Science, Service, Stewardship

Climate related changes in the nutritional condition of young-of-the-year pollock (*Theragra chalcogramma*) from the eastern Bering Sea

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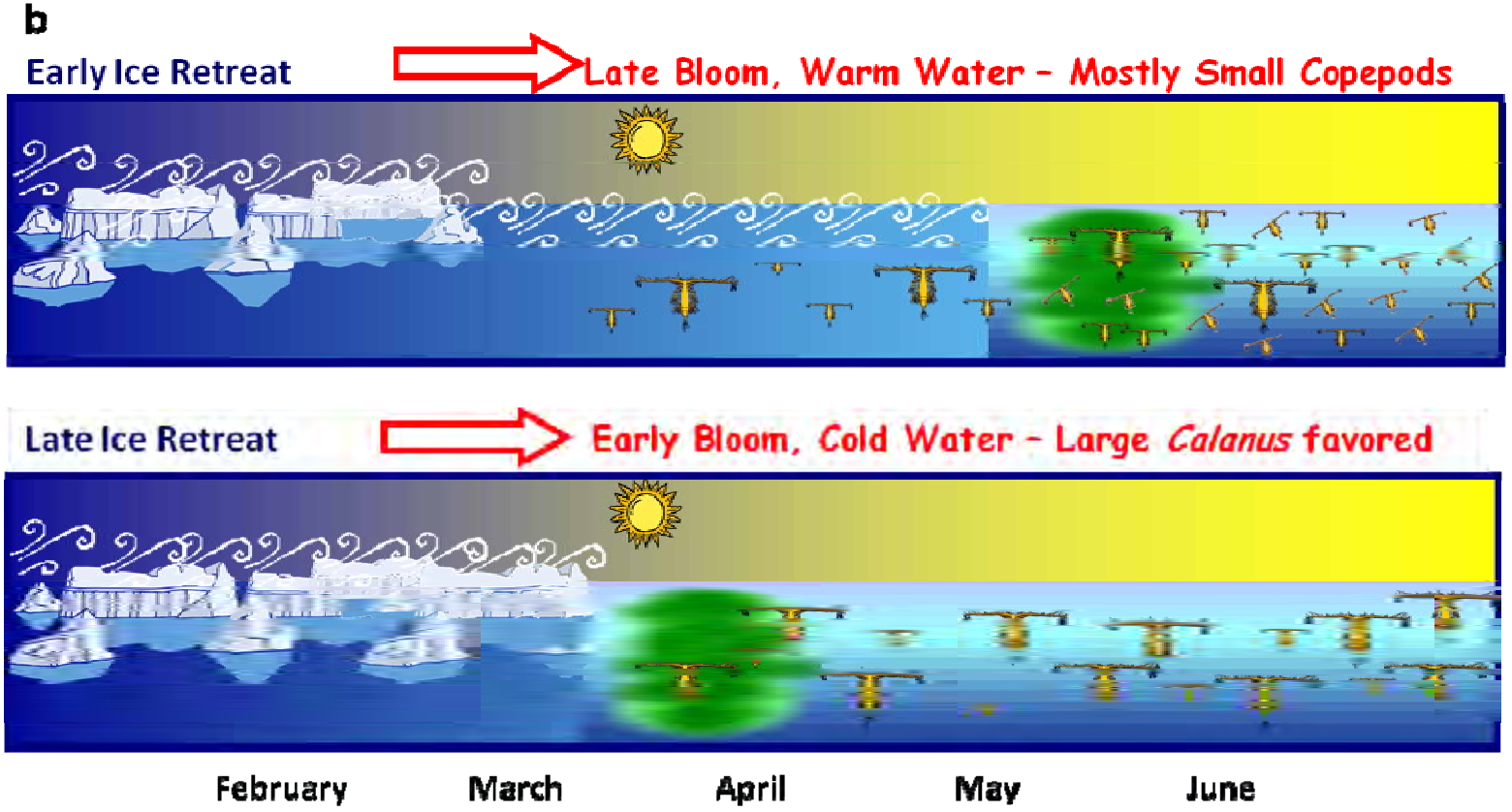
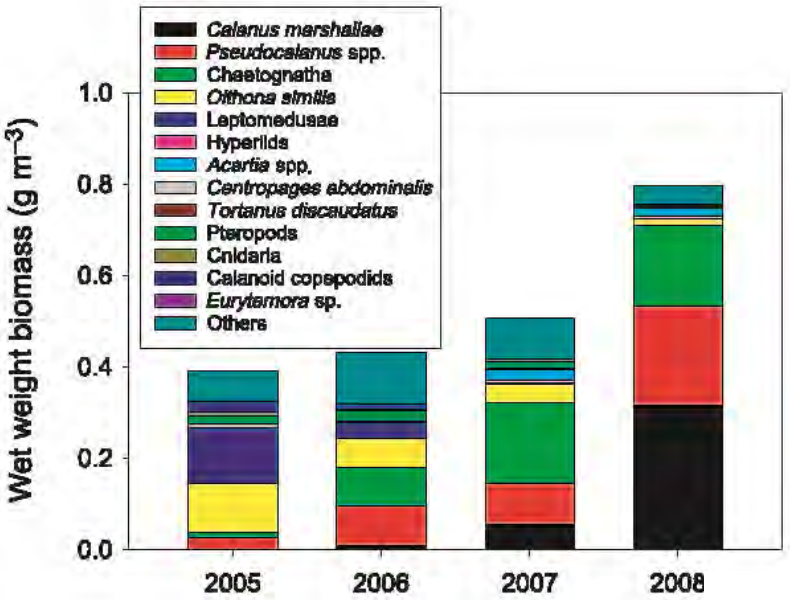
NOAA FISHERIES SERVICE

