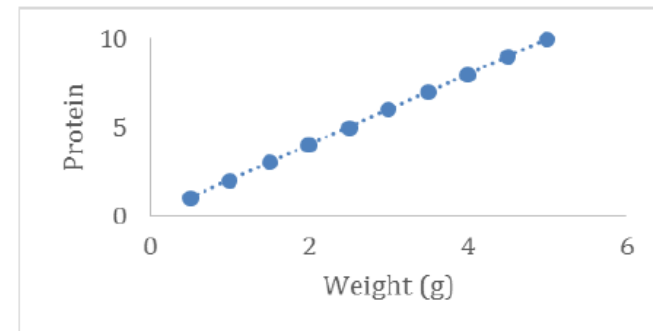
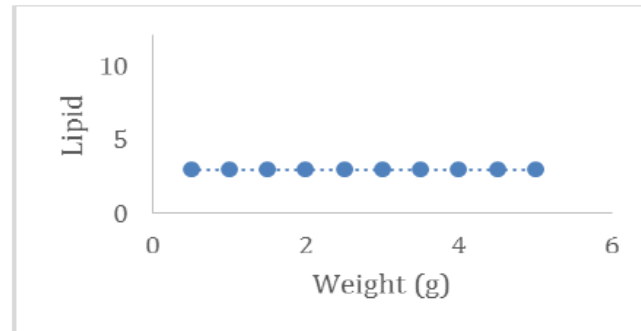
Fit

a.



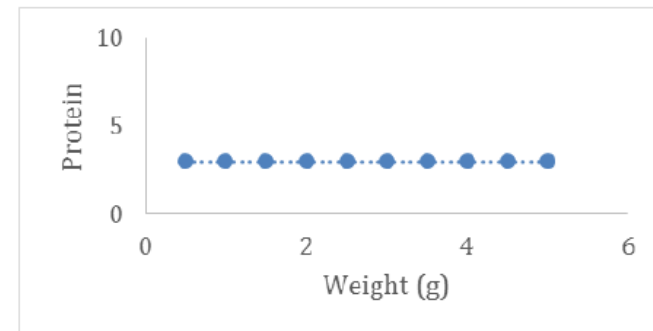
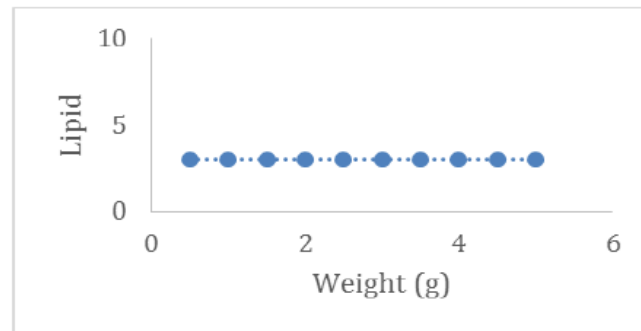
Not starving

b.



