The Gulf of Alaska ecosystem: lower trophic level trends and dynamics

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NOAA FISHERIES

EcoFOCI

Ecosystems & Fisheries-Oceanography Coordinated Investigations

Outline

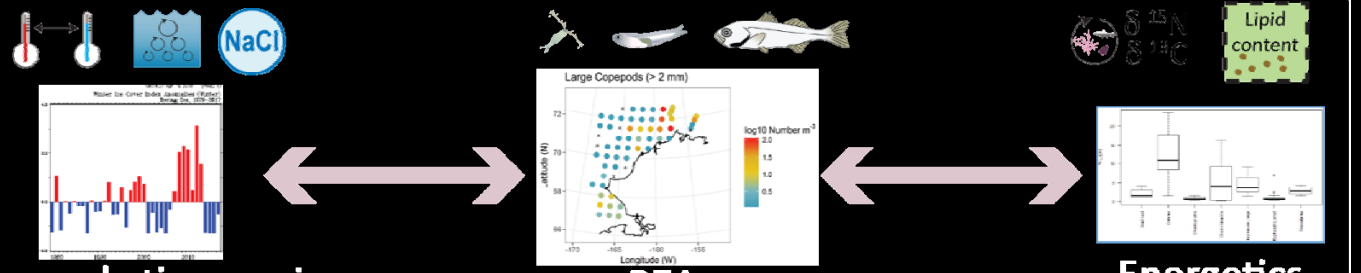
- Who we are – The Recruitment Processes Alliance (RPA)
- Where we work in the Gulf of Alaska
- A lower trophic level overview of the Gulf of Alaska ecosystem
  - General oceanography
  - Phytoplankton and primary productivity
  - Zooplankton
  - Forage Fish
- The "Blob" and Pacific cod – an ecosystem story