Revised Oscillating Control Hypothesis Relies on Changes in Availability of Prey



Hunt et al. 2011

Zooplankton Biomass and Pollock Diets Have Changed



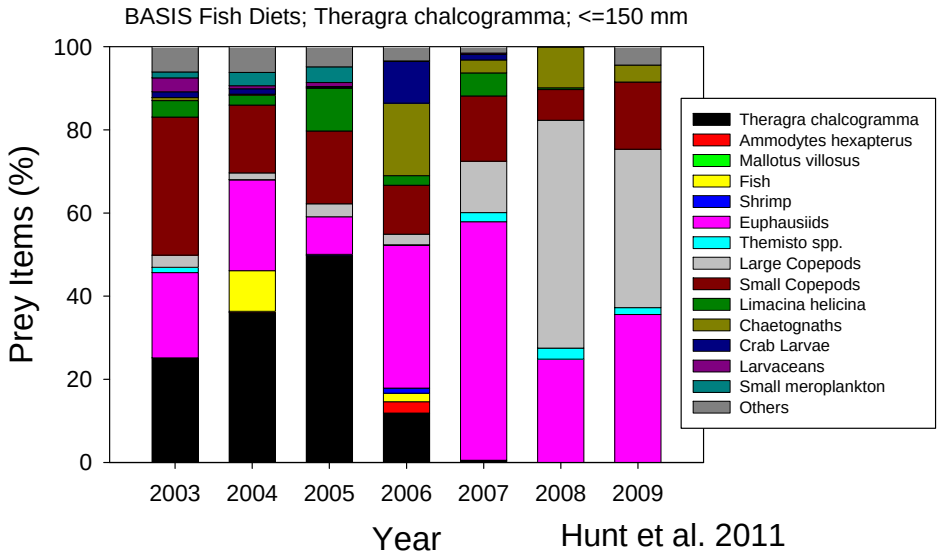
Middle Domain

Increased mass of C. marshallae

Also increases in euphausiids

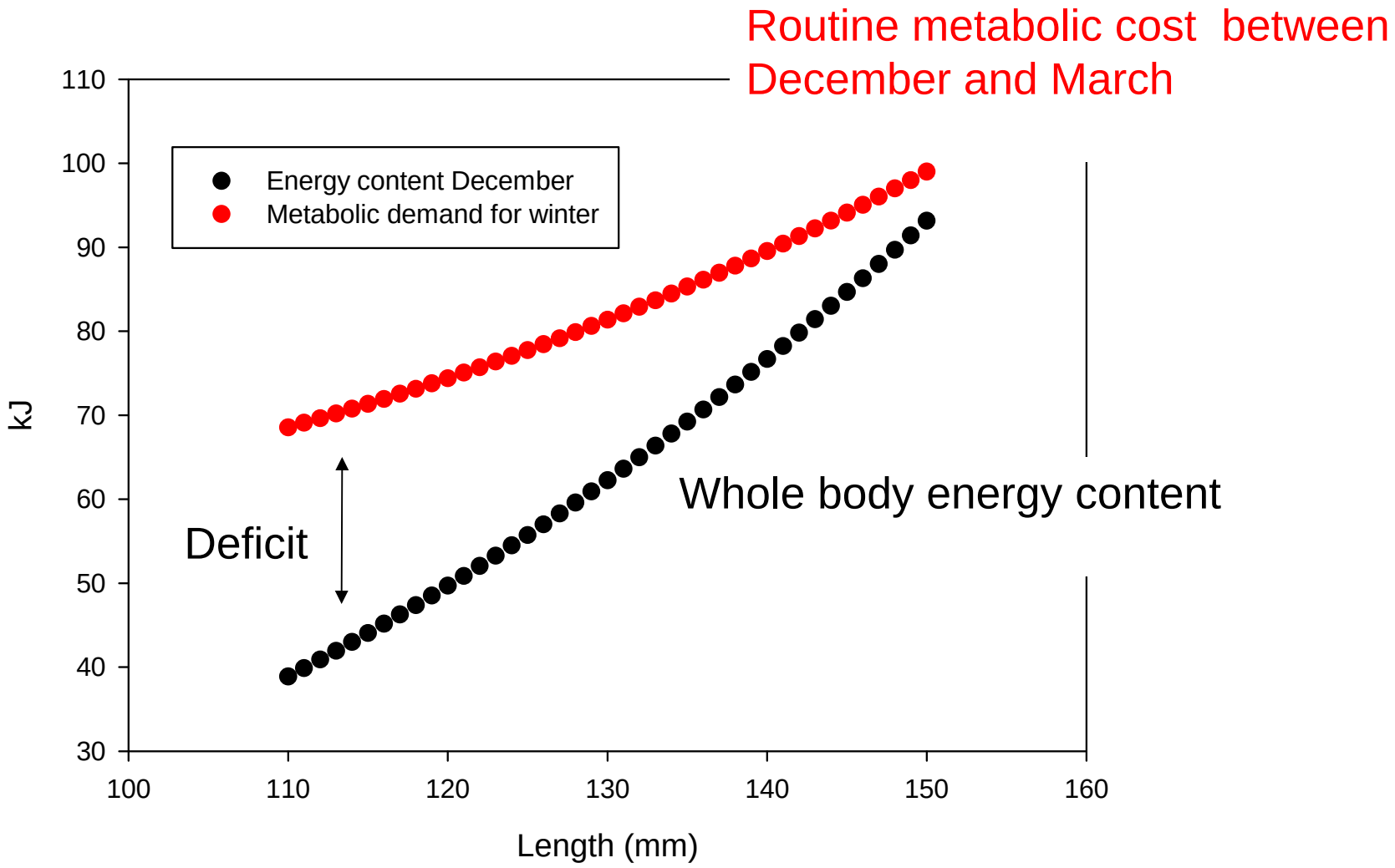
Coyle et al. 2010

Diets shifted from pollock, small copepods to Calanus euphausiids



Hunt et al. 2011