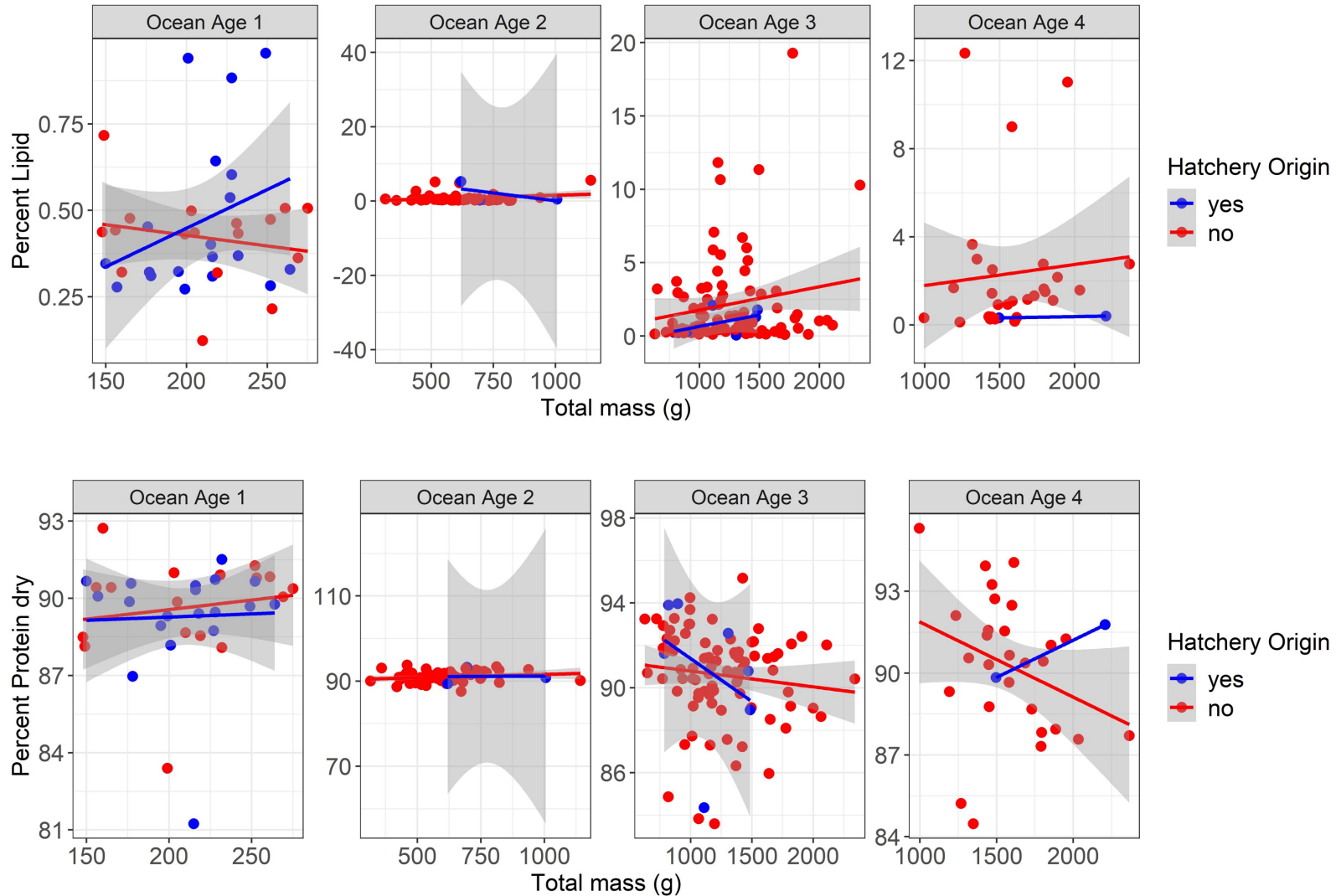
Starving

c.



