NOAA FISHERIES

Alaska Fisheries Science Center

Bioenergetics and Juvenile Growth

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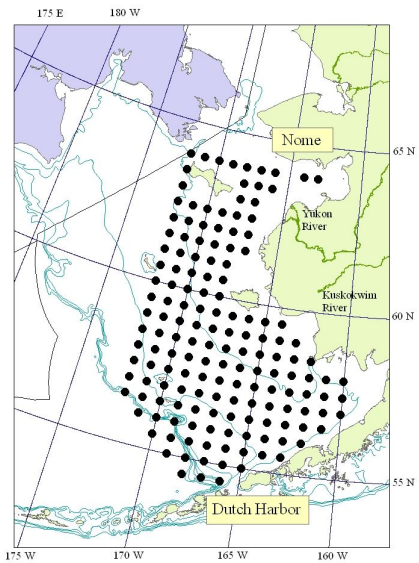
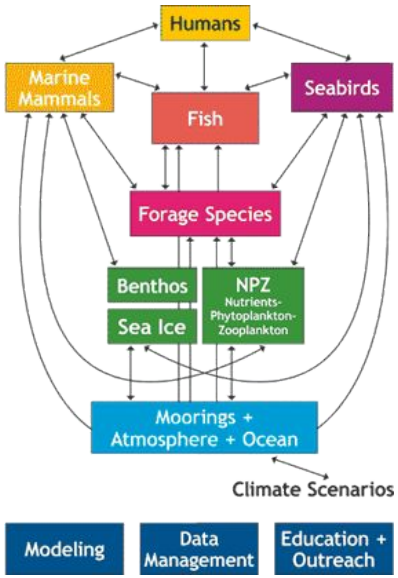
Ecosystem Science Review
Juneau, Alaska
May 2-6, 2016

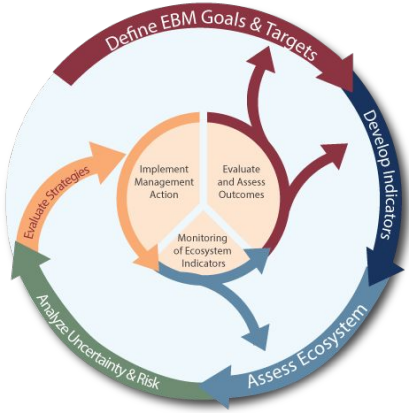
The Importance of Juvenile Ecology

Fishery and oceanographic data informs modeling efforts of climate variability on ecosystems

- How species respond to environmental change
- Develop indices to inform stock assessment