Recruitment Processes Alliance

COLLECTION

In situ Data | Survey Data | Laboratory Data

ANALYSIS

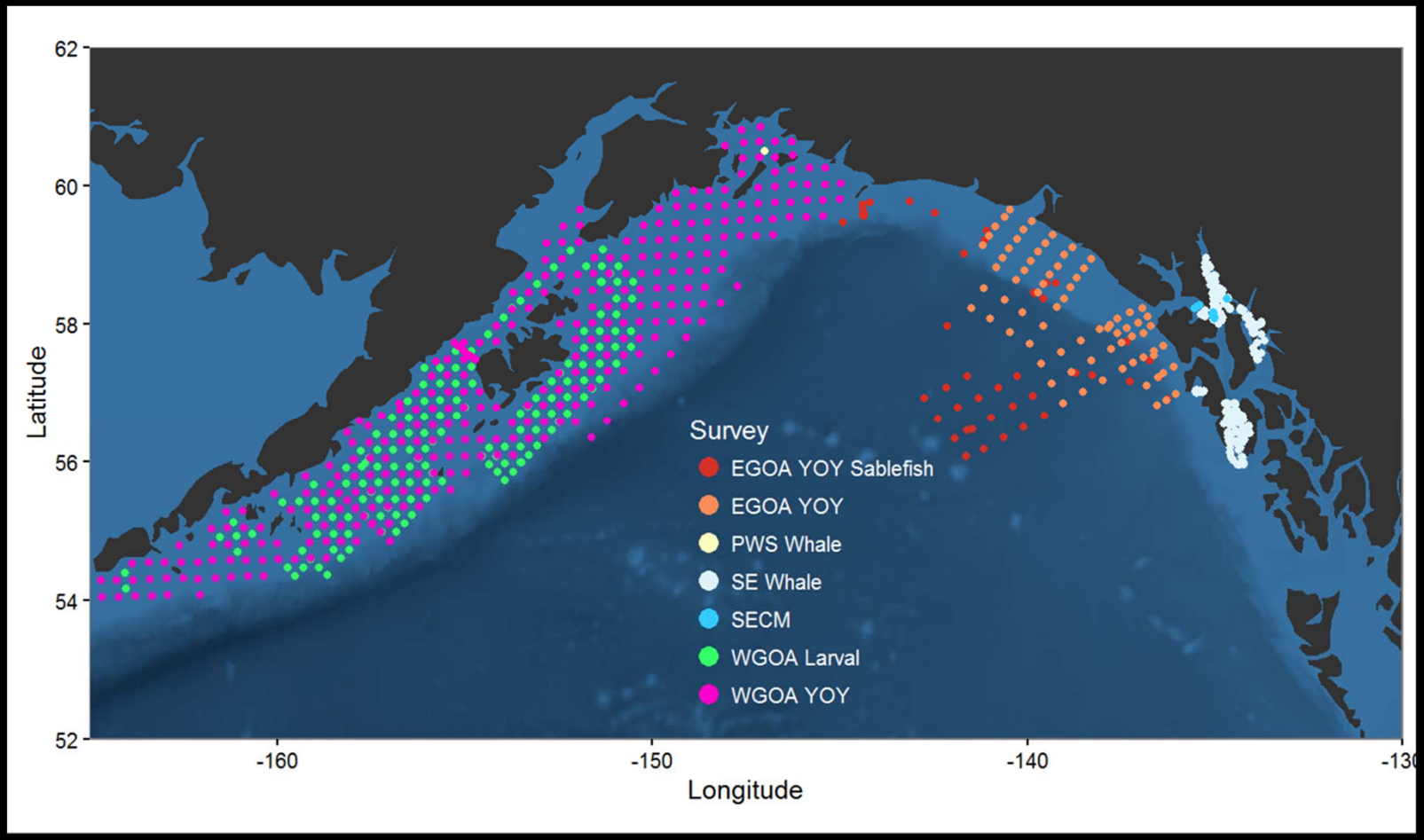


Anomaly time-series | RZA | Energetics

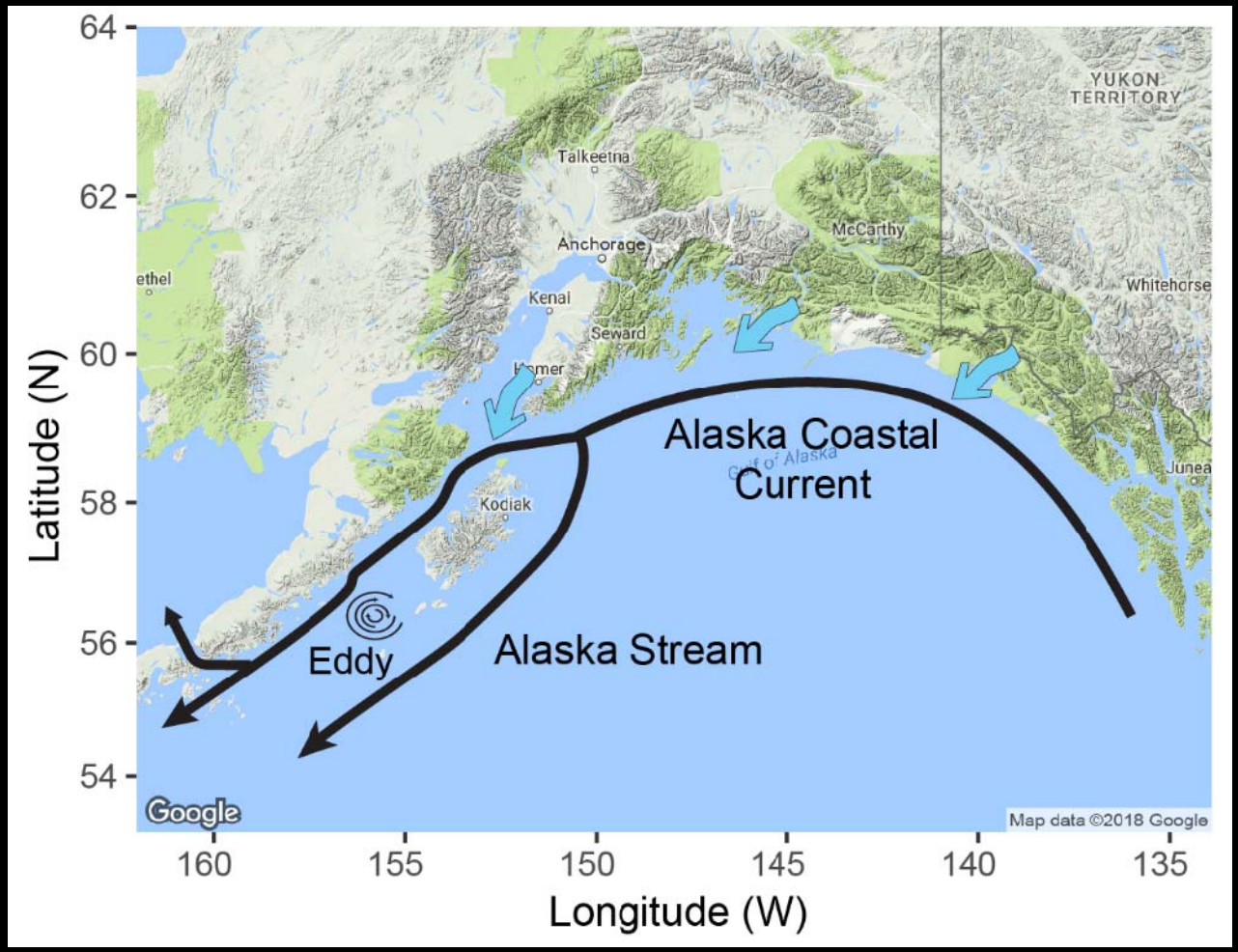
ECOSYSTEM PERSPECTIVE

Ecosystem Considerations | EBFM Process

GOA Ecosystem Surveys

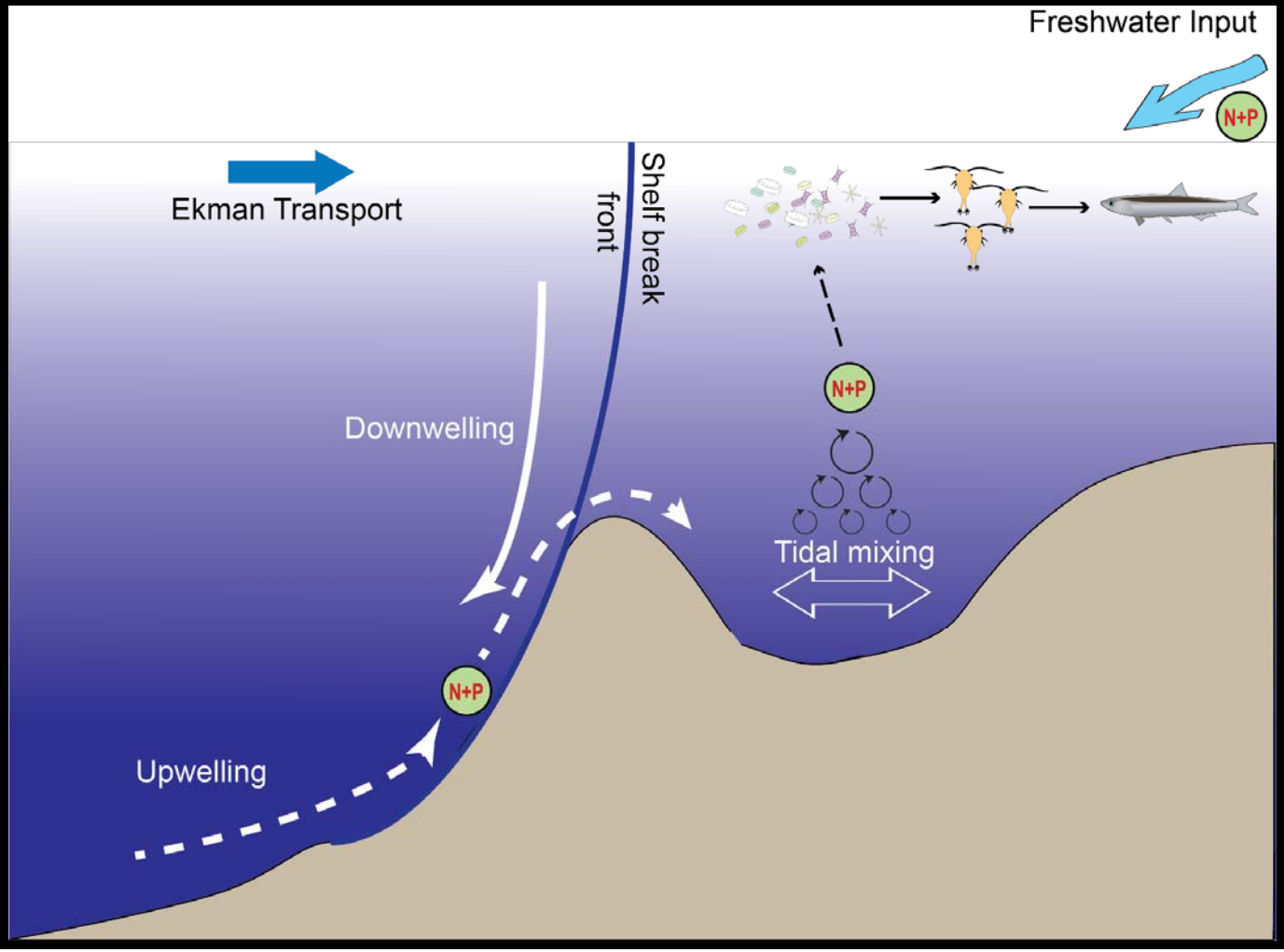


Oceanography - circulation