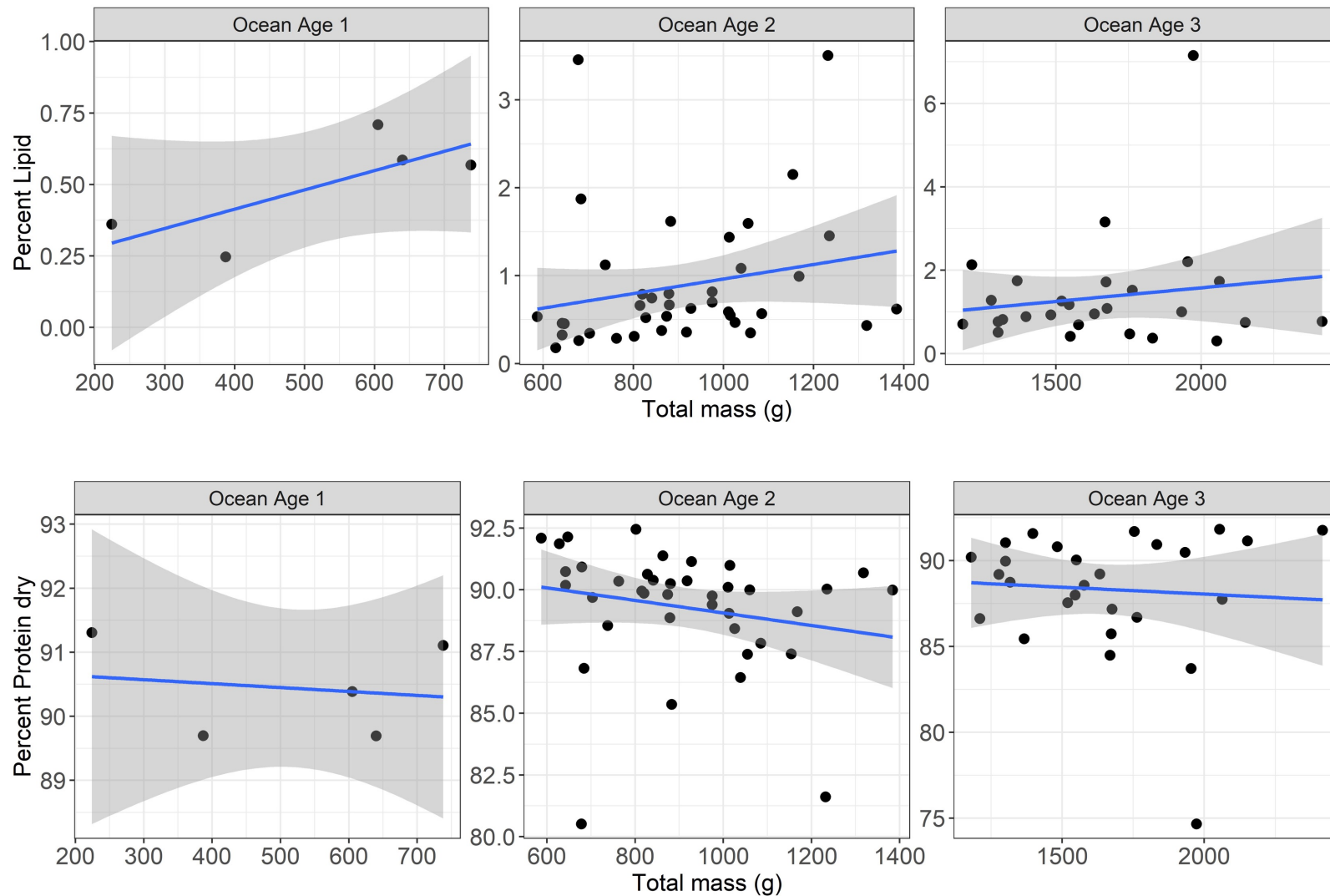
Adapted from Castellini and Rea (1992)