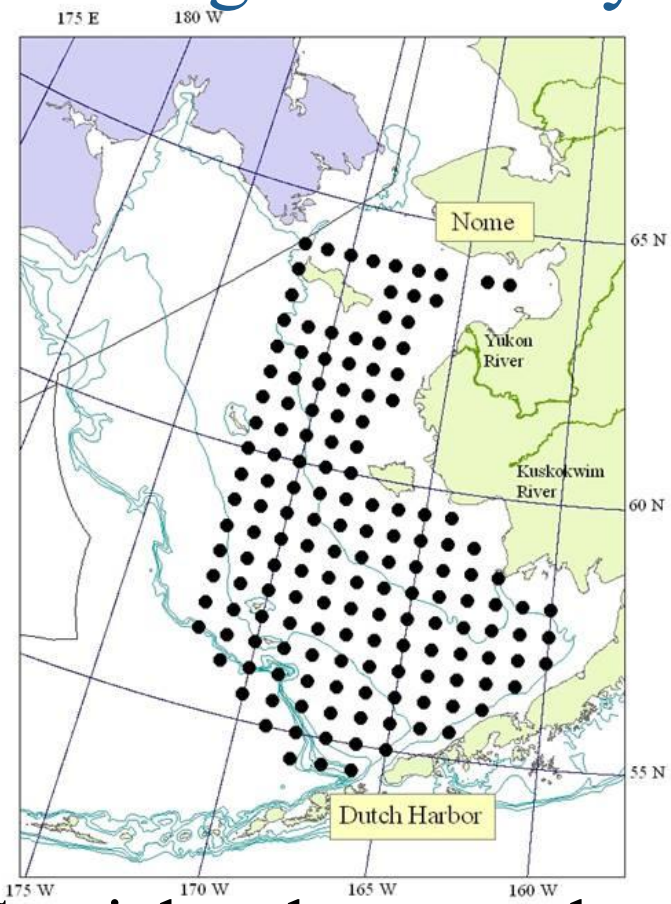






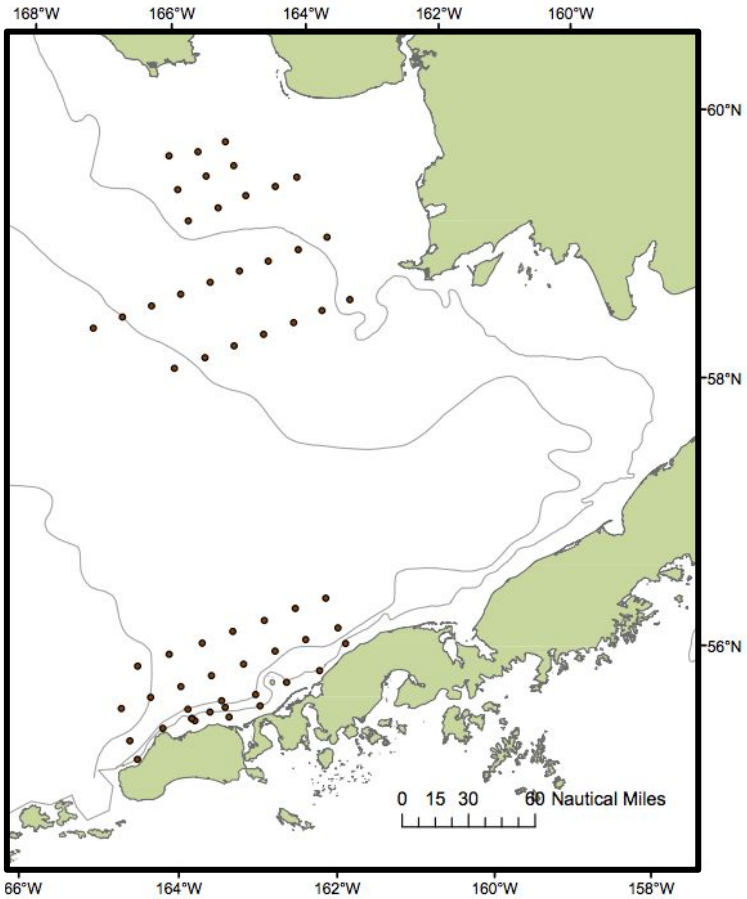
Status of Ecosystem Data

Bering Sea survey



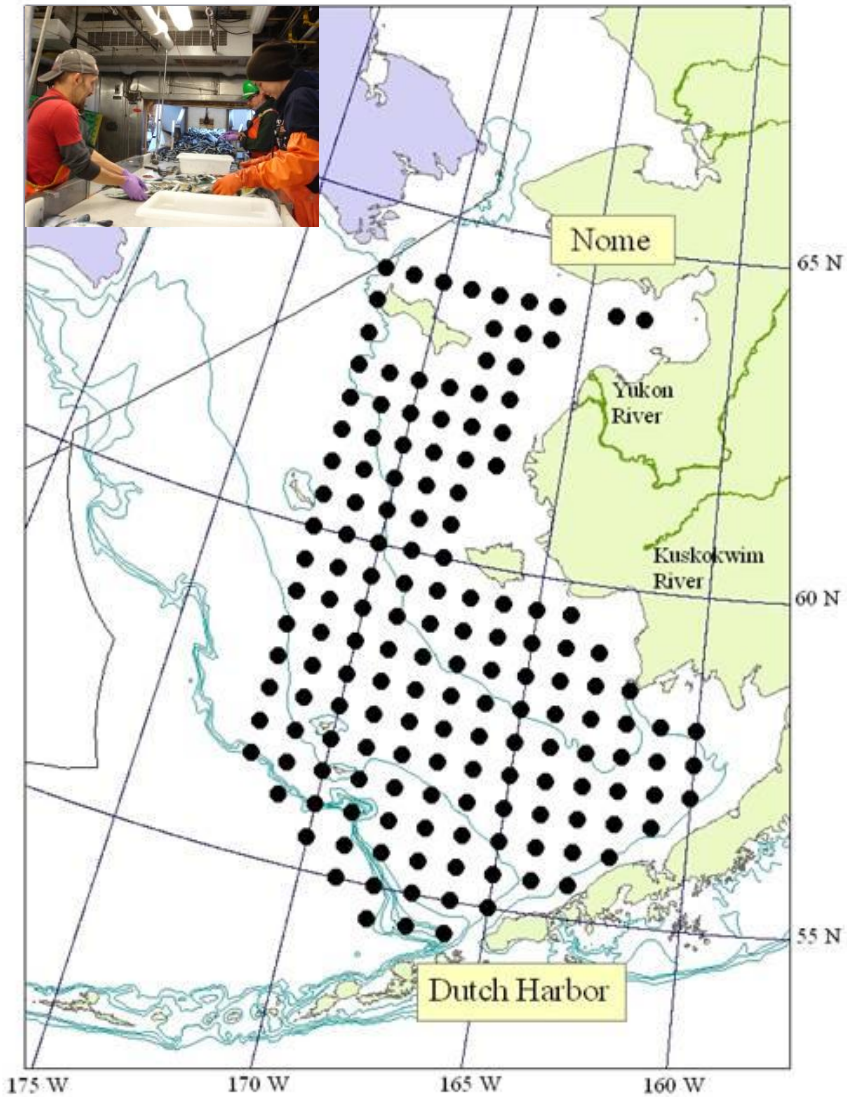
- Spatial and temporal variations in fish community
- Measures of fish condition
- Diet studies

FOCI Beam Trawl



- Settlement and nursery areas of age-0 flatfishes
- Juvenile transport

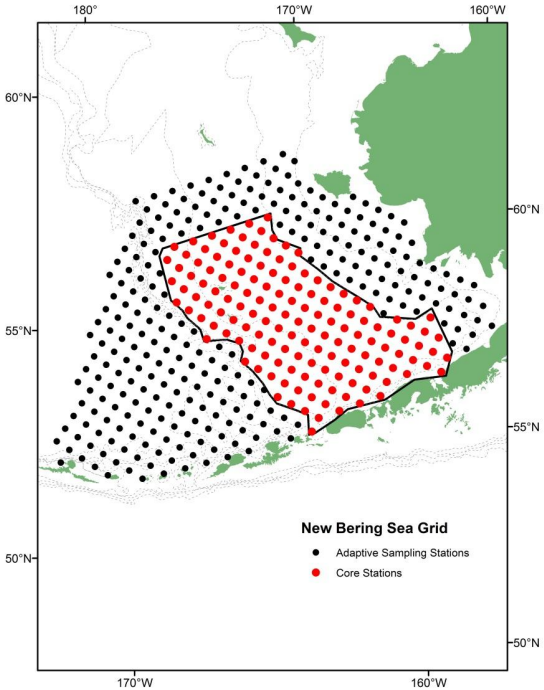
Strategies to obtain and manage ecosystem data



Bering Sea survey

Survey Redesign

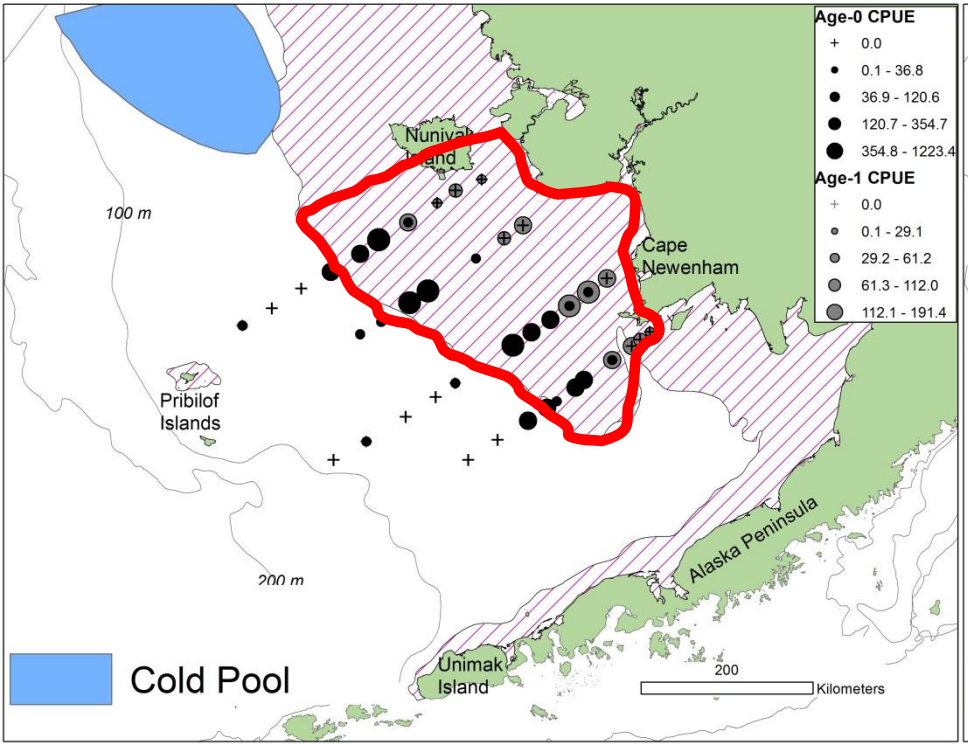
- Surface versus oblique tows
- Even-year surveys
- Different sampling schemes