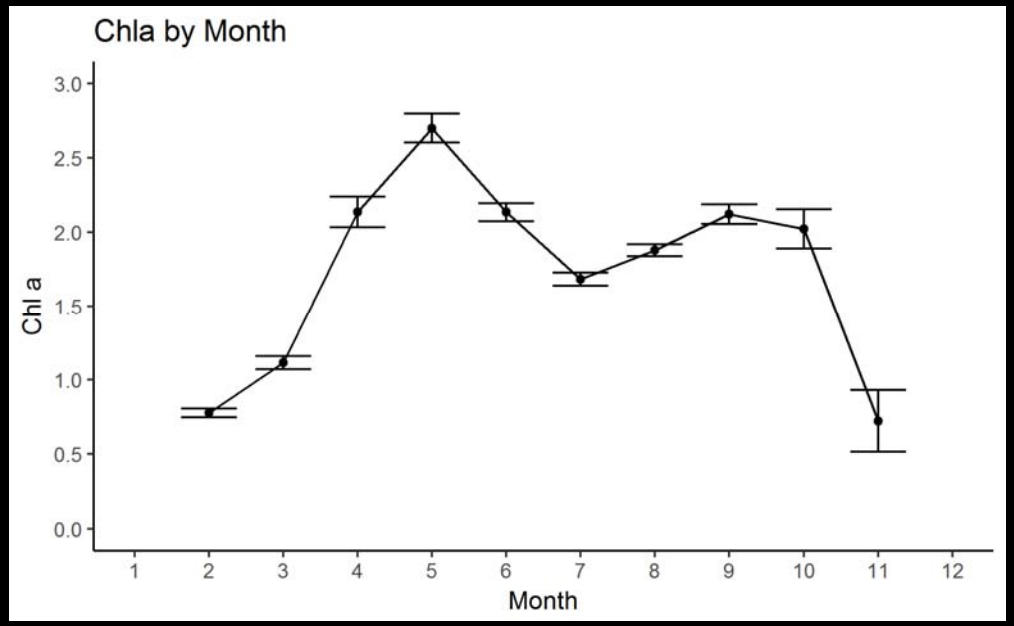


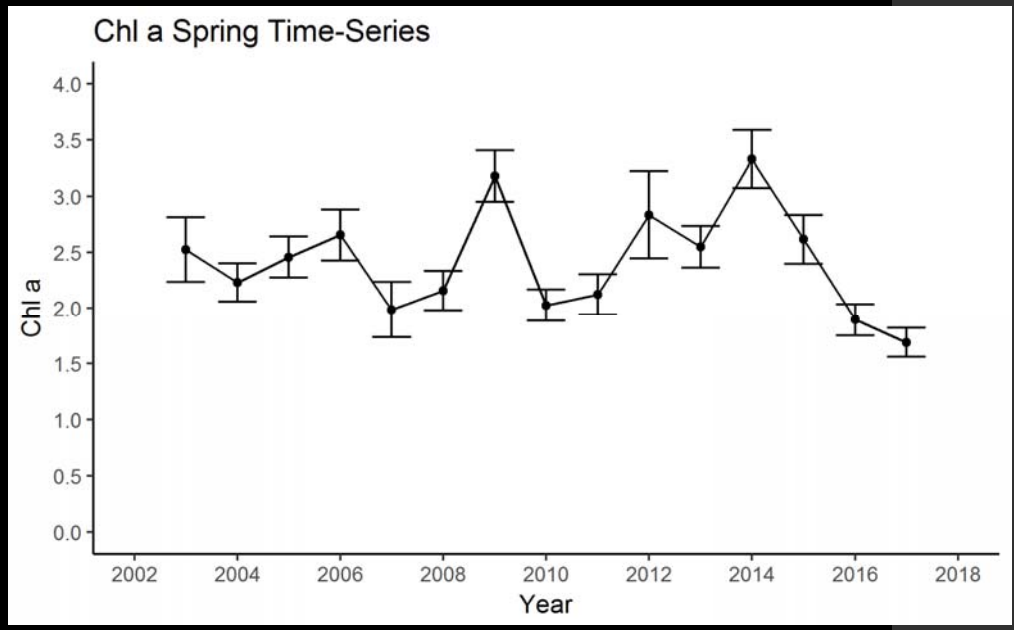
Stabeno et al. 2004. *CSR. 24*: 859-897

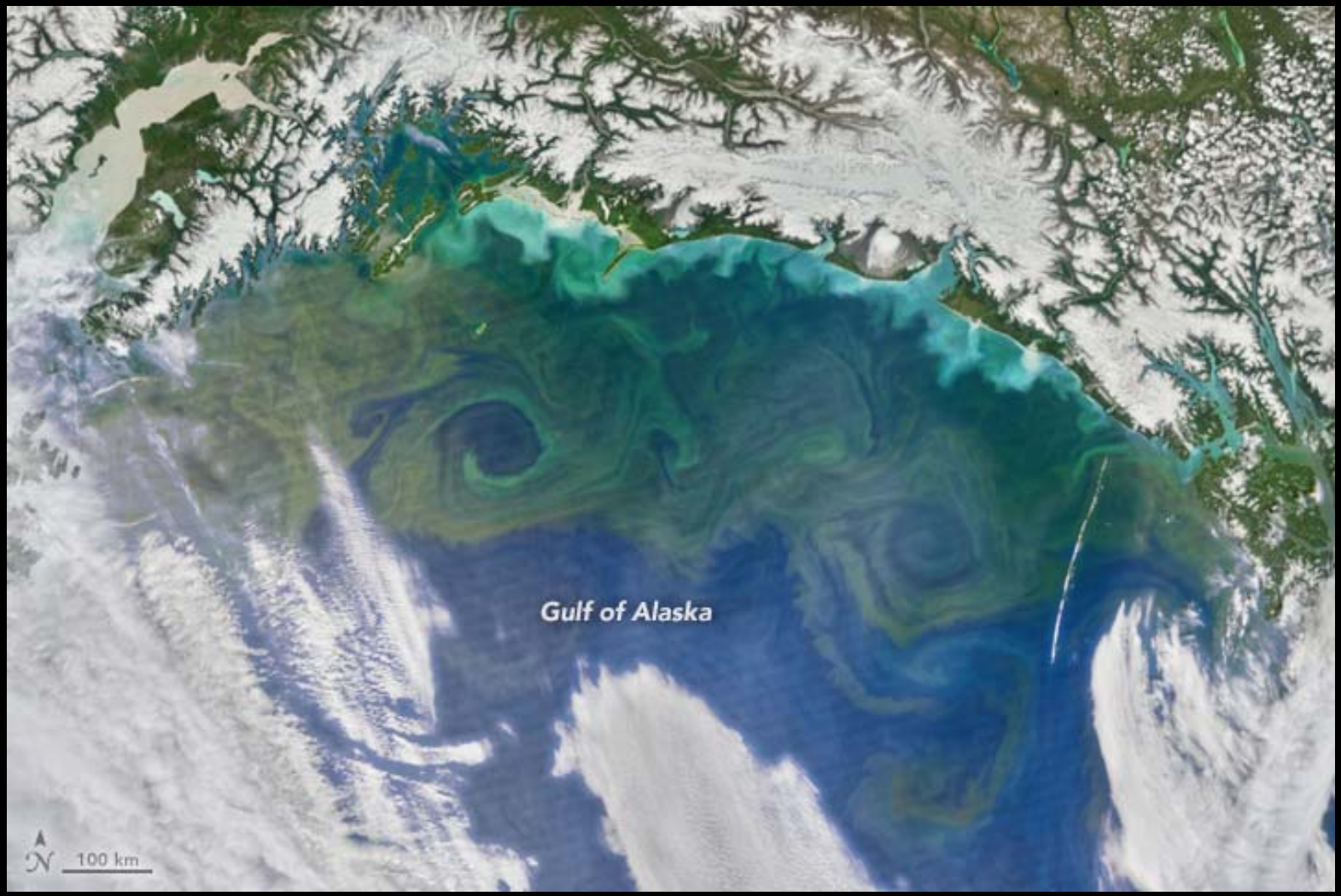
Oceanography - dynamics



Phytoplankton biomass

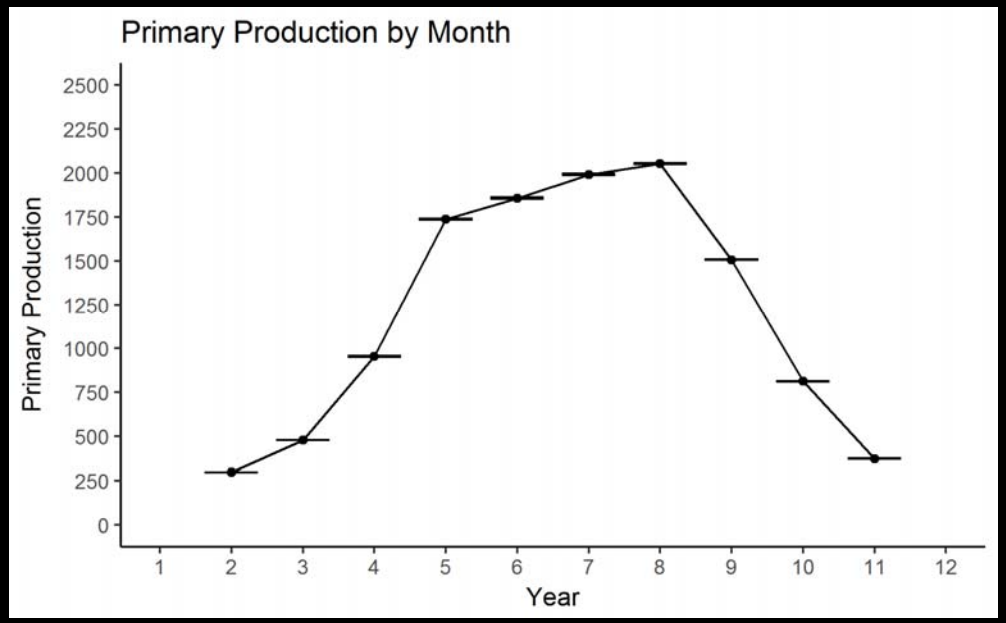


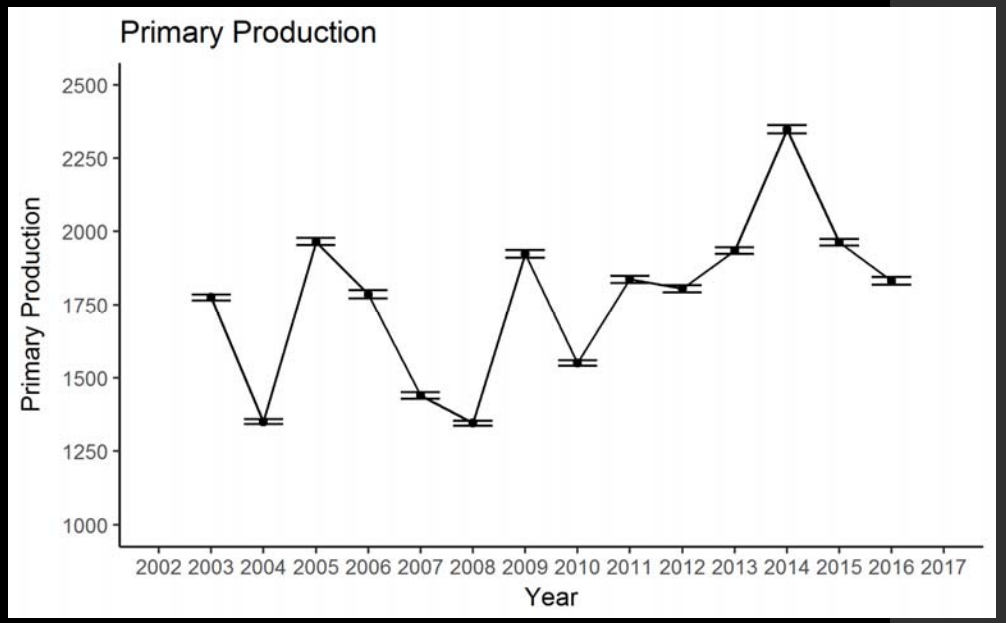




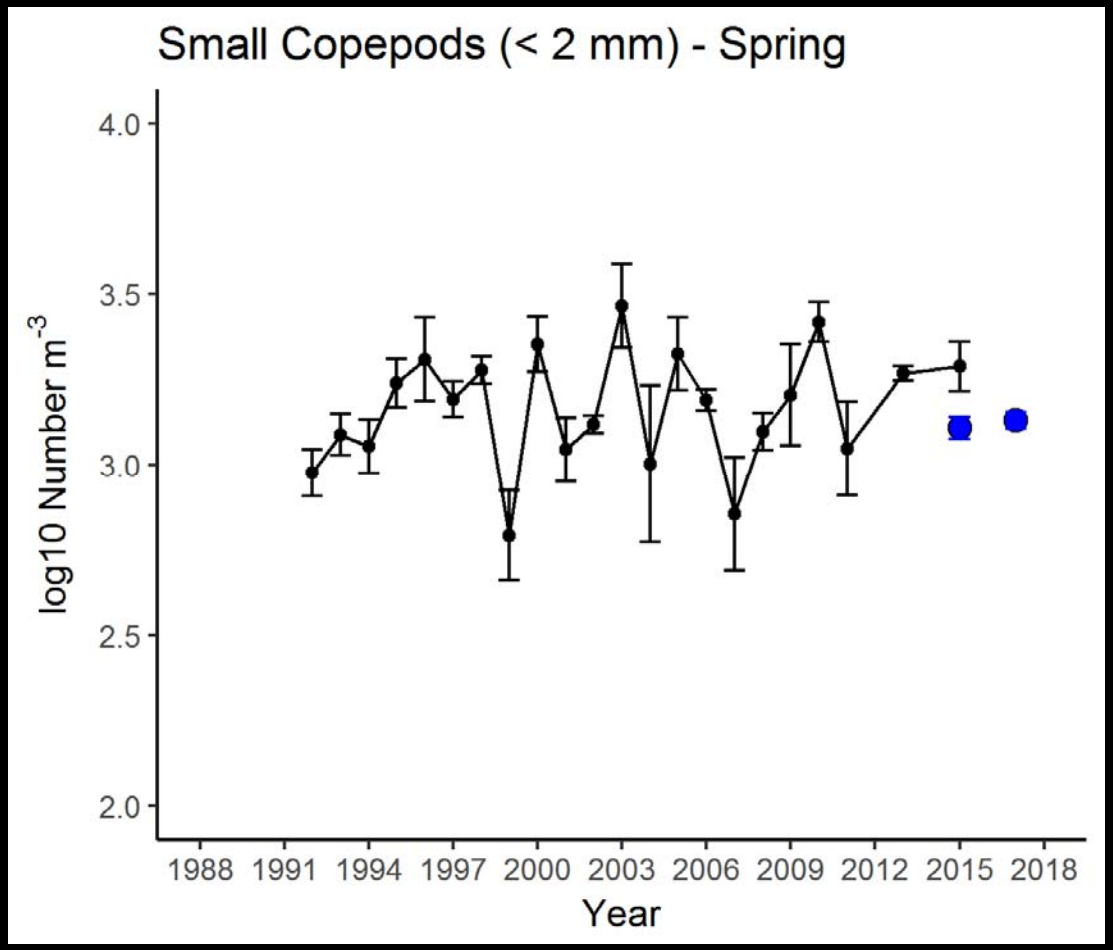
https://earthobservatory.nasa.gov/IOTD/view.php?id=88238