# Lipid and protein by age class: Chum

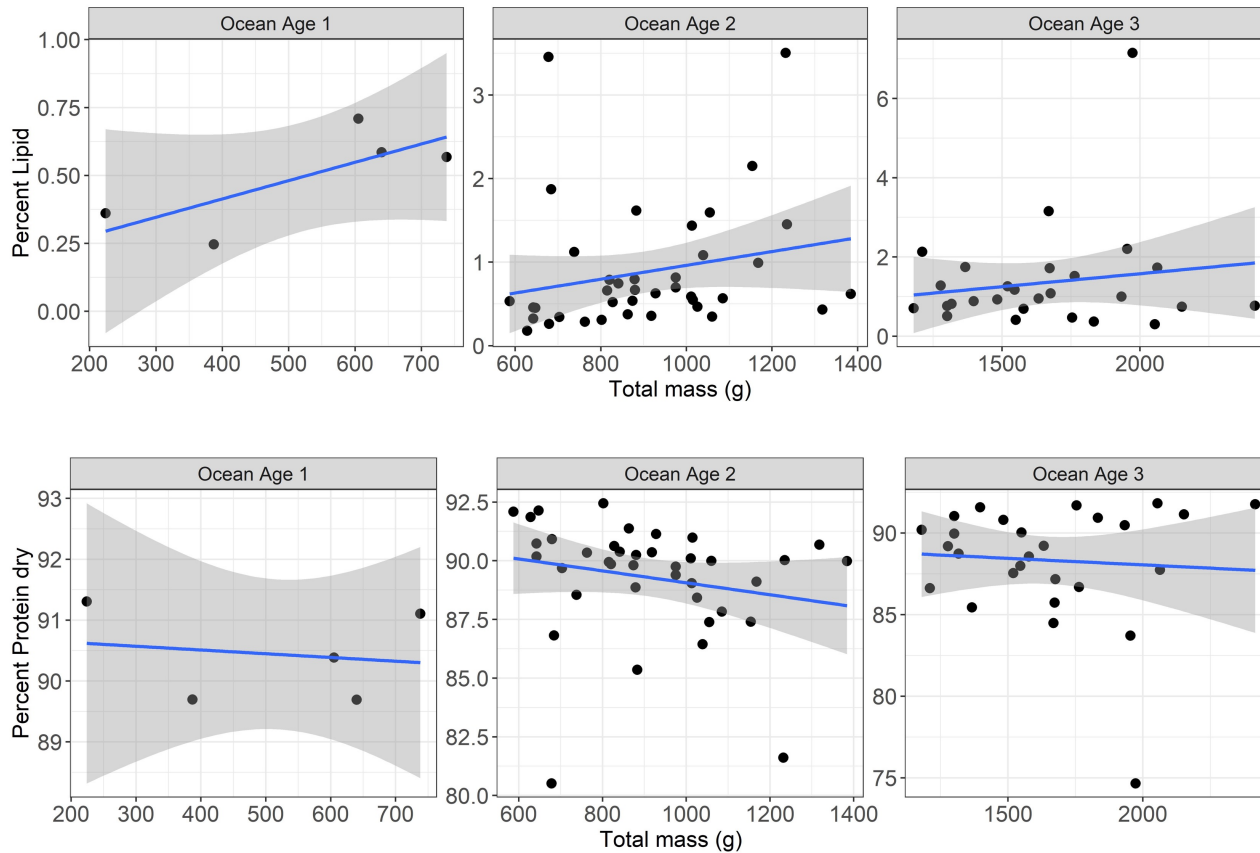