Winter Energy Deficits Force Foraging in YOY Pollock



Objective

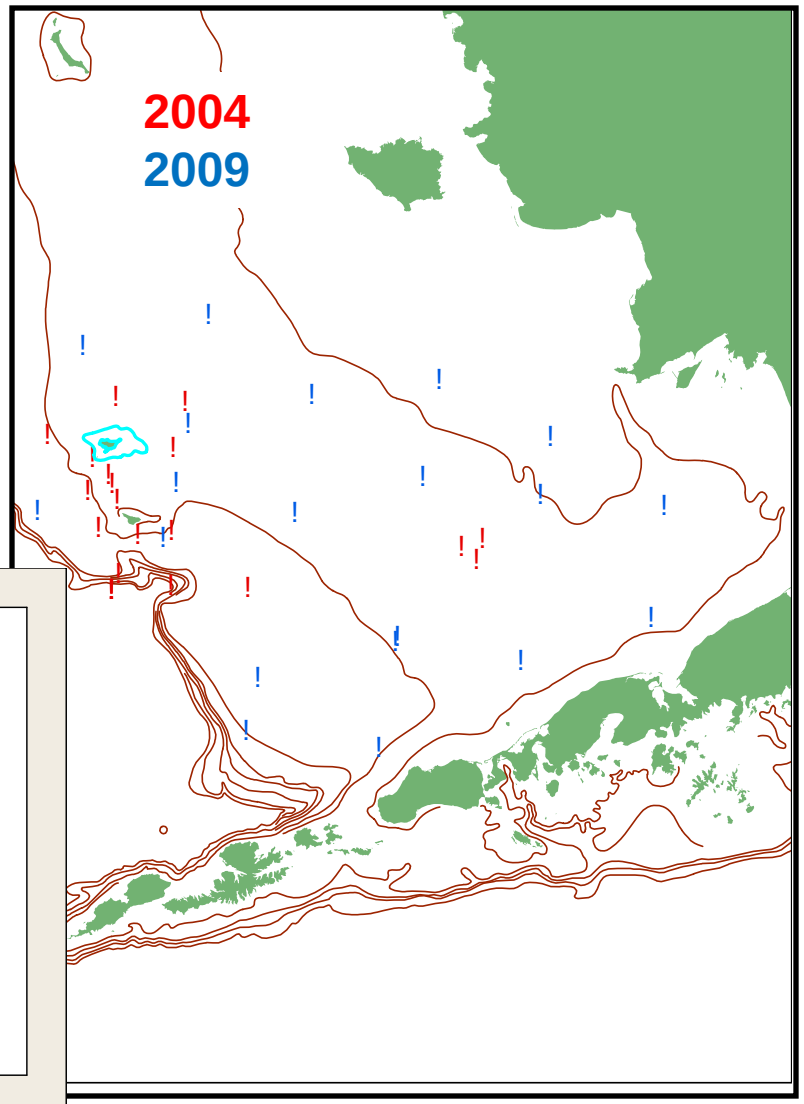
Determine influence of diet quality on pollock condition in warm and cold years

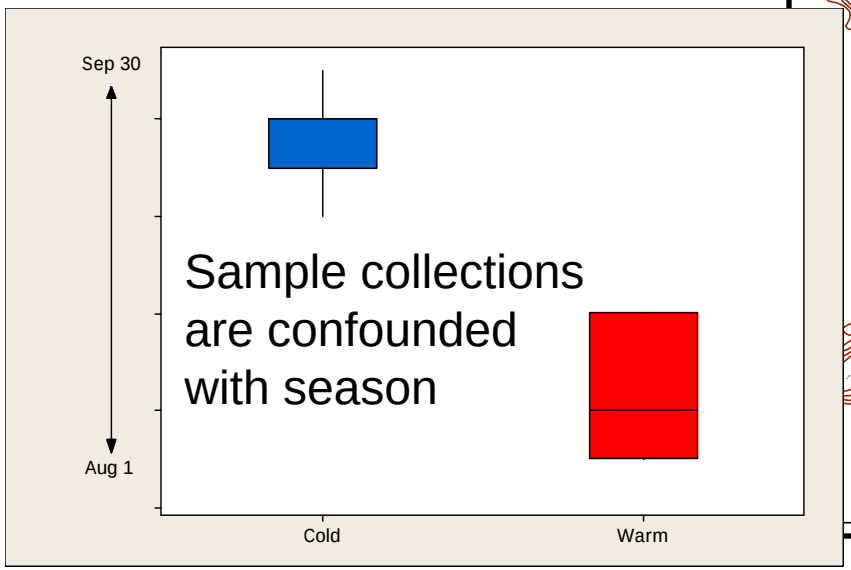
- **Reconstructed lipid content of diets from warm and cold years**
- **Compared lipid content of specific prey in warm and cold years**
- **Compared pollock condition in warm and cold years**