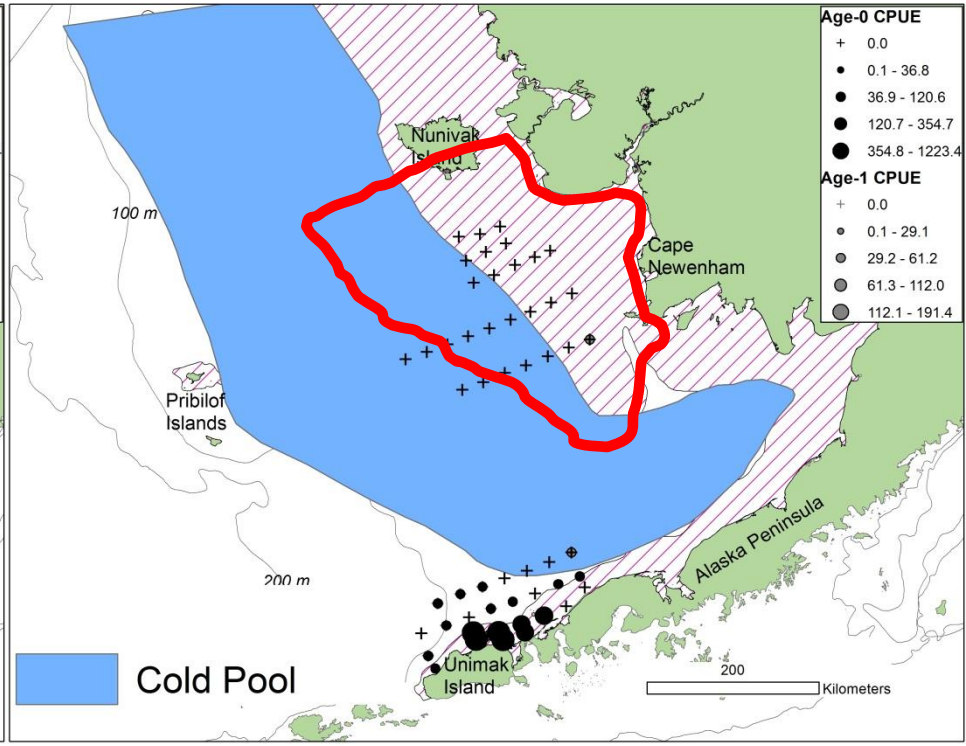
Northern rock sole

Age-0 and age-1 fish abundance is variable in the northern nursery area

2003

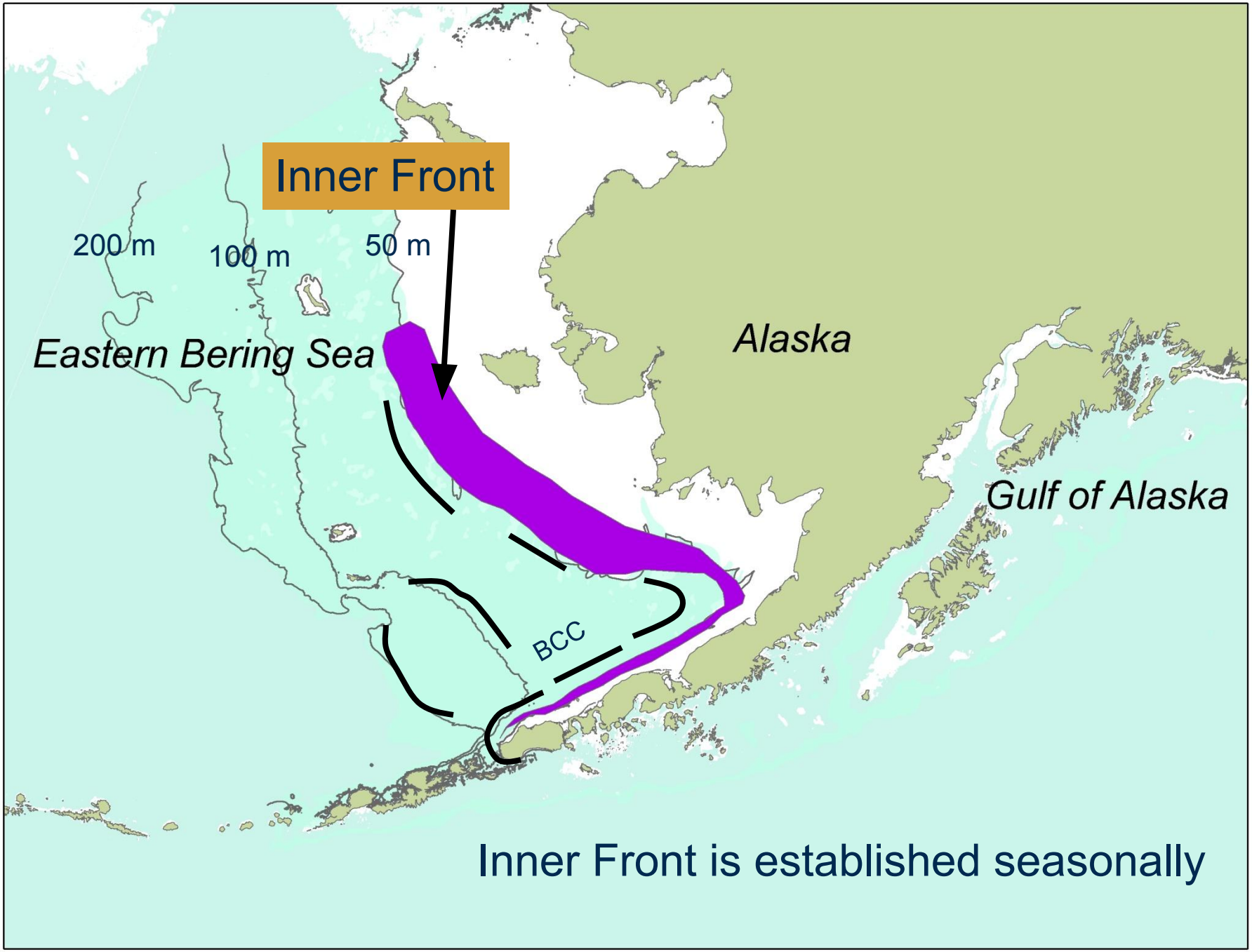


2010



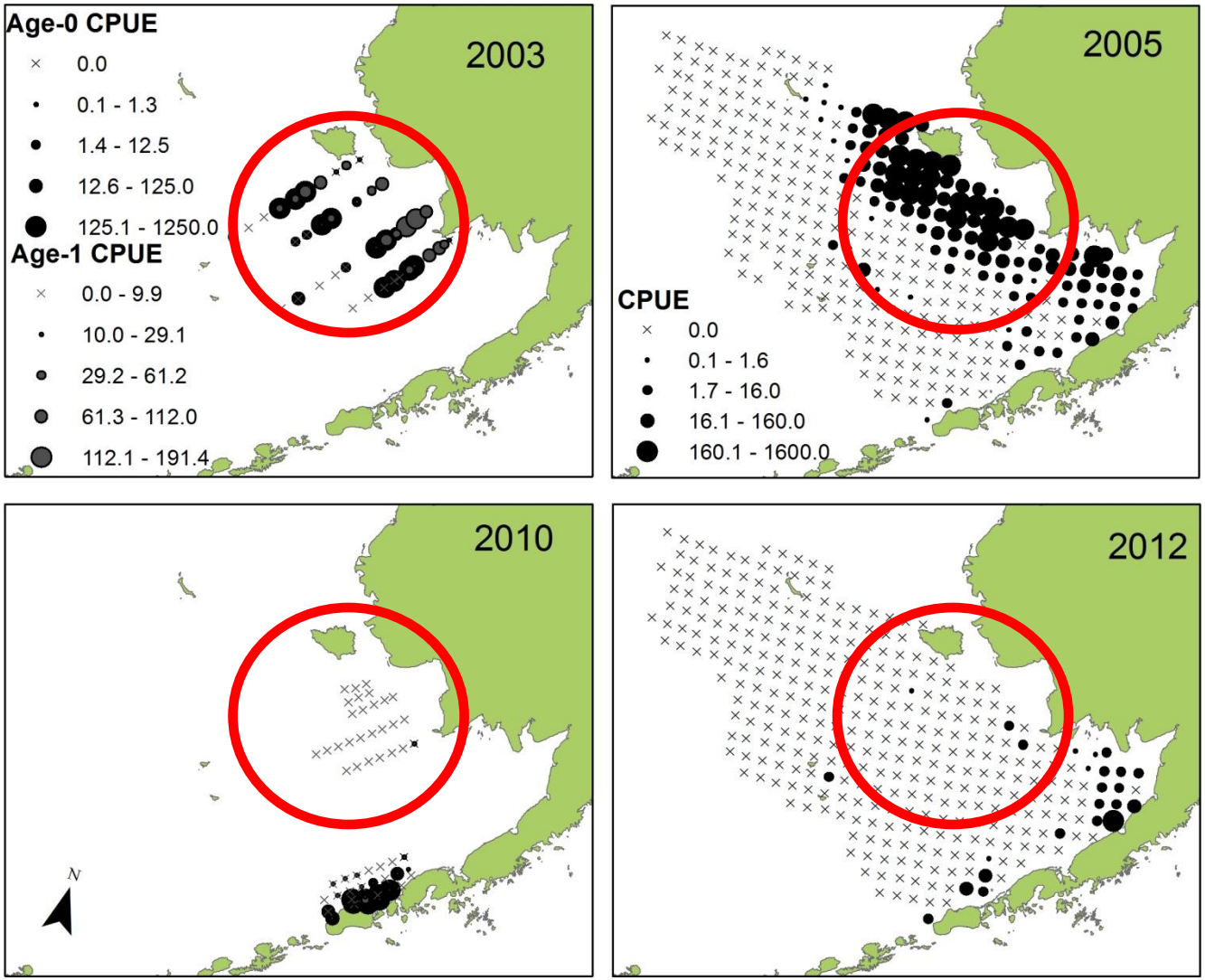
Northern nursery area not used in cold age-0 years