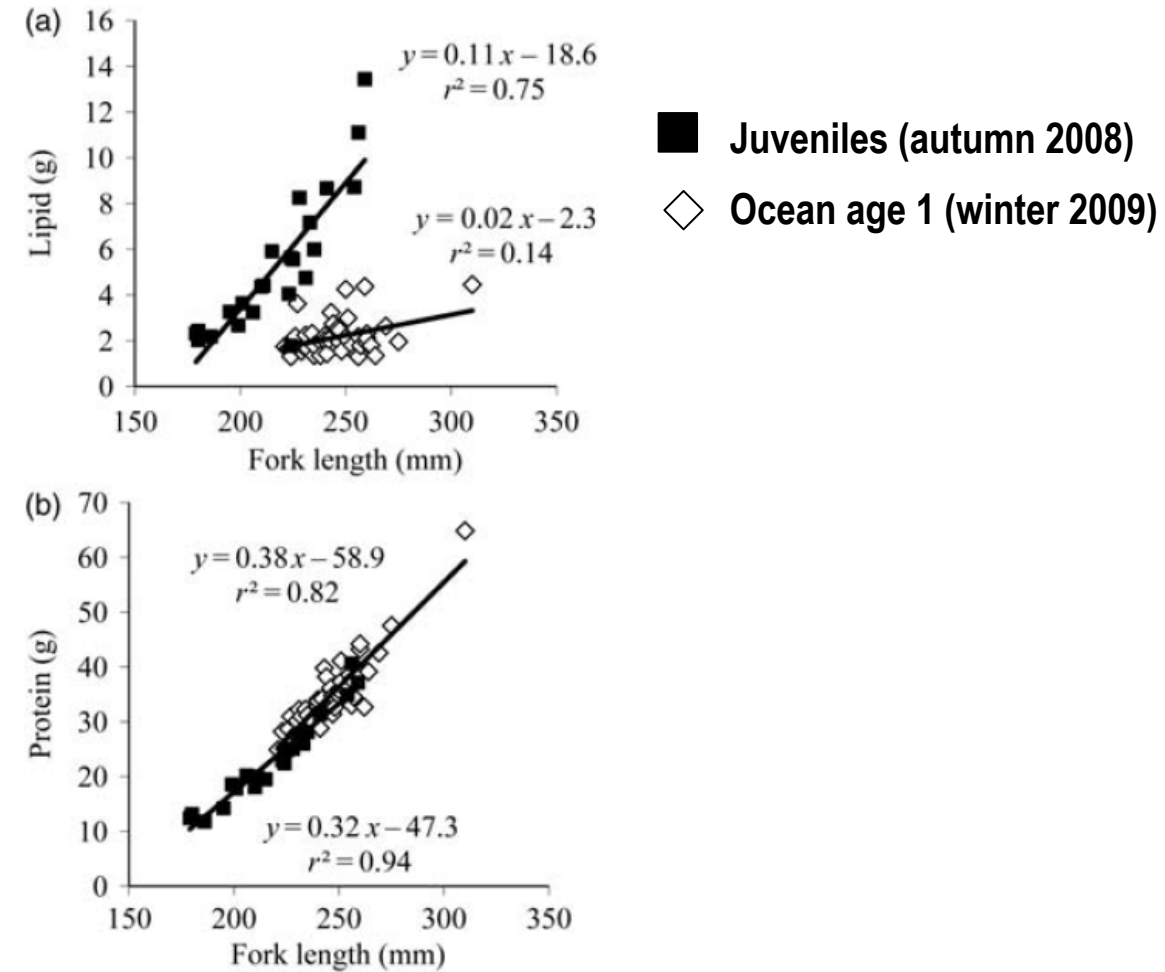
# Lipid and protein by age class: Sockeye