Primary production

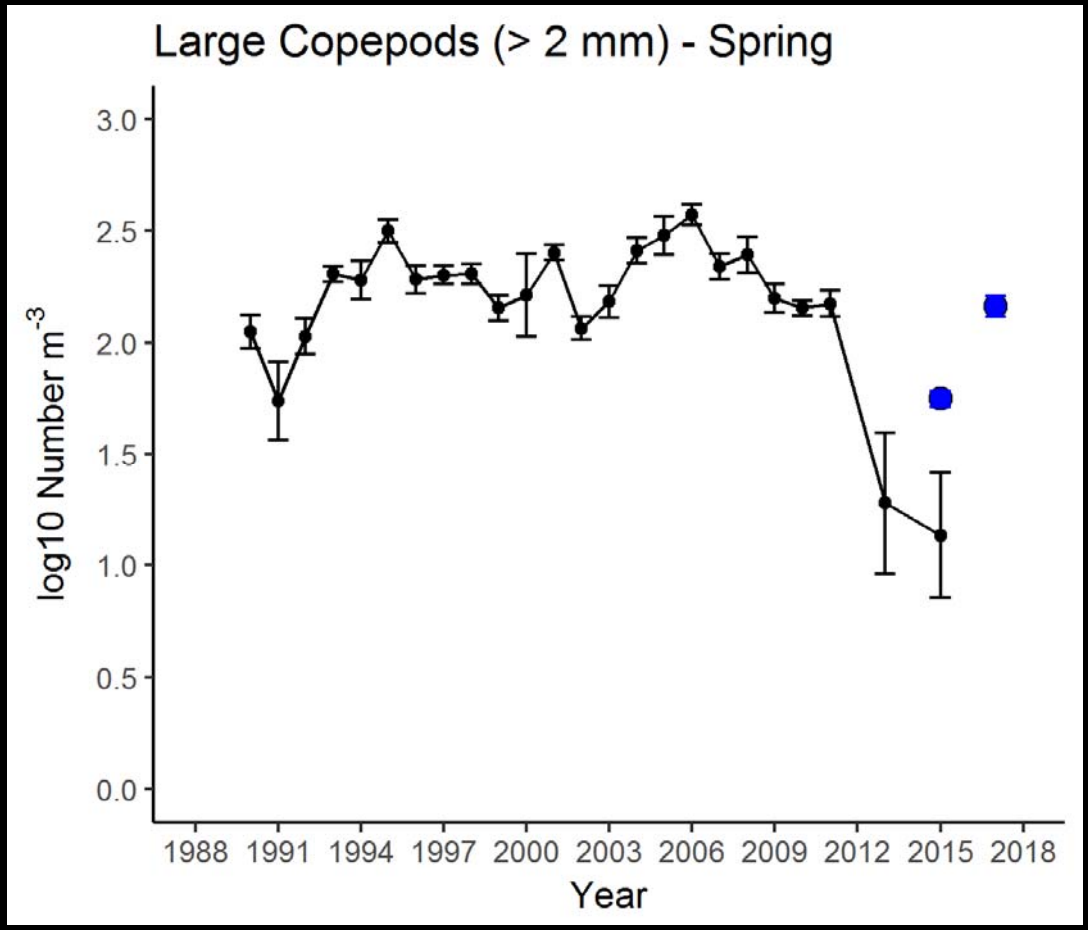




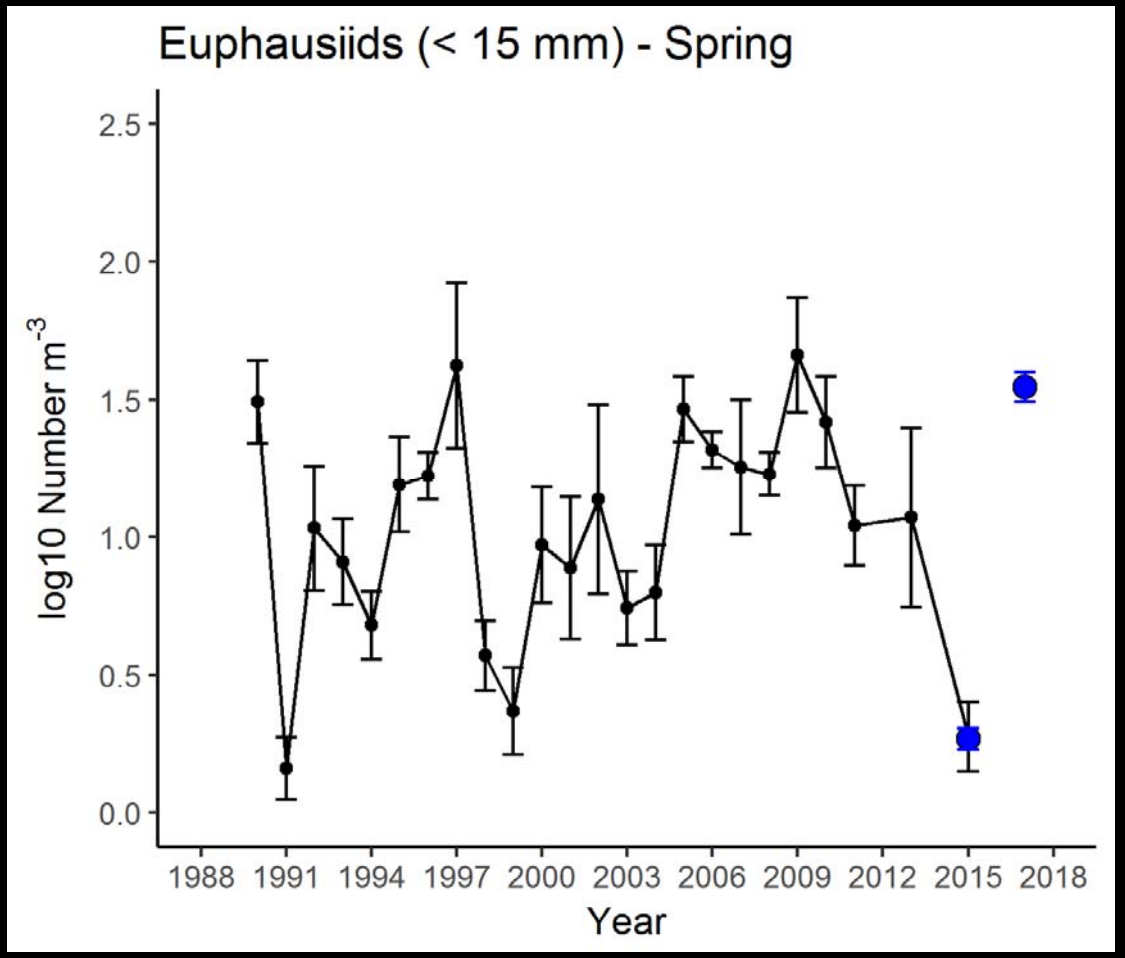
Zooplankton – Copepods (< 2 mm)



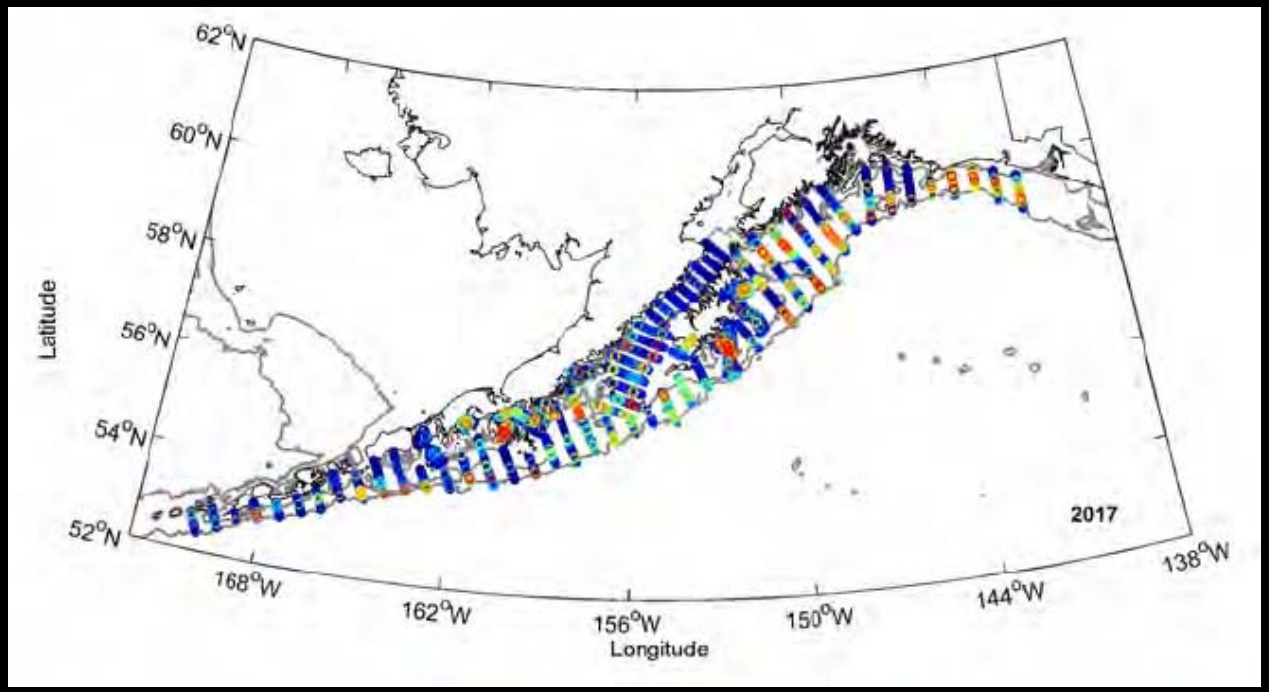
Zooplankton – Copepods (> 2 mm)