Cooper et al. 2013; 2014


Inner Front
200 m
100 m
50 m
Eastern Bering Sea
Alaska
Gulf of Alaska
BCC
Inner Front is established seasonally

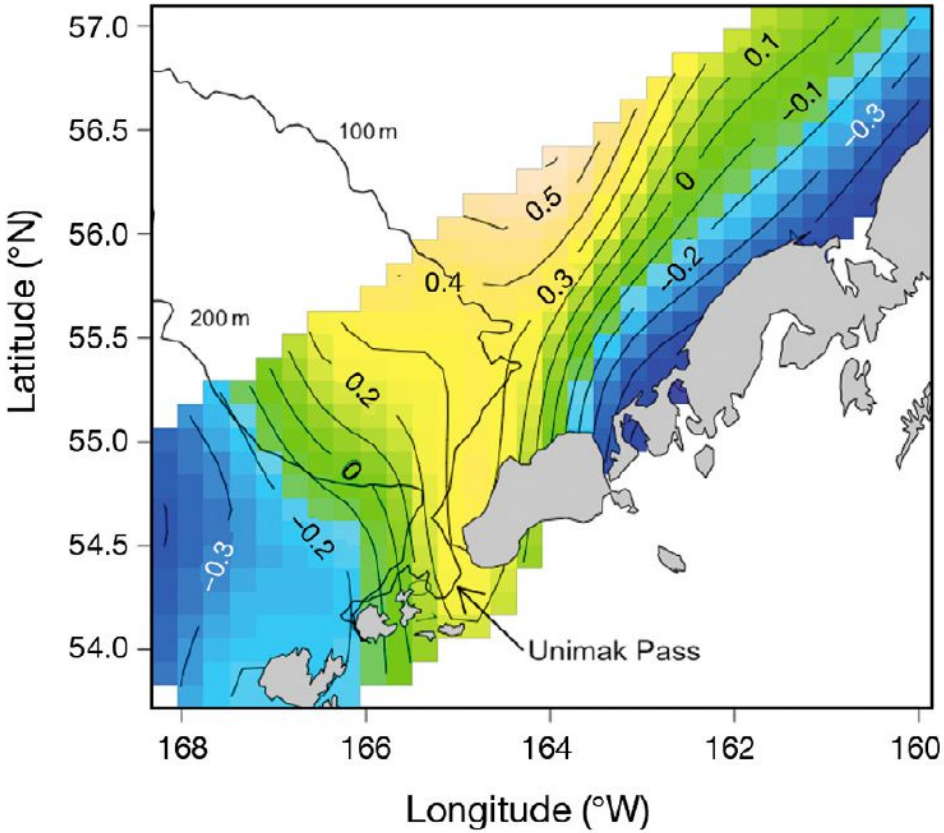
Do age-0 and age-1 distribution patterns persist until age-2 & 3 in the Trawl Survey?