Zooplankton Sampling Sites

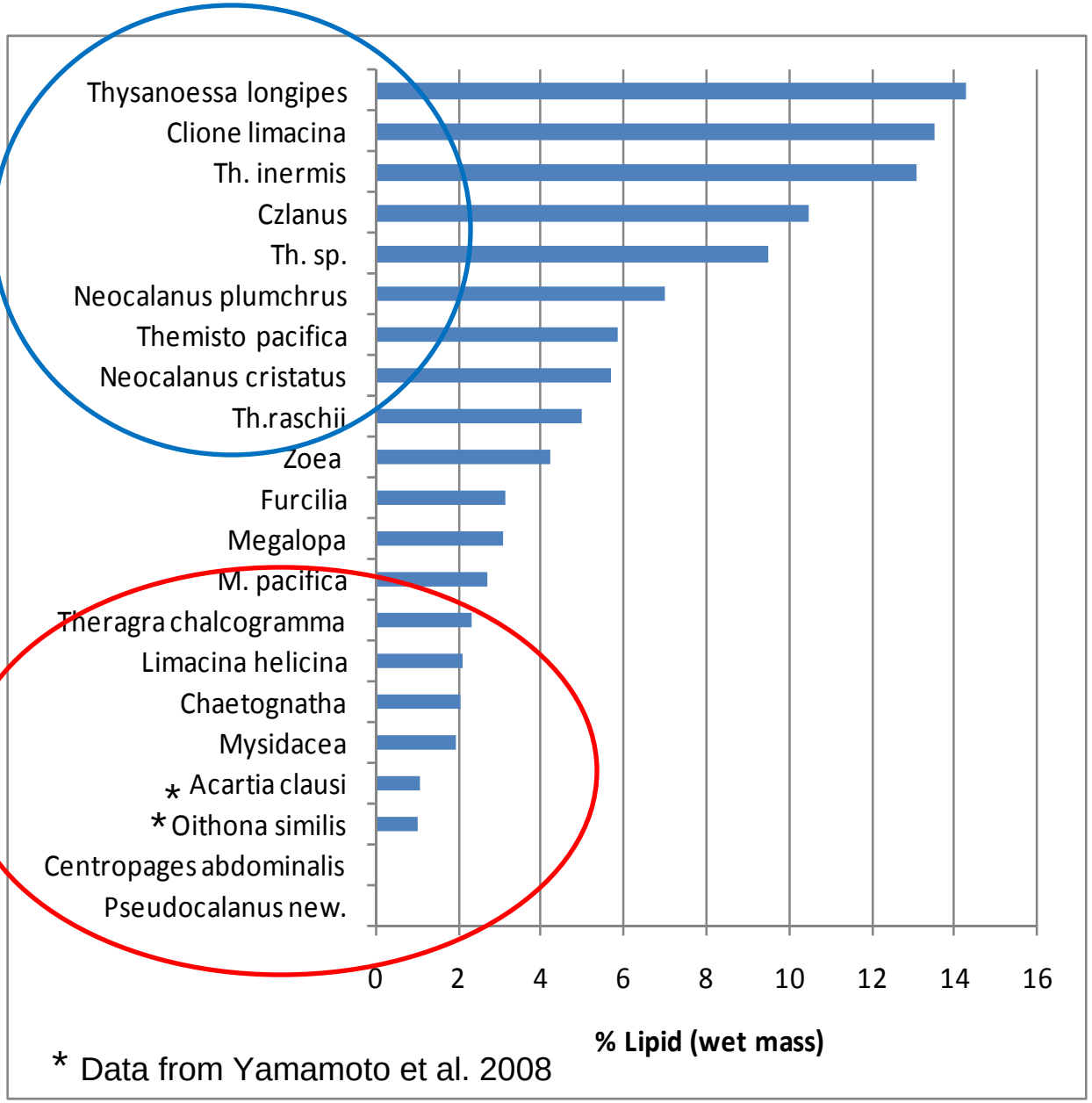
2004 – Warm Year
MOCNESS
505 mesh
Early – mid August

2009 – Cold Year
Bongo
335 mesh
Mid – late September





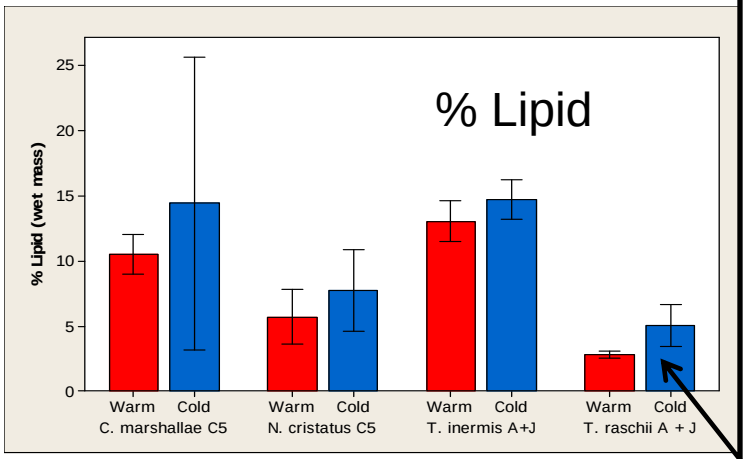
Cold – type Zooplankton Have High Lipid Levels