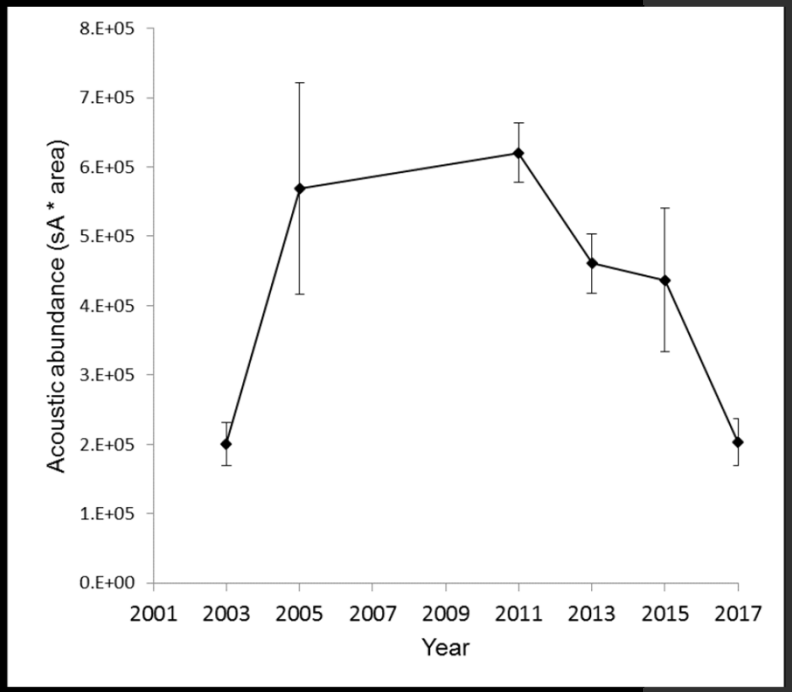


Zooplankton – Euphausiids < 15 mm



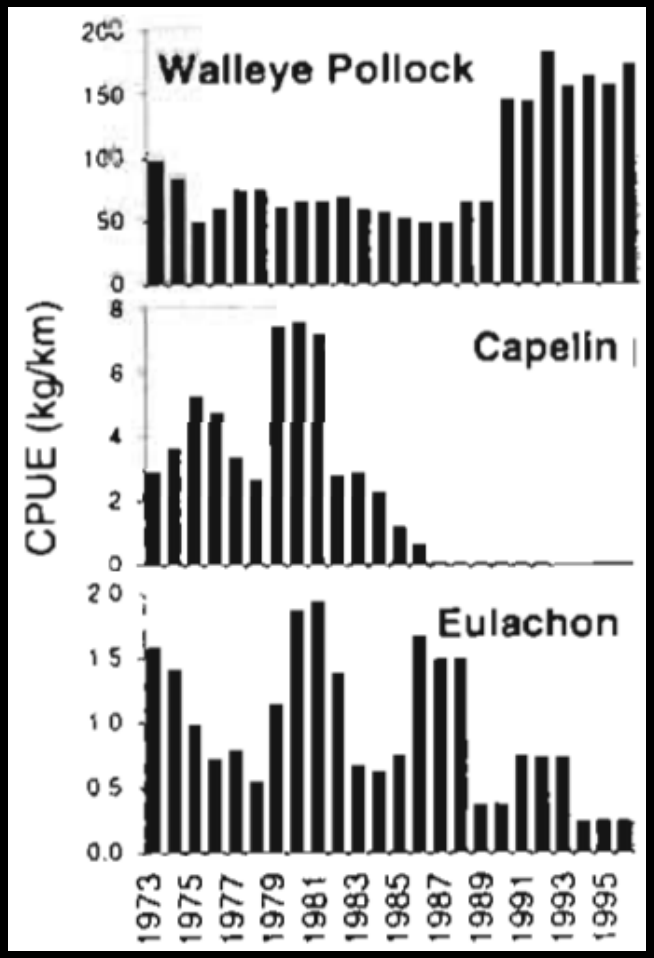
Euphausiids (krill)