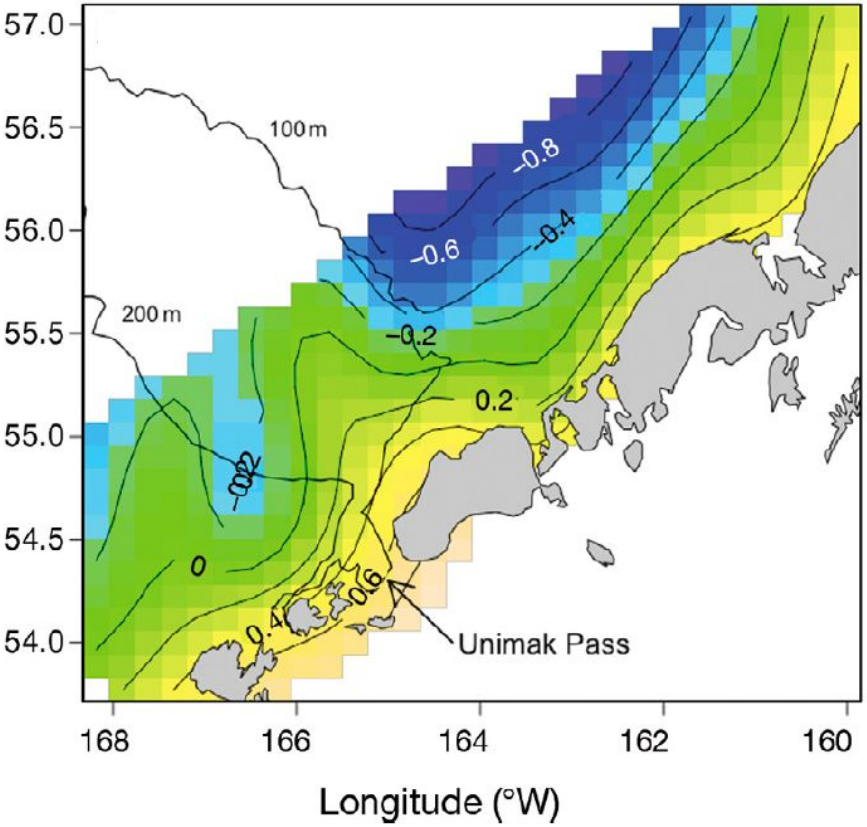
Beam Trawl (age-0 & 1) → 2 years later → Trawl Survey (age-2 & 3)



Cooper & Nichol, in review

Pacific cod

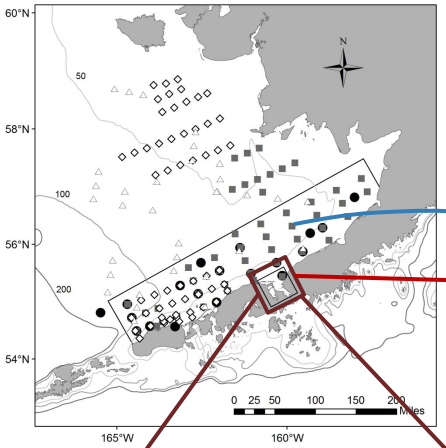


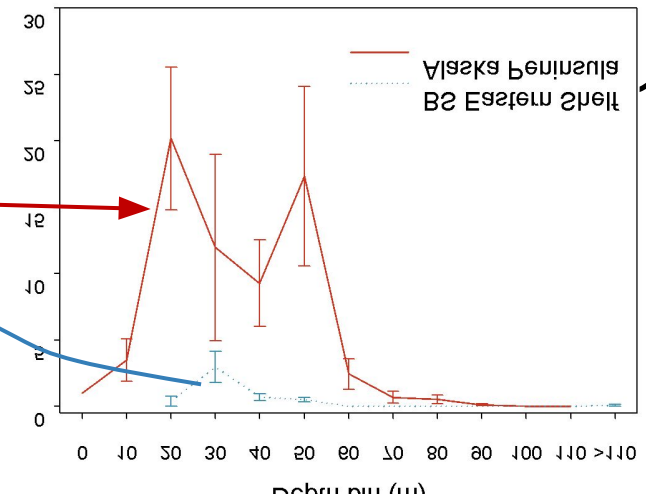


Siddon et al., 2011

Basin-wide habitat use of age-0 pacific cod

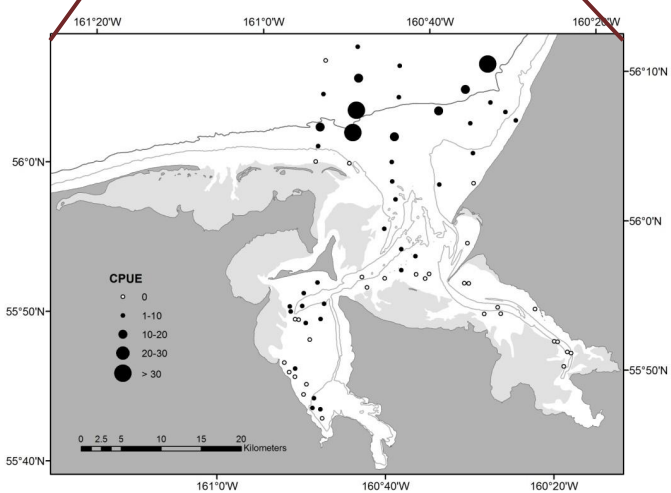
demersal shelf





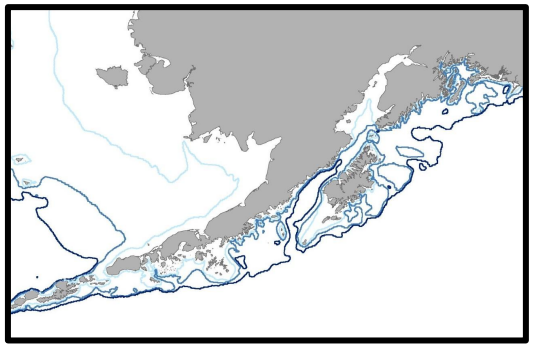
1. Most abundant 20-50m along Alaska Peninsula