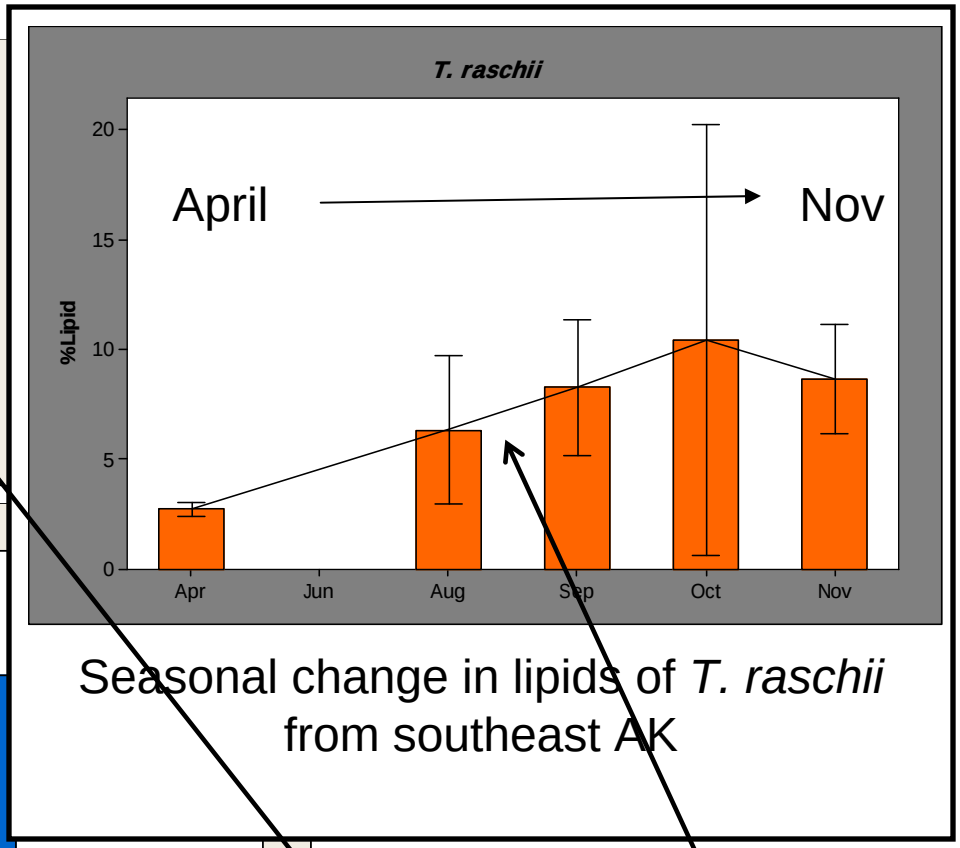


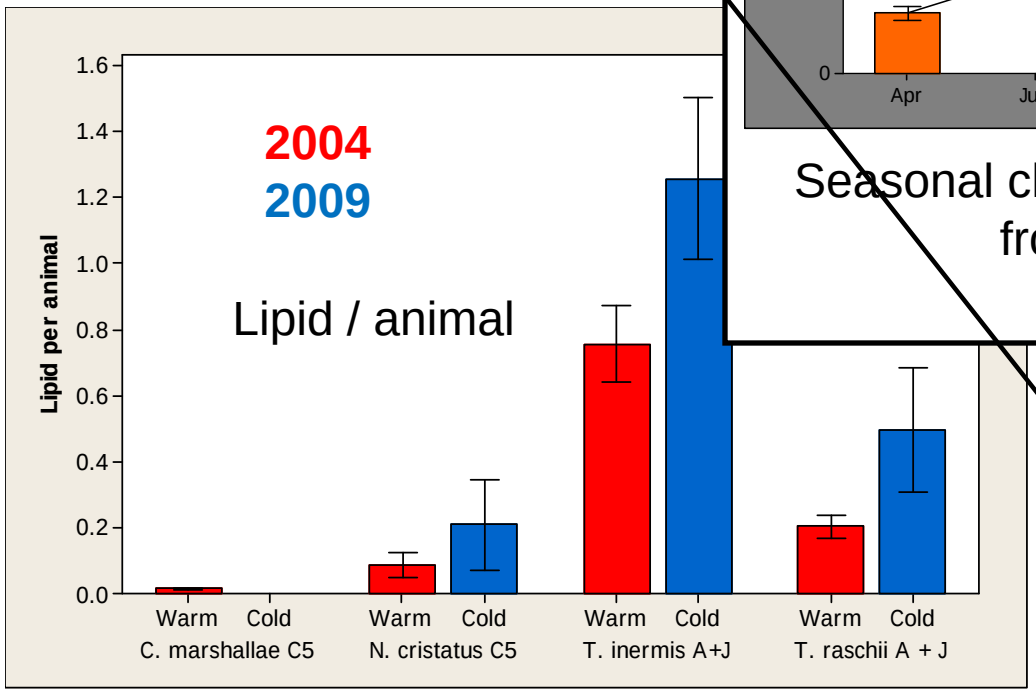
* Data from Yamamoto et al. 2008

Zooplankters were Bigger and Fatter in 2009

Climate or Seasonal Effect?