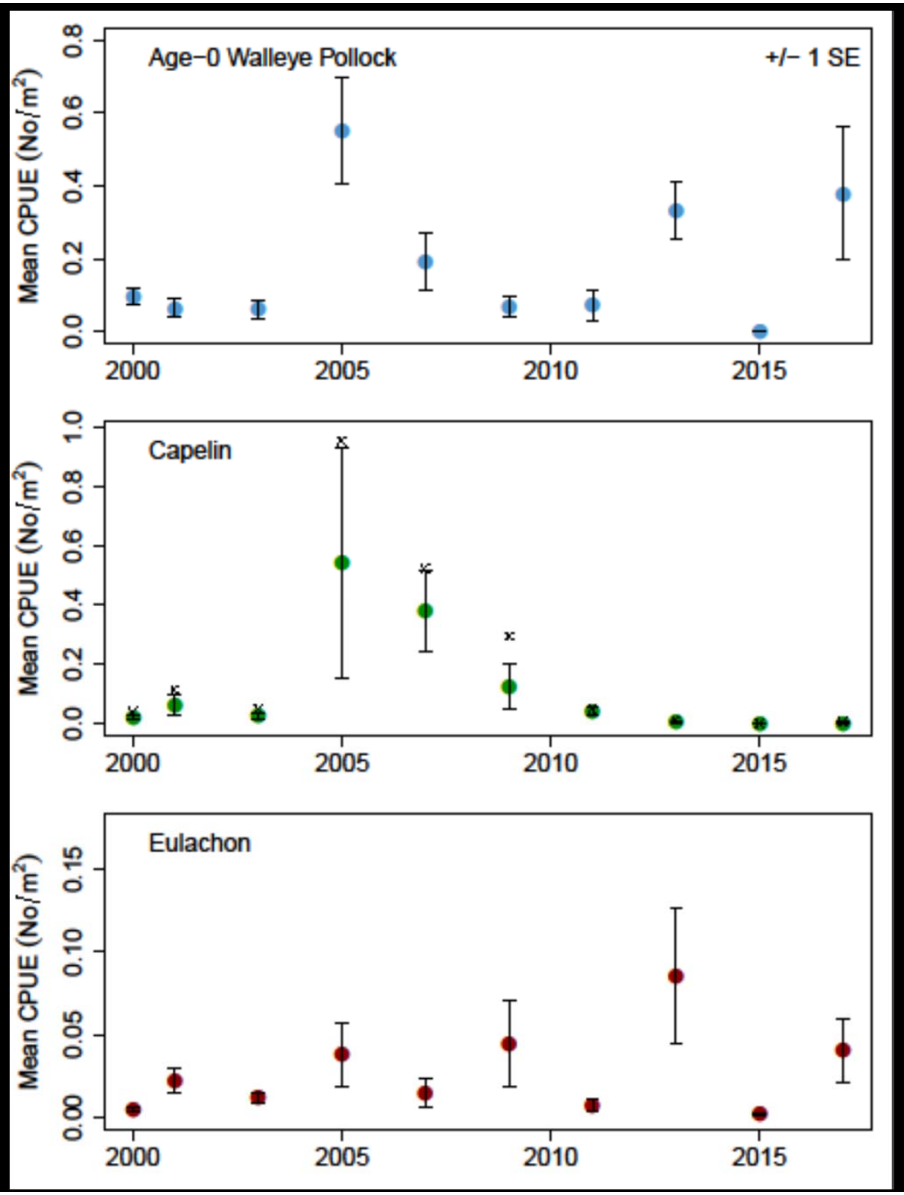


Ressler Ecosystem Considerations Chapter 2017

Forage fish



Anderson et al. 1999. MEPS. 189: 117-123



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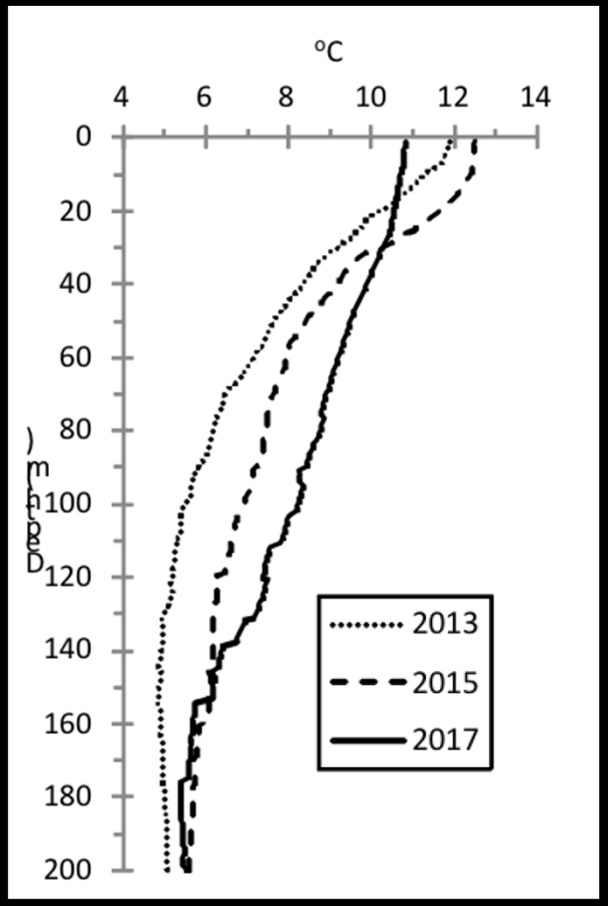
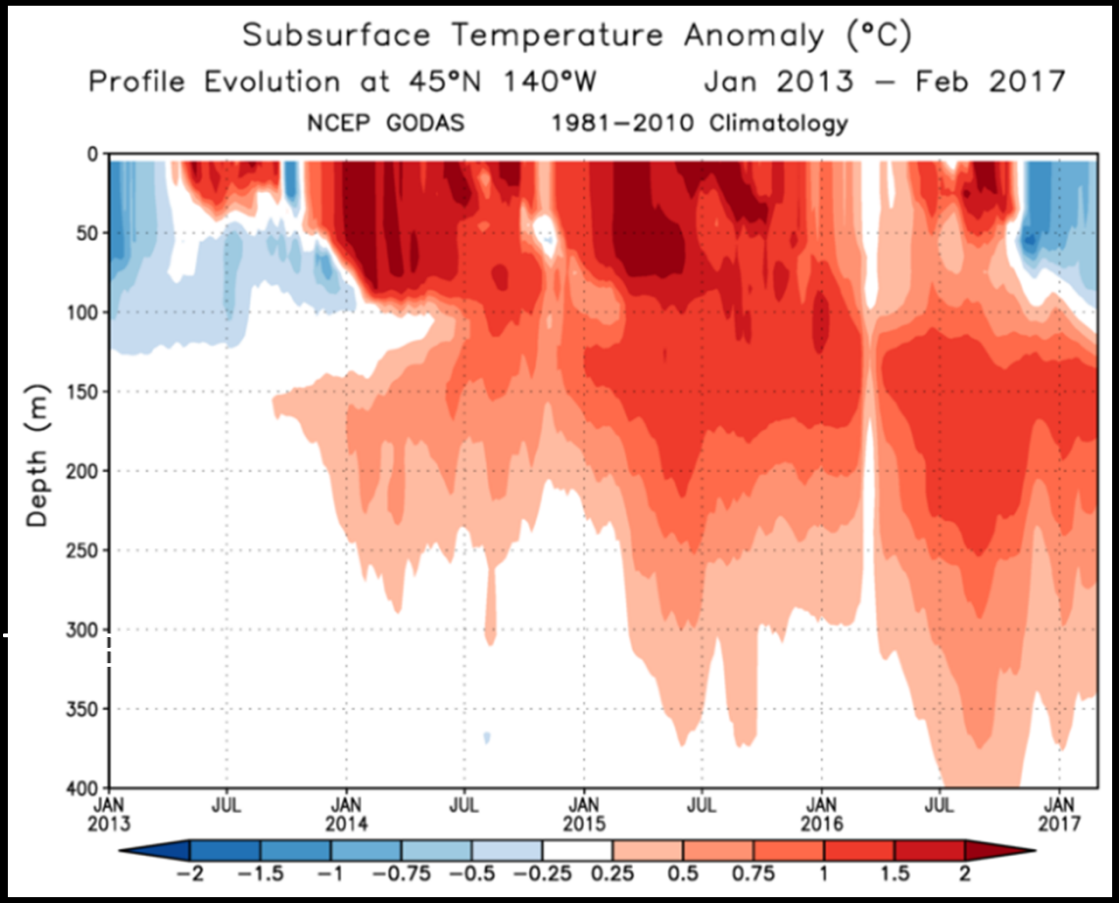
The "Blob" and Pacific cod – an ecosystem story

