Spatial and Interannual Variability in Growth and Body Composition Over Winter in YOY Pacific Herring from Prince William Sound

Fletcher Sewall
Ron Heintz
Johanna Vollenweider
Auke Bay Laboratories
Alaska Fisheries Science Center
NMFS, NOAA
Juneau, AK
fletcher.sewall@noaa.gov

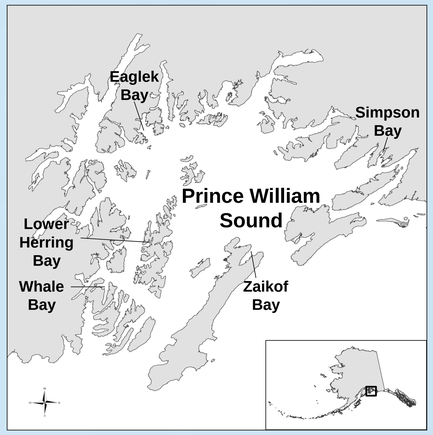
Objective

Determine how well fall growth rates and body composition indicate overwinter survival of YOY Pacific herring.

Background

- **Overwinter survival during the first year of life is vital in determining year-class strength.**
- **Winter survival of YOY (young-of-the-year) depends on their energy stores. During fall provisioning fast growing Individuals may be able to allocate more energy to storage.**
- **This study is part of the larger Prince William Sound (PWS) Herring Survey.**

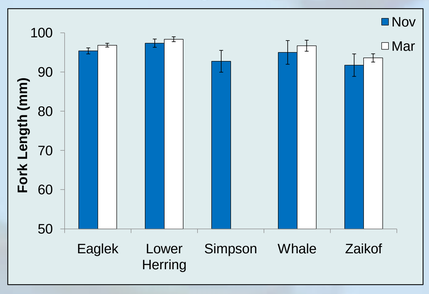
Methods

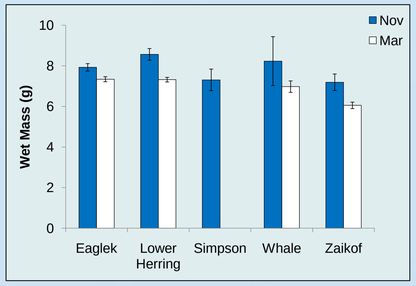


- **YOY herring collected from multiple bays in PWS in fall and subsequent spring over 2 winters: (Nov '09 & March '10; Nov '10 & March '11).**
- **100 – 200 fish from each period analyzed for growth and energy allocation:**
  - **i) Growth: estimated by nucleic acid ratio (RNA/DNA) content in muscle. (RNA/DNA > 4 indicates positive growth)**
  - **ii) Energy allocation: whole body lipid, protein and moisture content.**

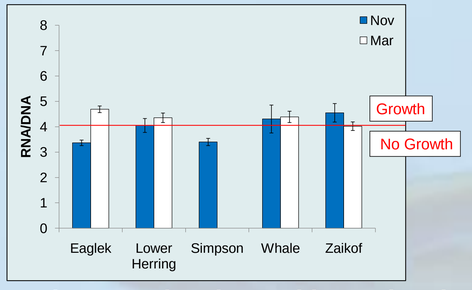
Findings

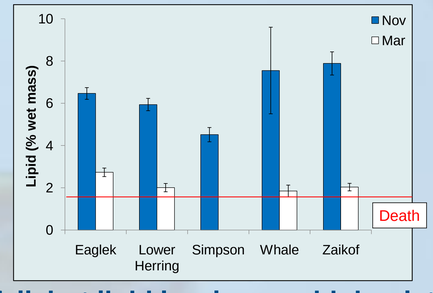
WINTER 1: 2009 - 2010





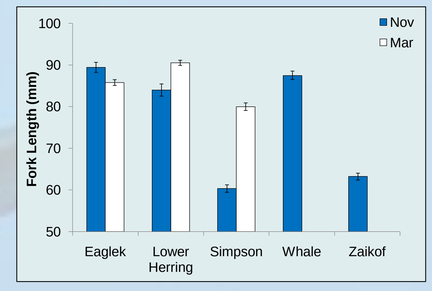
Conditions in summer 2009 led to increased size in fall relative to 2010. Loss of mass over winter coupled with increased lengths suggests size dependent mortality.

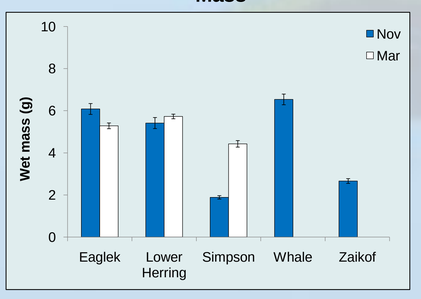




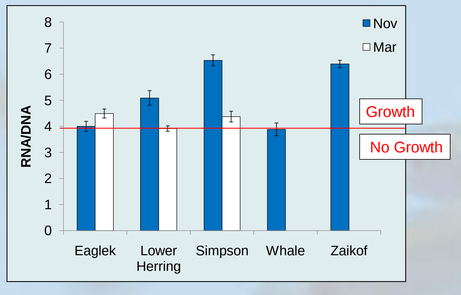
Protein accretion (growth) was low in fall, but lipid levels were high relative to 2010. Loss of lipid over winter is consistent with size dependent mortality.

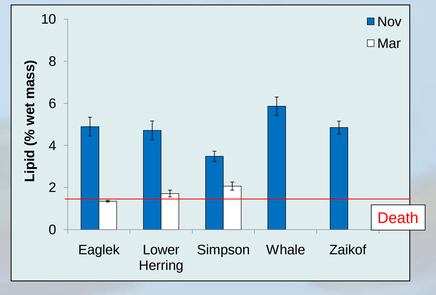
WINTER 2: 2010 – 2011





Fish were smaller than in 2009. Decreased length and weight for Eaglek suggests winter mortality was not size dependent.





The pattern of high growth and low lipid in 2010 compared with 2009 suggests the smaller fish in 2010 employed a different energy allocation strategy.

Conclusions

Size in fall dictates energy allocation strategy with small YOY favoring protein accretion (growth) over lipid storage.

YOY condition is highly variable between bays thus bays do not uniformly contribute to recruitment. Maintenance of a variety of wintering habitats promotes herring recruitment.

Fish in the best initial condition lost the most energy over winter, suggesting fish initially in poor condition rely more on foraging to survive winter.

The recommendations and general content presented in this poster do not necessarily represent the views or official position of the Department of Commerce, the National Oceanic and Atmospheric Administration, or the National Marine Fisheries Service.

Acknowledgements: Funding provided by the EVOS Trustee Council (Project #10100132-D). We thank the Prince William Sound Science Center, Scott Pegau, Michele Buckhorn, Robert Bradshaw, Sarah Christiansen, Andrew Eller, Lia Heifetz, John Moran, Bonita Nelson, Ann Robertson, Lawrence Schaufler, and Ashwin Sreenivasan for assistance with this project.