# Lipid and protein by age class: Sockeye

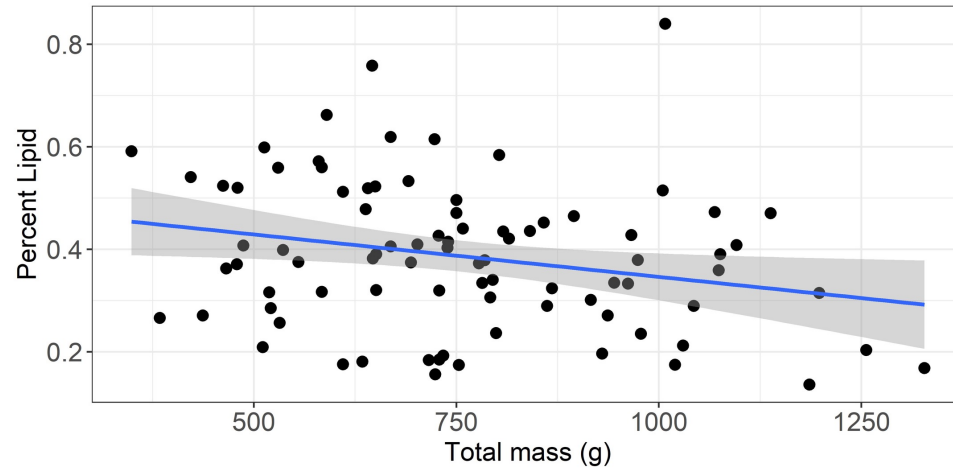


Farley et al. (2011) – EBS sockeye

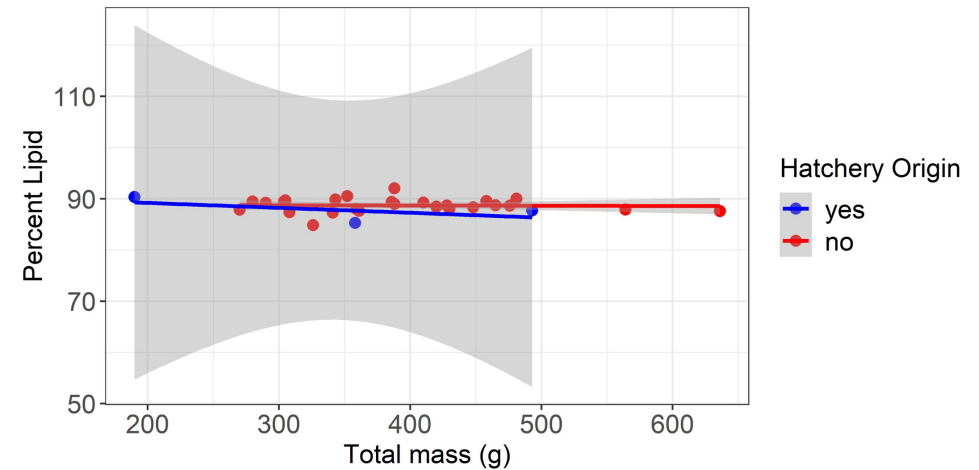
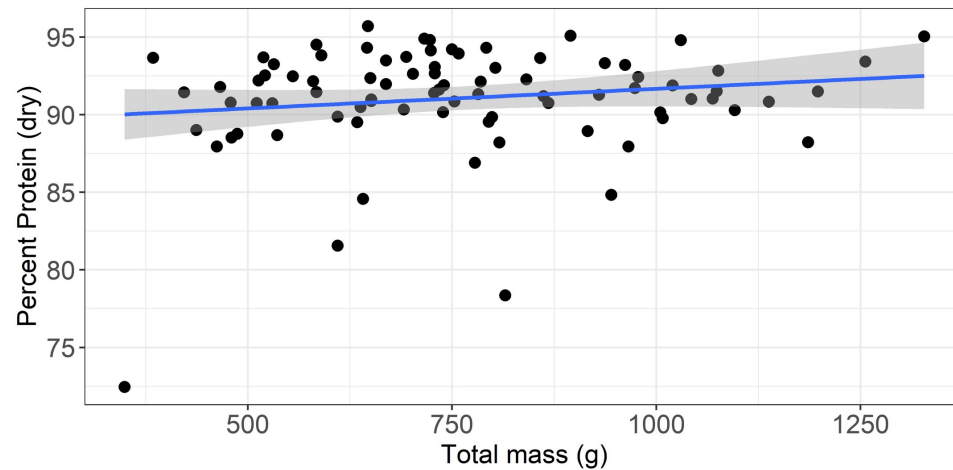
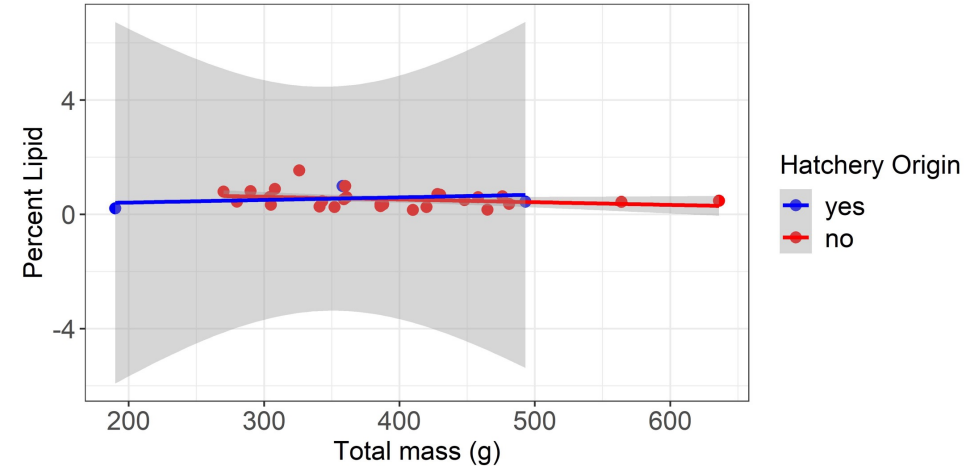


# Lipid and protein: Coho and pinks

## Coho



## Pink



# Summary

- Energy densities may reflect baseline winter conditions; need more years
- Juvenile: Age 1 comparisons suggest fish have depleted energy stores
- No energetic differences by country of origin or hatchery/wild origin
- Lipid and protein content indicate fish are “not starving” but needs further analysis



# Acknowledgements

**Expedition and Sample Collection:** Dick Beamish, NPAFC, entire crew and science team of the 2019 Winter IYS Expedition

## **Sample processing:**

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ADF&G - Megan Lovejoy, Joe Cashen, Jodi Neill

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