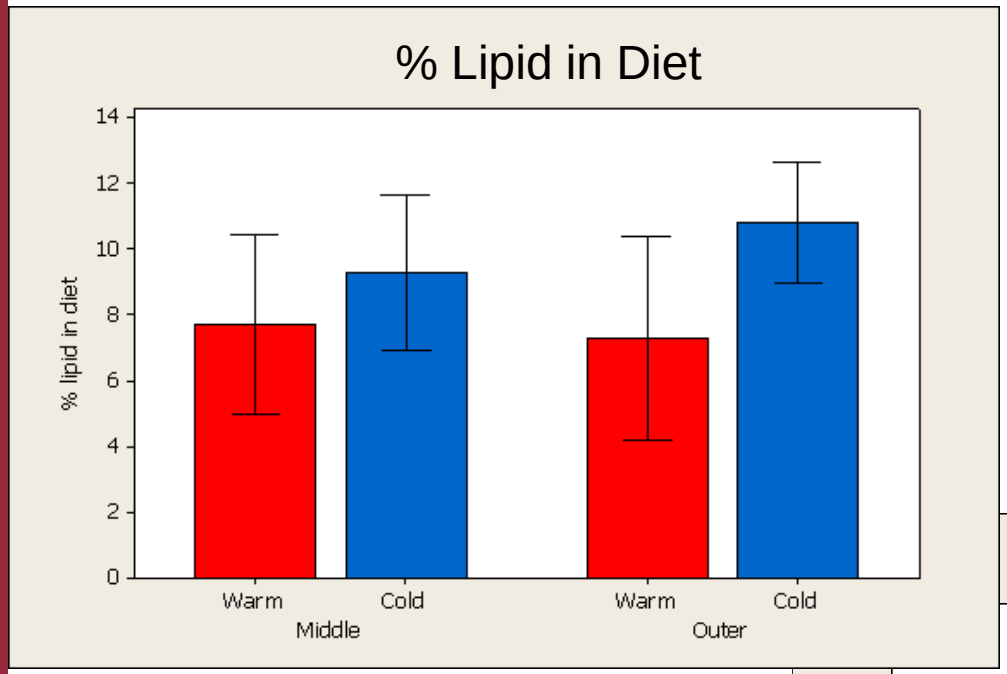




100% increase

30% increase

Pollock Consumed Fatter Diets in 2009 and Got Fatter

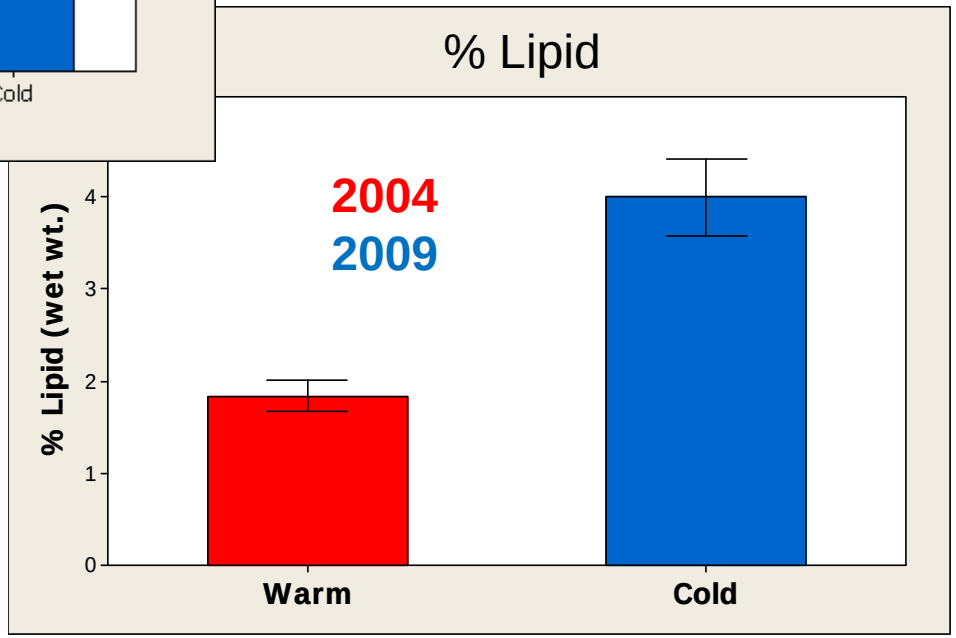


Reconstructed from BASIS survey data

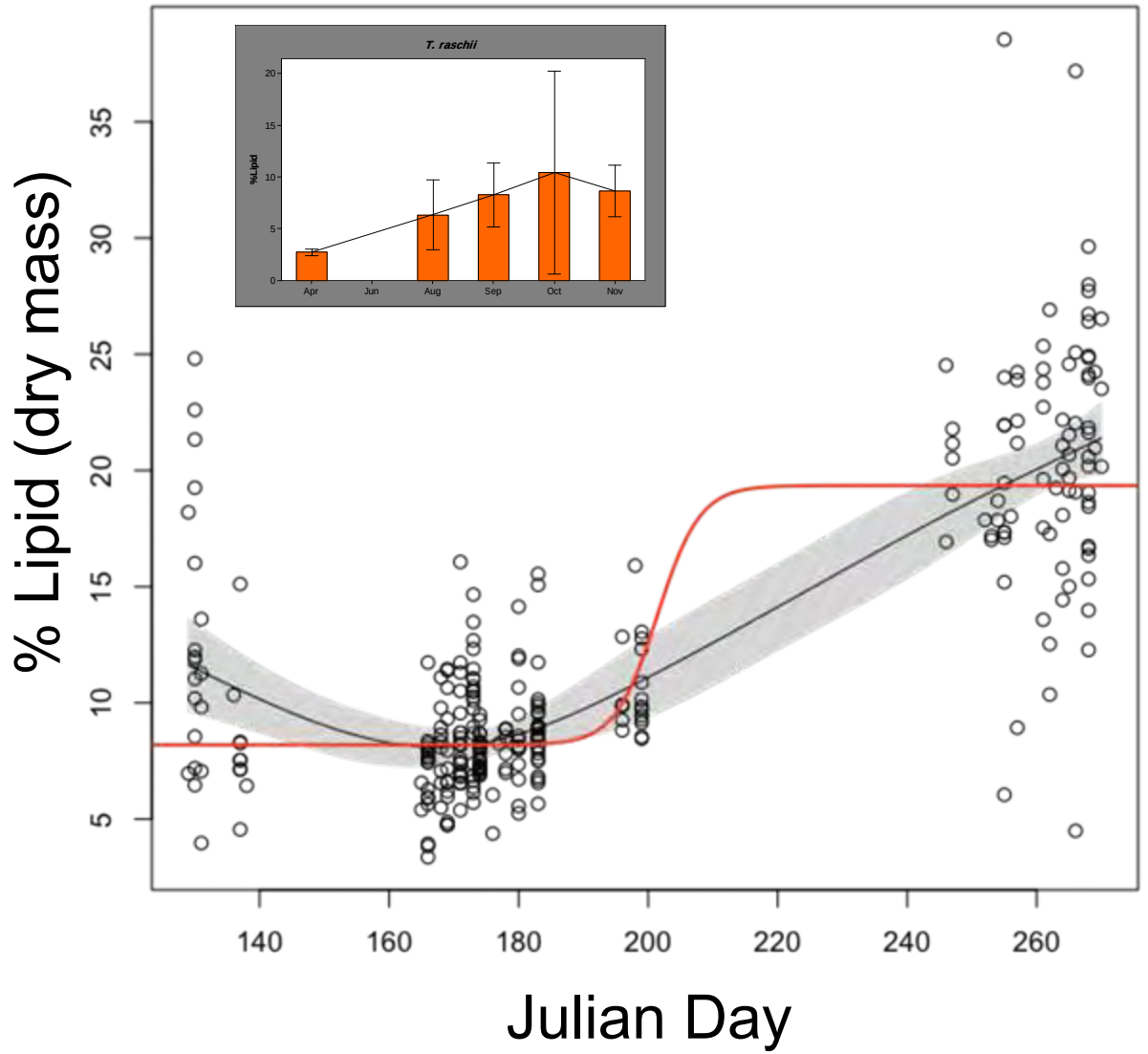
Used appropriate warm/cold data

90% of mass accounted for

How much is seasonal ?