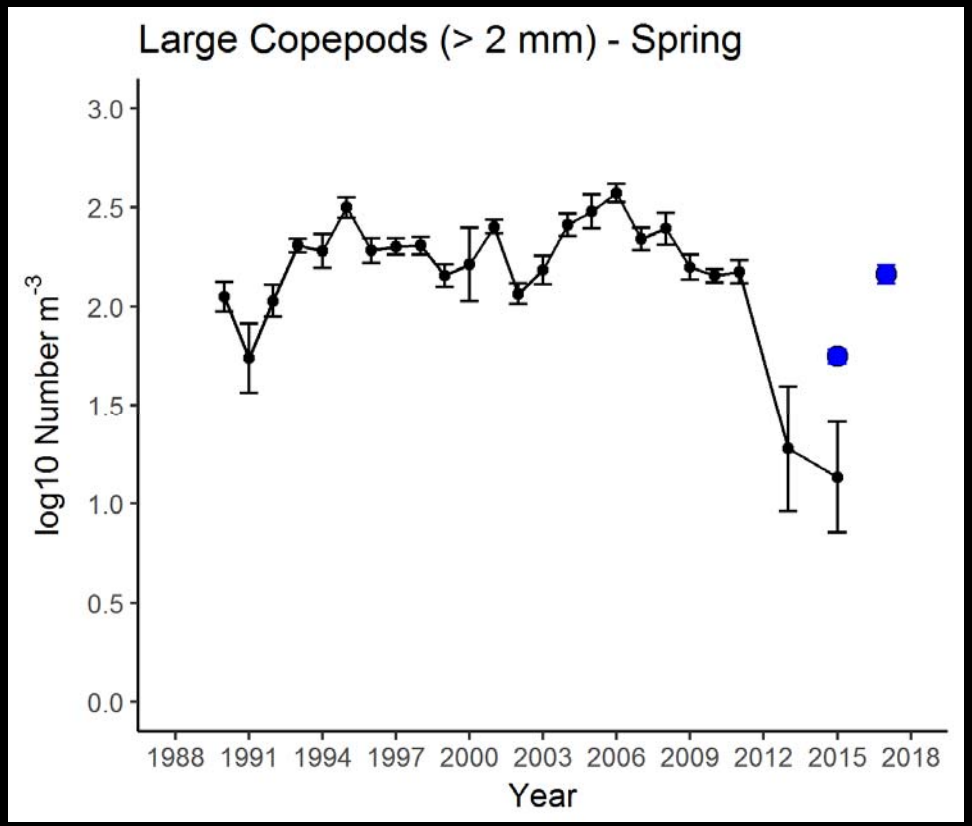


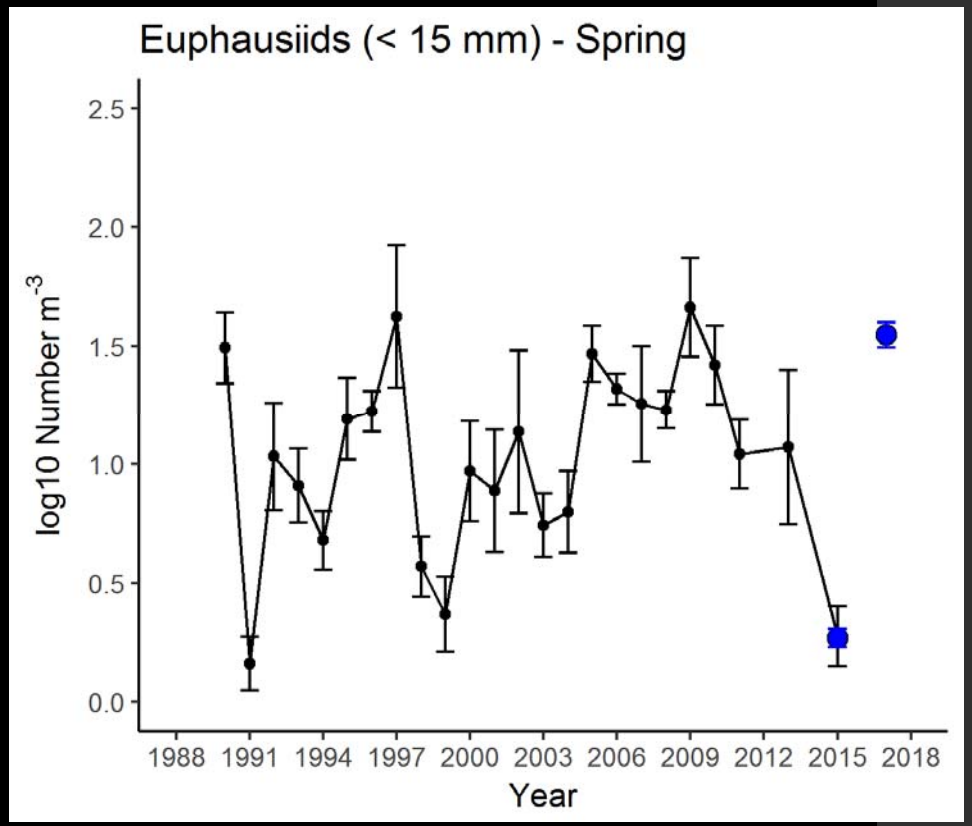


N. Ferm/M. Wilson

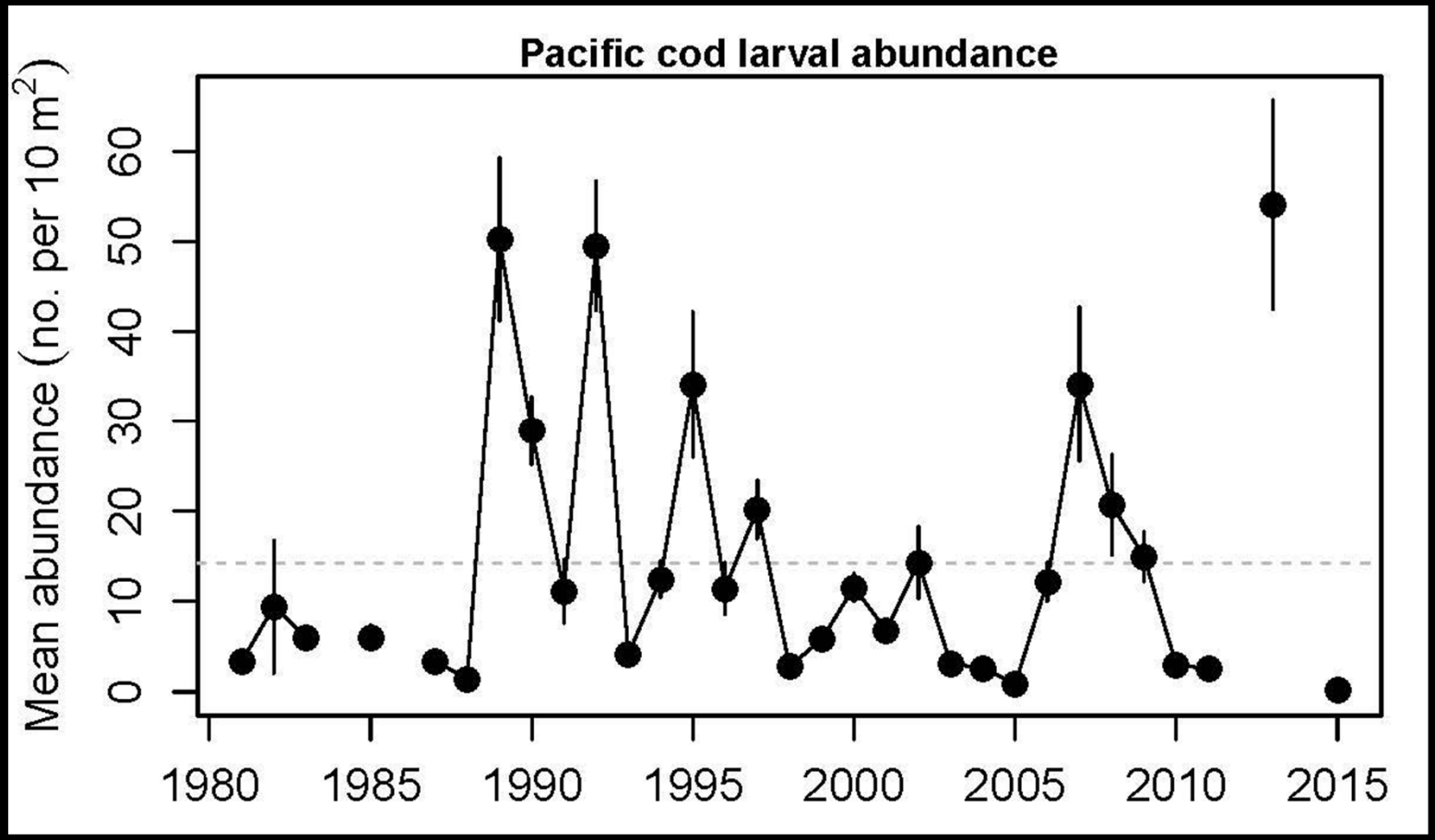
https://alaskapacificblob.wordpress.com/2017/03/13/the-blob-in-hibernation/

Spring Ecosystem Survey: Zooplankton





Spring Ecosystem Survey: Larvae



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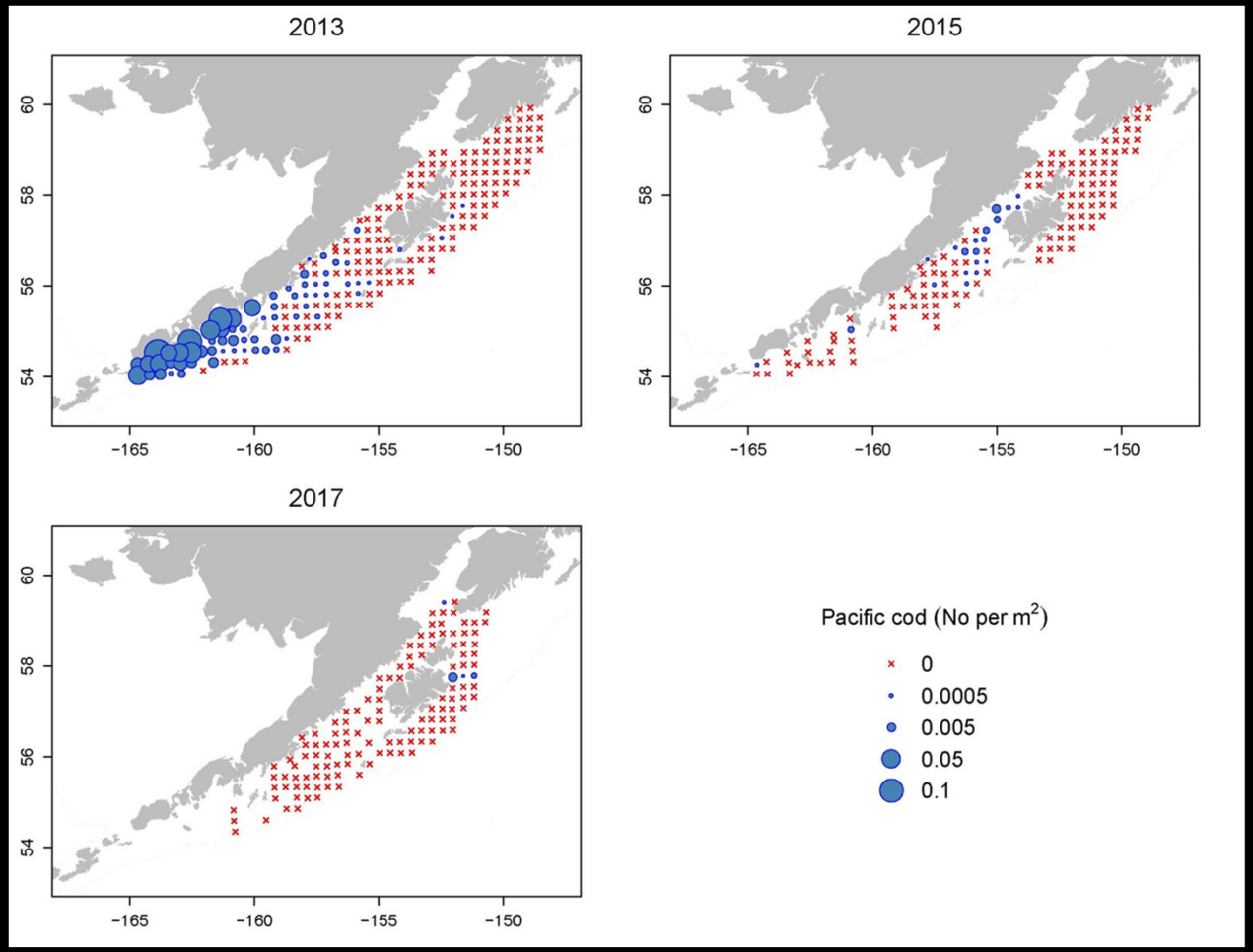
Summer Ecosystem Survey: Age-0



