Spatiotemporal trends in stomach fullness reflect food availability and feeding behaviour in adult Chinook salmon (*Oncorhynchus tshawytscha*) in southern British Columbia

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Questions? Reach out!
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Background

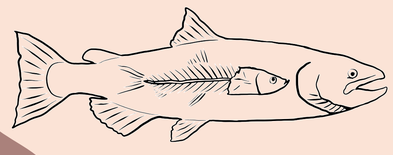
- Chinook salmon undergo long and energetically costly migrations
- The energy for migration is obtained through feeding in the ocean
- In British Columbia, spatial and temporal patterns in feeding are poorly understood

Question & Hypothesis

- How does the amount of food that adult Chinook salmon consume in the ocean vary through space and time?
- Hypothesis: stomach fullness will follow food availability

Methods

The Adult Salmon Diet Program



Program website:

4500+ Chinook salmon stomach samples…



250+ Recreational anglers…

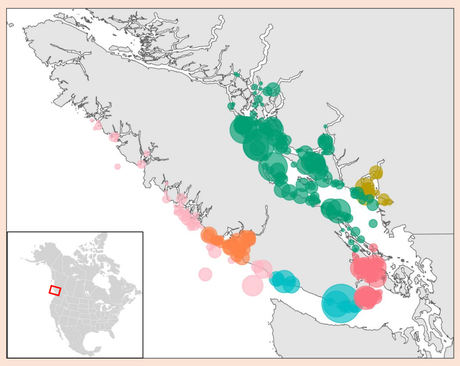




To investigate our questions, we use an index of stomach fullness:

$$\textit{Stomach Fullness} = \frac{Mass\ of\ prey\ (g)}{(Salmon\ fork\ length\ (cm))^3}$$