coastal

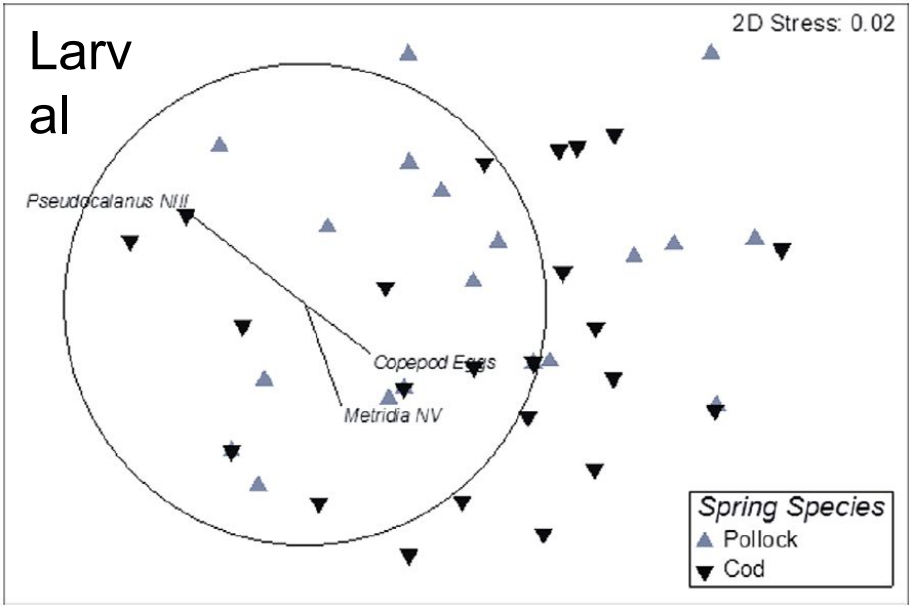


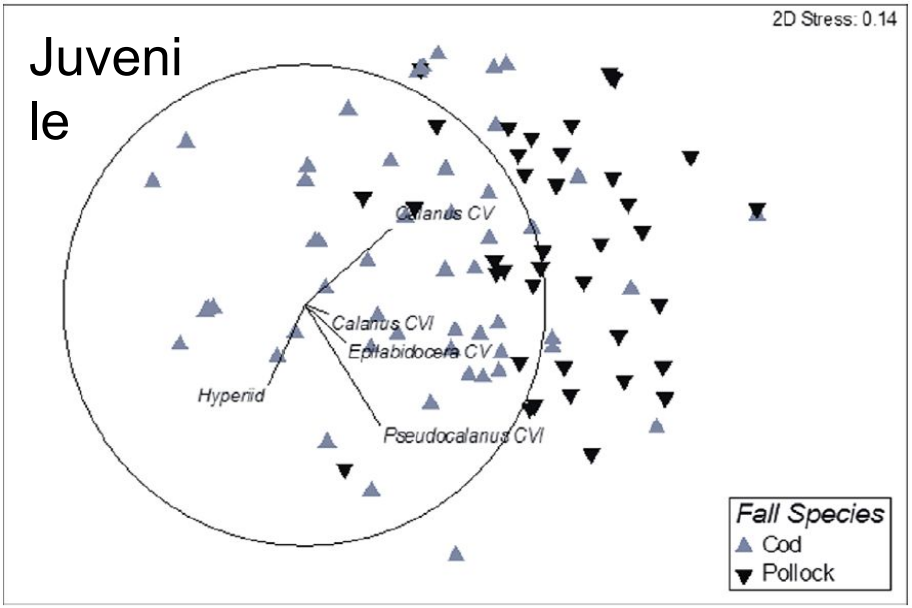
2. More abundant along open coastline than embayments