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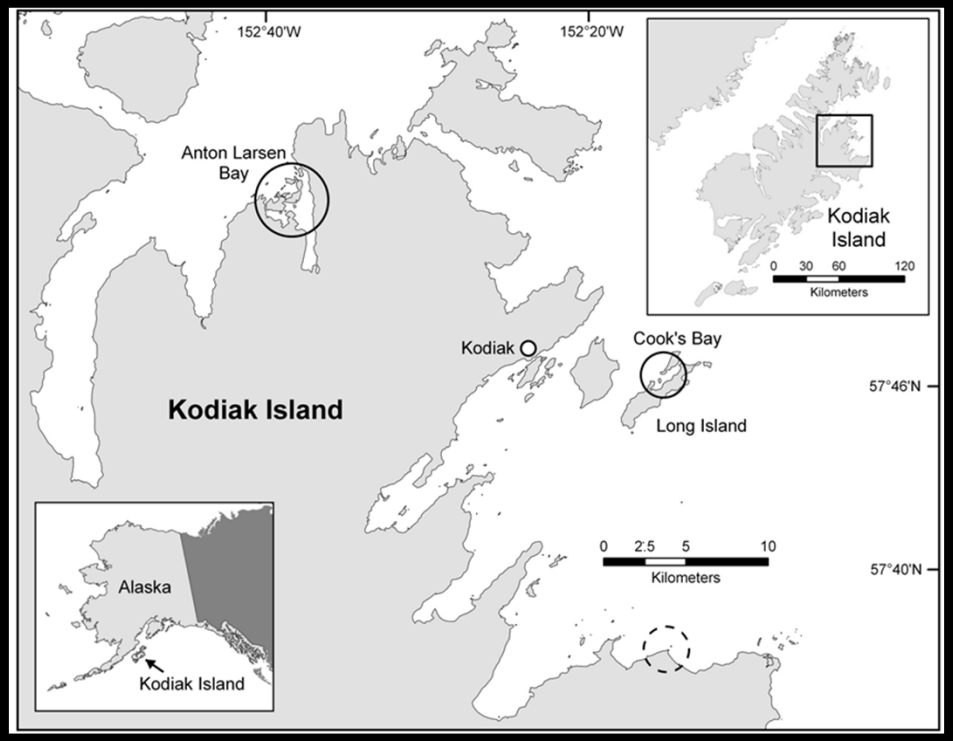
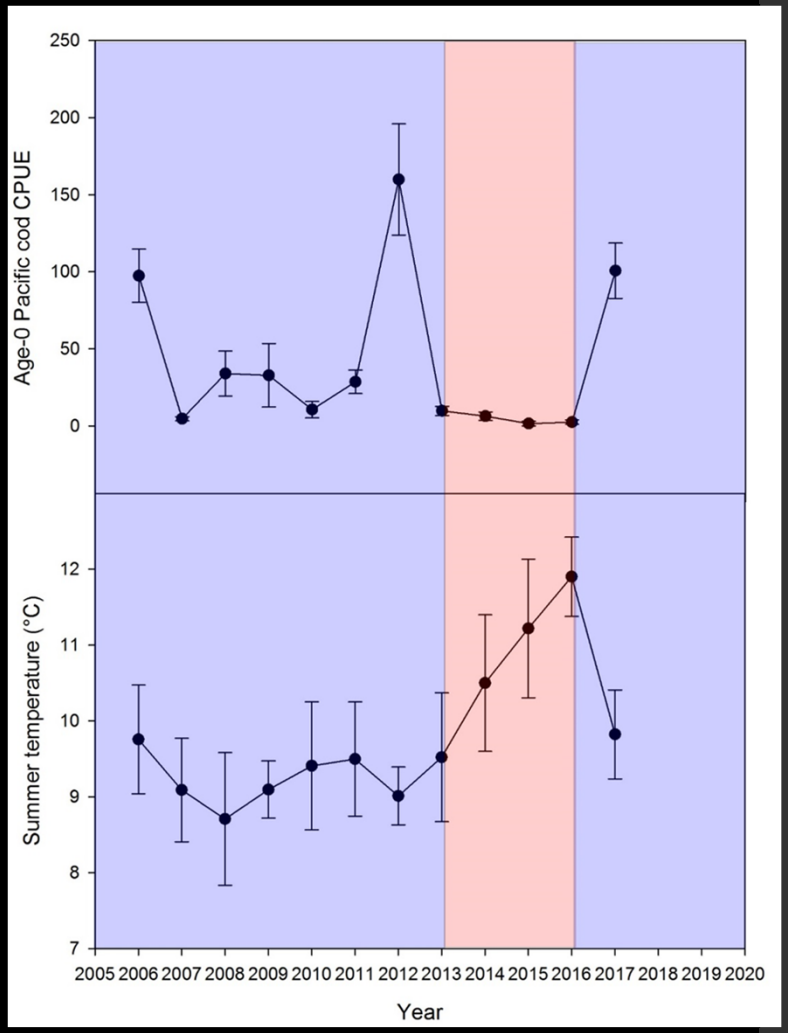
Kodiak Beach Seine





Ben Laurel, Newport OR

Summary

- Gulf of Alaska is a dynamic, continental shelf ecosystem characterized by nearshore downwelling, high freshwater input, and a strong, alongshore current

- Lower trophic level dynamics
  - Are strongly related to temperature and regional oceanography
  - Many aspects remain poorly understood

- Lower trophic level trends
  - Long-term trends largely absent across lower trophic levels
  - Some indication that primary production may be increasing?

The "Blob" and lower trophic levels

- Overall lower trophic level abundance declined and has since rebounded
- Effects were evident up to juvenile fish
- Ecosystem sensitivity to warming suggests some hypotheses:
  - Change in phenology of biomass and productivity peaks
  - Higher primary productivity, but smaller cell sizes
  - Longer food webs, less accumulation of lipids

Acknowledgments

Recruitment Processes Alliance

- Janet Duffy-Anderson
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- Ed Farley
- Ron Heintz

Alaska Fisheries Science Center

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- Lauren Rogers
- Matt Wilson

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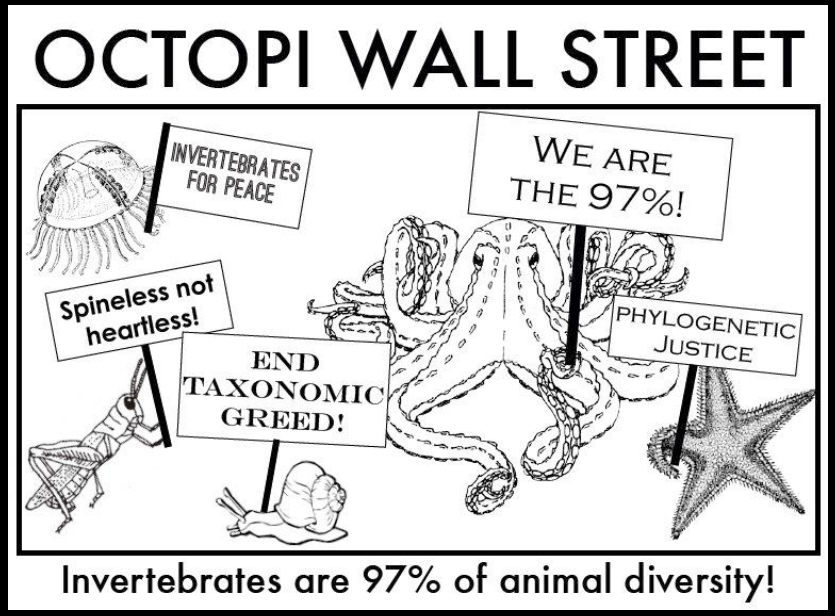
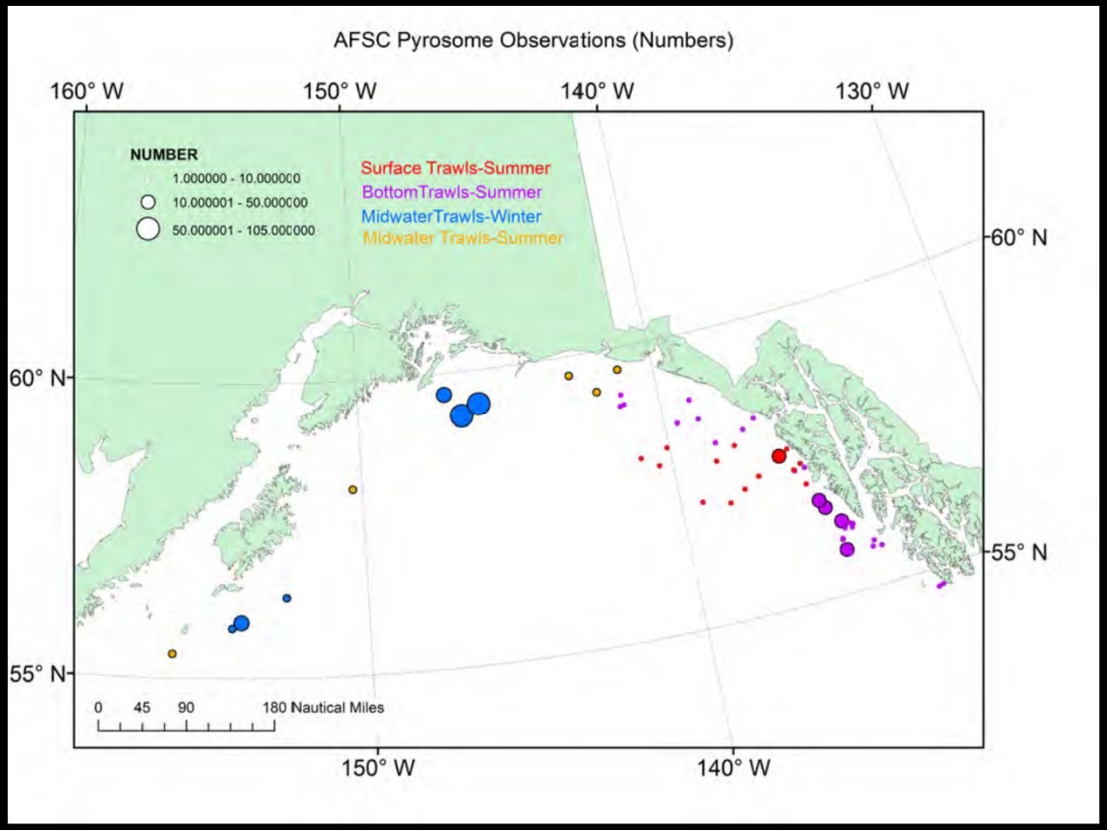
- Nissa Ferm
- Colleen Harpold
- Jesse Lamb
- Adam Spear



Pyrosomes



Map: W. Palsson

2017 Ecosystems Considerations Chapter