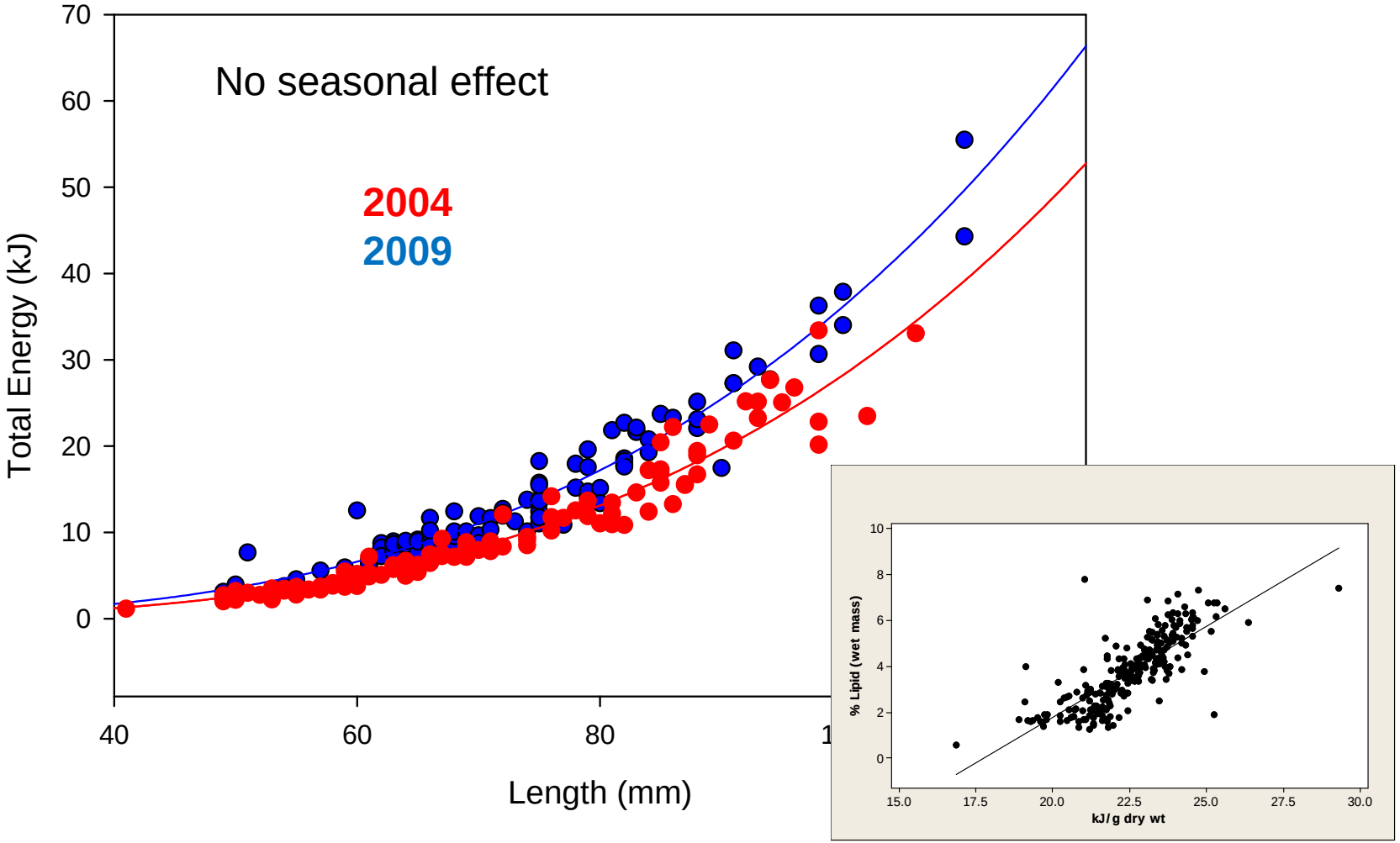


Seasonal Shifts in Lipid Content of YOY Pollock Mirror Those of Prey



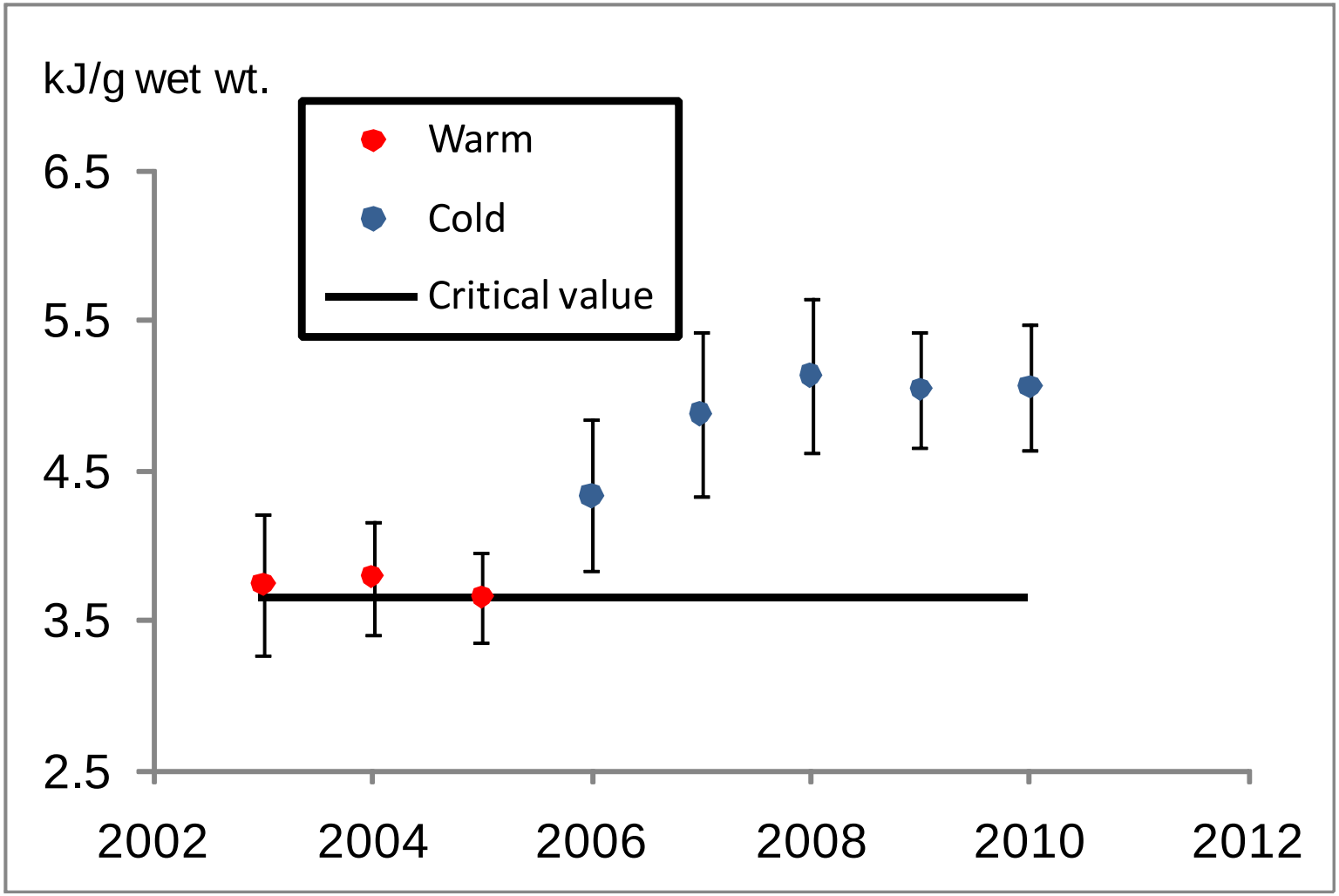
In Fall Lipid is Allometrically Related to Length