Contrasting habitat use in GOA and Bering



Hurst et al., 2015

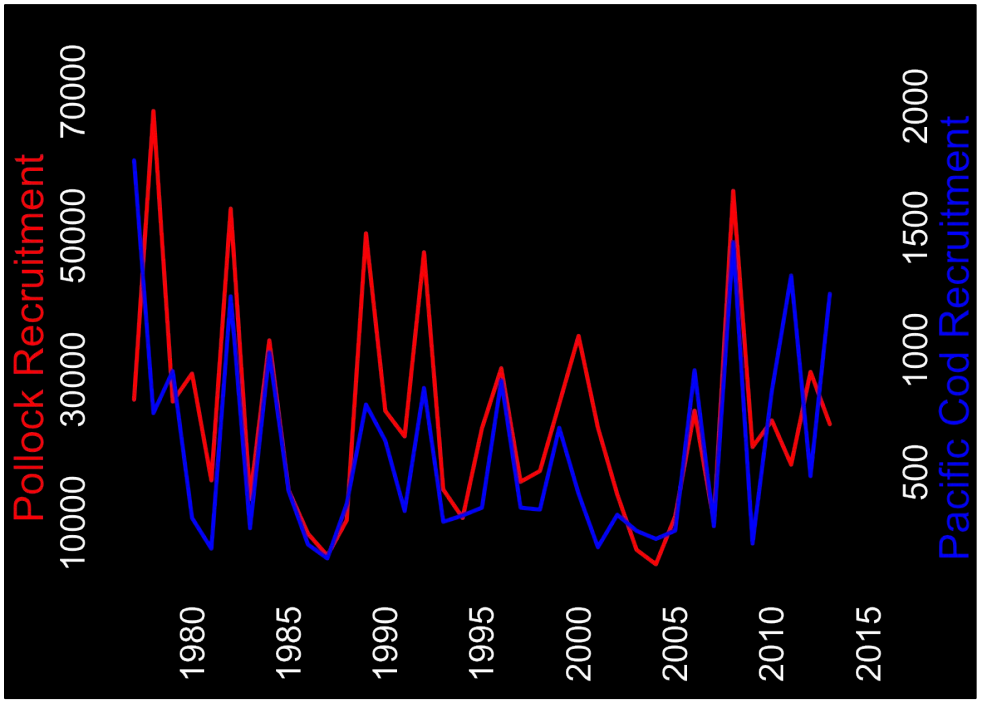




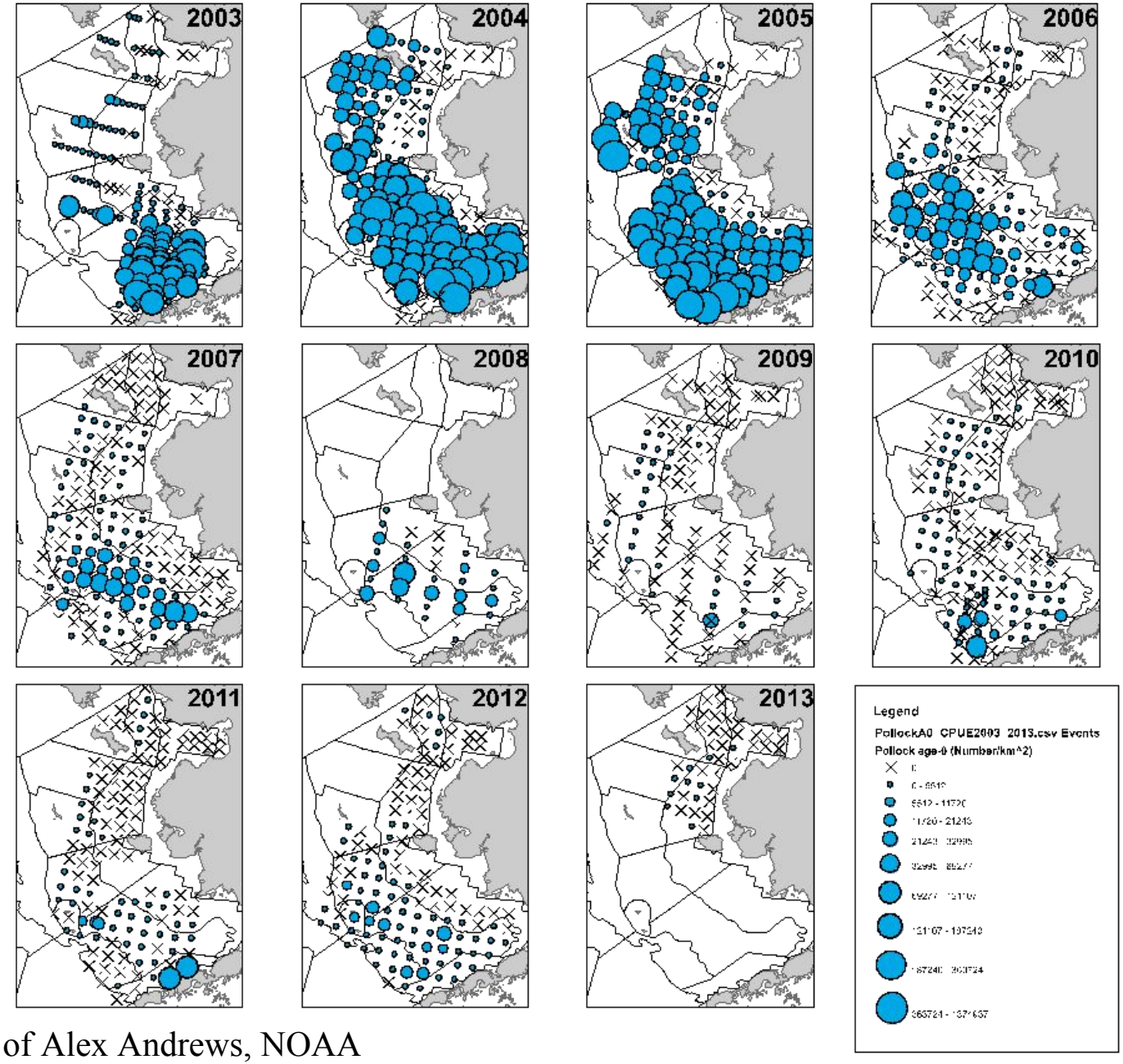
Strasburger et al., 2014

Resource partitioning?

Pacific cod consumed fewer but larger prey items than walleye pollock, especially as juveniles.



