

Seasonal Trends in Growth and Stored Energy for Juvenile Pacific Herring in Prince William Sound

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Objective

Describe seasonal trends in growth and body composition of YOY (young-of-the-year) herring in Prince William Sound (PWS).

Background

- Herring year-class strength can be strongly influenced by YOY winter survival.
- Seasonal timing of changes in growth and lipid storage is important for modeling winter mortality, and provides context for fish condition data from field sampling.
- This study is part of the PWS Herring Research & Monitoring effort.

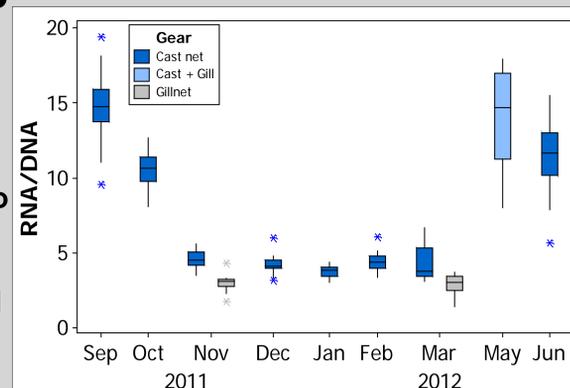


Photo: J. Vollenweider

Findings

Growth

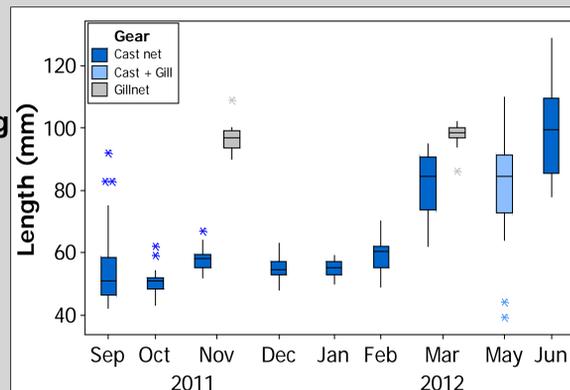
- RNA/DNA declined ~72% from September to November, remained near survival ratio (no growth) through March.



RNA/DNA content for YOY herring in Simpson Bay, September 2011 – June 2012.

Mortality Patterns

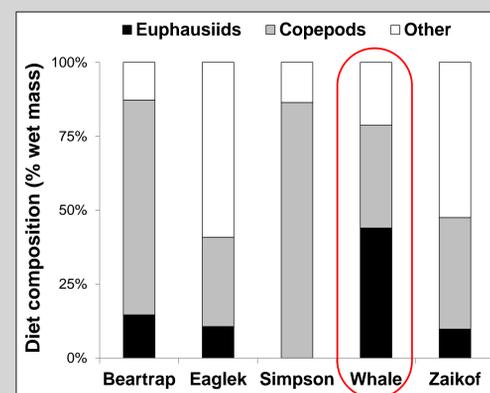
- Small herring were rare by March, large herring persisted, suggesting size-dependent winter mortality.



Length of YOY herring in Simpson Bay, September 2011 – June 2012.

Links to Diet

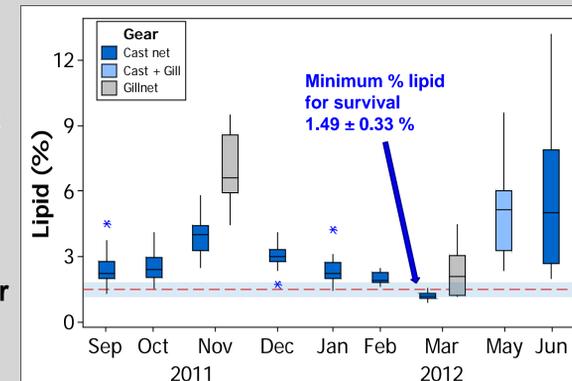
- YOY herring that ate diets high in energy-dense euphausiids (Whale Bay) had above-average growth and lipid stores.



Diet composition of YOY herring by bay in PWS, November 2011.

Lipid Storage

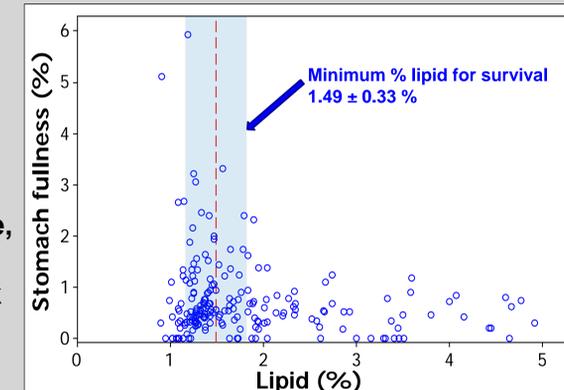
- Lipid content peaked in November, declined through March. Larger herring (gillnet) had more lipid.



Lipid content for YOY herring in Simpson Bay, September 2011 – June 2012.

Mortality Causes

- Herring with <2% lipid in March were foraging more, increasing predation risk to avoid starvation.

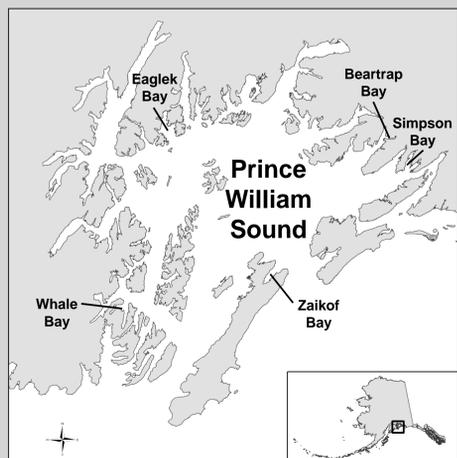


Stomach fullness vs. lipid for YOY herring in PWS, March 2010 – 2012.

Methods

- YOY herring collected monthly by cast net and gillnet from Simpson Bay in PWS, September 2011 – June 2012., and from multiple bays in November and March of 3 years, November 2009 – March 2012.
- 20 fish from each monthly Simpson Bay collection, and ~100 fish from broader fall and spring collections analyzed for:

- Growth: estimated by nucleic acid ratio (RNA/DNA) content in muscle;
- Energy allocation: whole body lipid content.



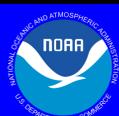
Conclusions

'Winter' for YOY herring starts in November when growth stops and fat stores are highest, and lasts through March.

Small YOY herring incur higher predation risk to forage in late winter as they deplete their energy stores.

As a result, few small herring survive through March.

When local habitat conditions support high quality zooplankton prey, this can promote higher herring winter survival.



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.

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