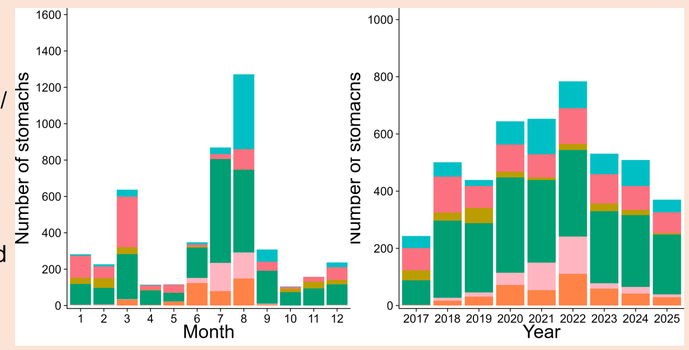
Across southern BC



Region: JDF; S Gulf Islands/ Haro Strait; Howe Sound; SoG; WCVI; Barkley Sound

Sample size: 10, 50, 100, 200

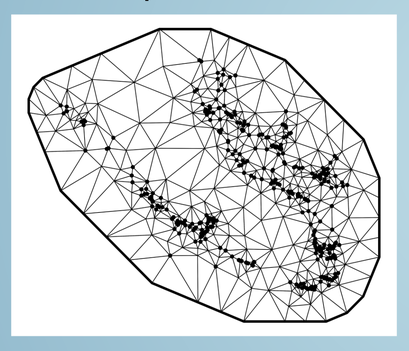
In all seasons… 2017-2025



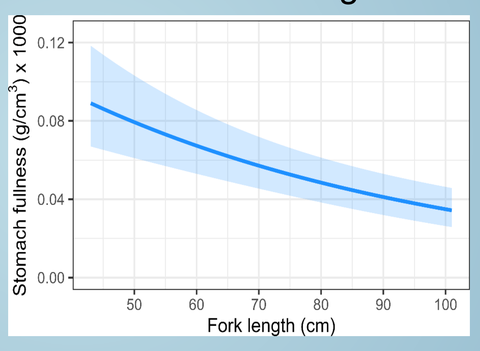
Modeling Framework

sdmTMB

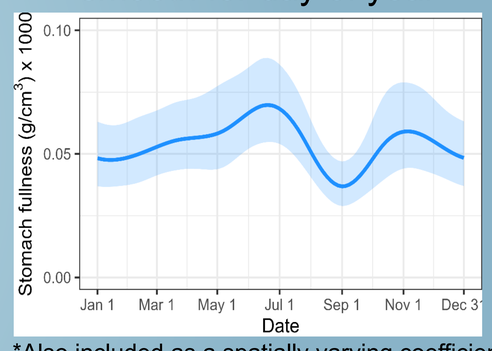
Random effect: spatial field



Fixed effect: salmon fork length



Fixed effect: cubic cyclic smooth for day of year*

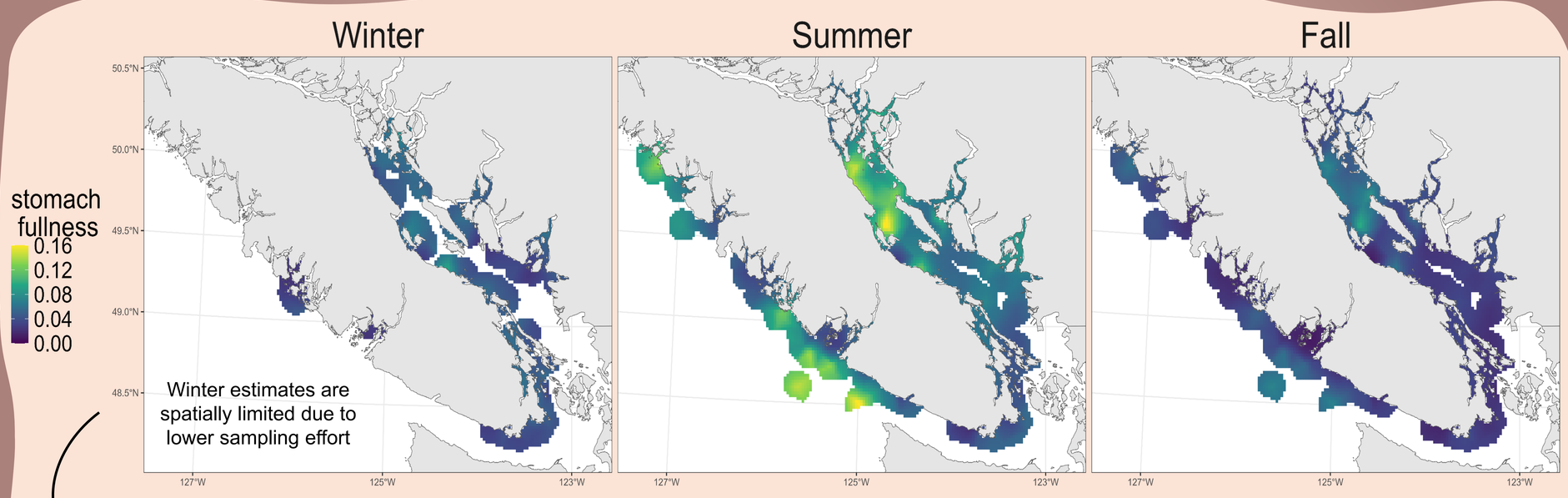


*Also included as a spatially varying coefficient

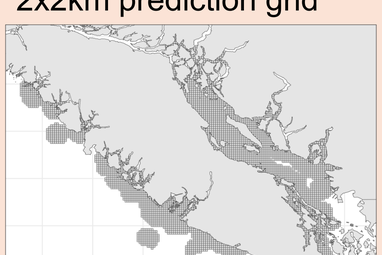
Why use Spatiotemporal Models?

Account for spatial and temporal unevenness in sampling
- Community science
- Fishery closures

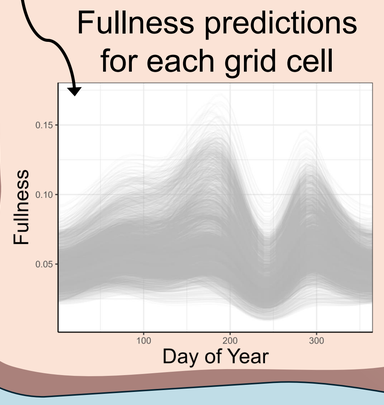
Results

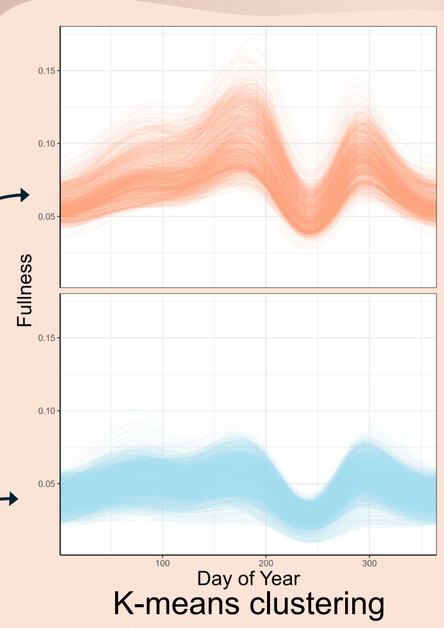


2x2km prediction grid

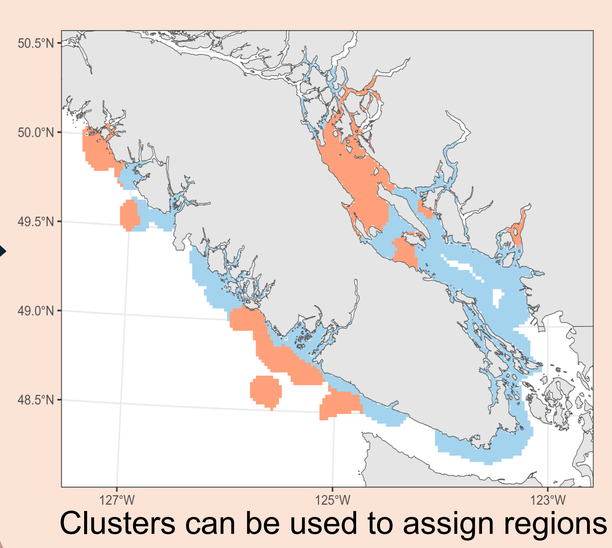


Fullness predictions for each grid cell





K-means clustering of fullness curves



Clusters can be used to assign regions

Conclusions

Seasonal fullness trends
- Food availability: high in summer, low in winter
- Feeding behaviour: migratory salmon are not feeding

Spatial fullness trends
- Food availability: high fullness is often associated with the presence of adult herring
- Feeding behaviour: low fullness in migratory corridors

Future Directions

Spatiotemporal models
- Annual time steps
- Investigate interannual variation

Prey species models
- Models to understand when and where different prey types are most important
- Focus on pacific herring