The consequence of lipid rich diet was higher fat content

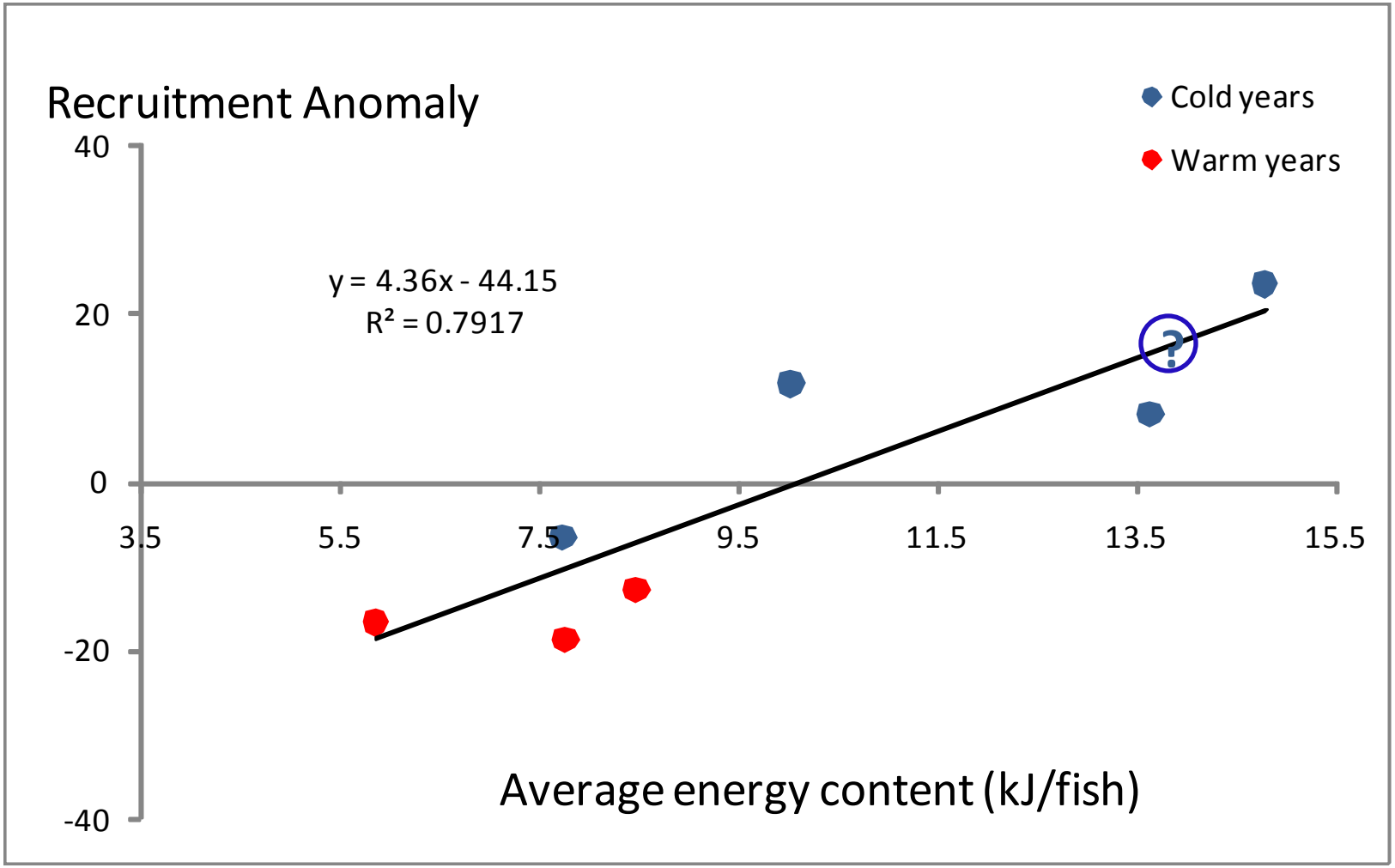


YOY pollock start winter with low energy reserves in warm years

Energy content of Bering Sea Pollock in September



YOY Whole Body Energy Content Relates to Recruitment as Age-1



Summary

- Cold year zooplankton assemblage is characterized by high lipid content
- There may be a climate effect on the lipid content of particular zooplankton species
- Period of high lipid content in zooplankton occurs when pollock allocate mass to lipid
- Climate effects amplify the influence of prey quality on pollock condition and subsequent recruitment