Walleye pollock

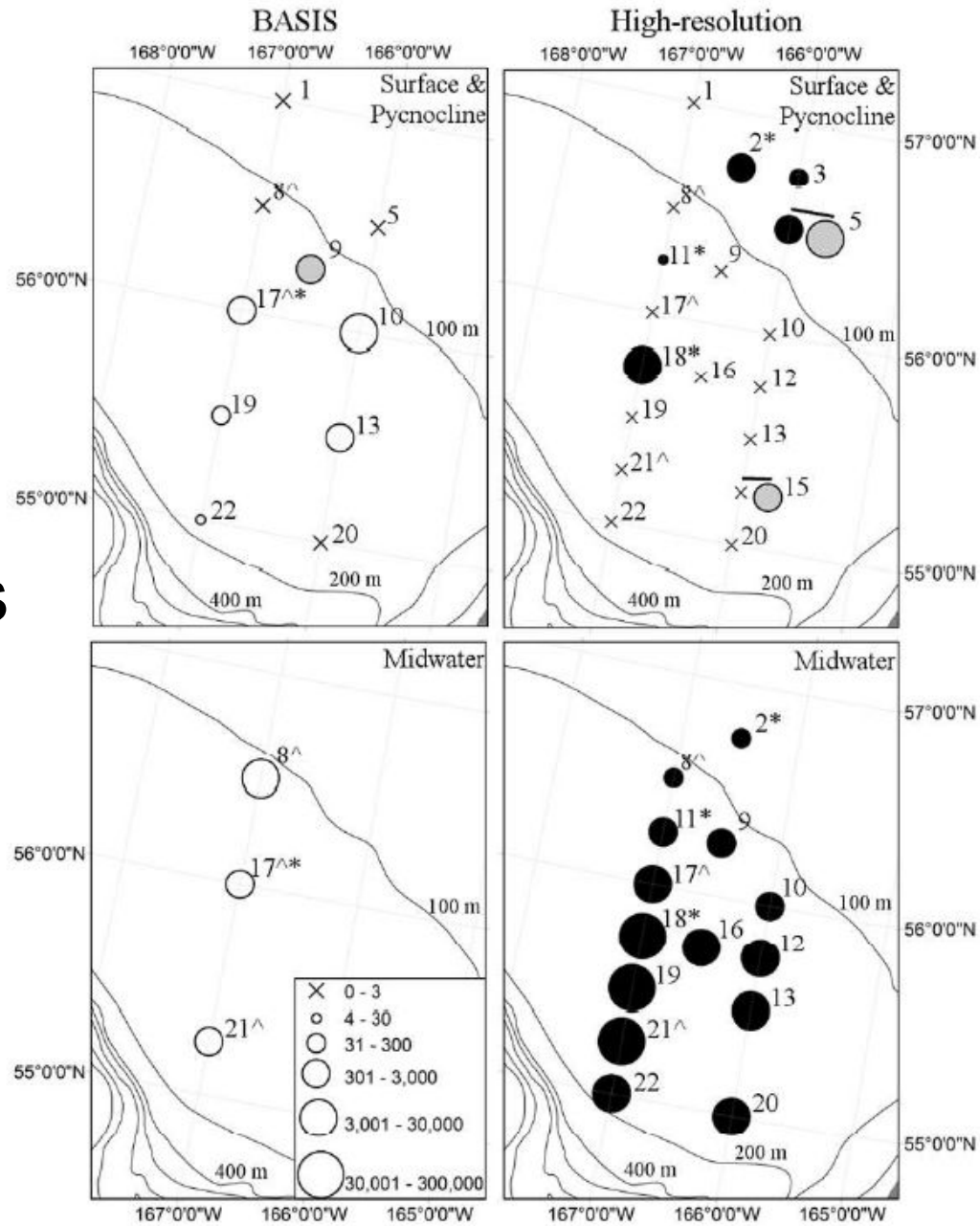


Maps courtesy of Alex Andrews, NOAA

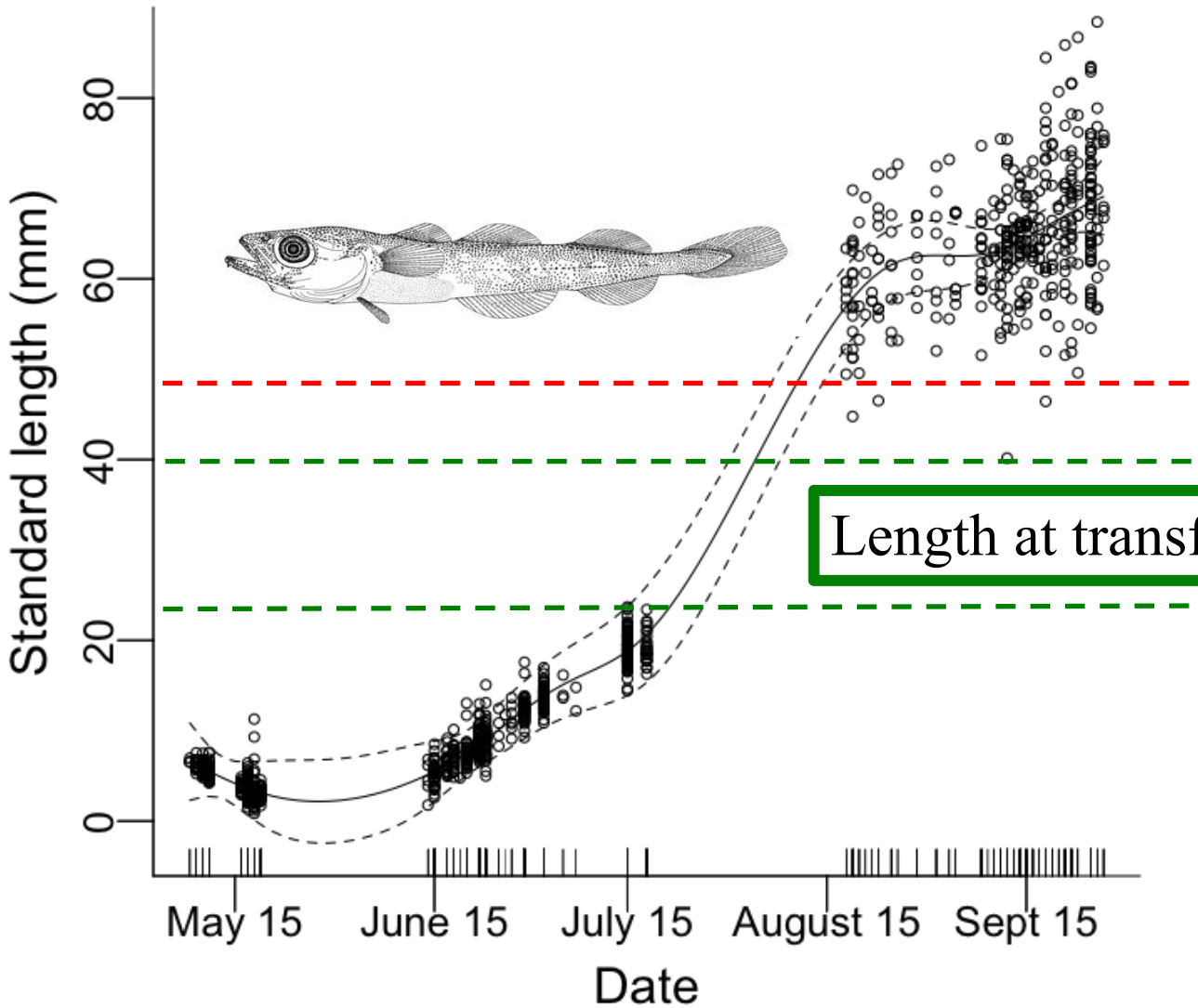
Vertical distribution of age-0 walleye pollock

No clear driver of when/why age-0 pollock move into deeper waters

- Ontogenetic shift?
- Environmental cue?



Parker-Stetter et al., 2015



DVM & nocturnal feeding

Length at transformation

Brodeur et al., 2000

Brown et al., 2001

Siddon et al., 2013 DSRII

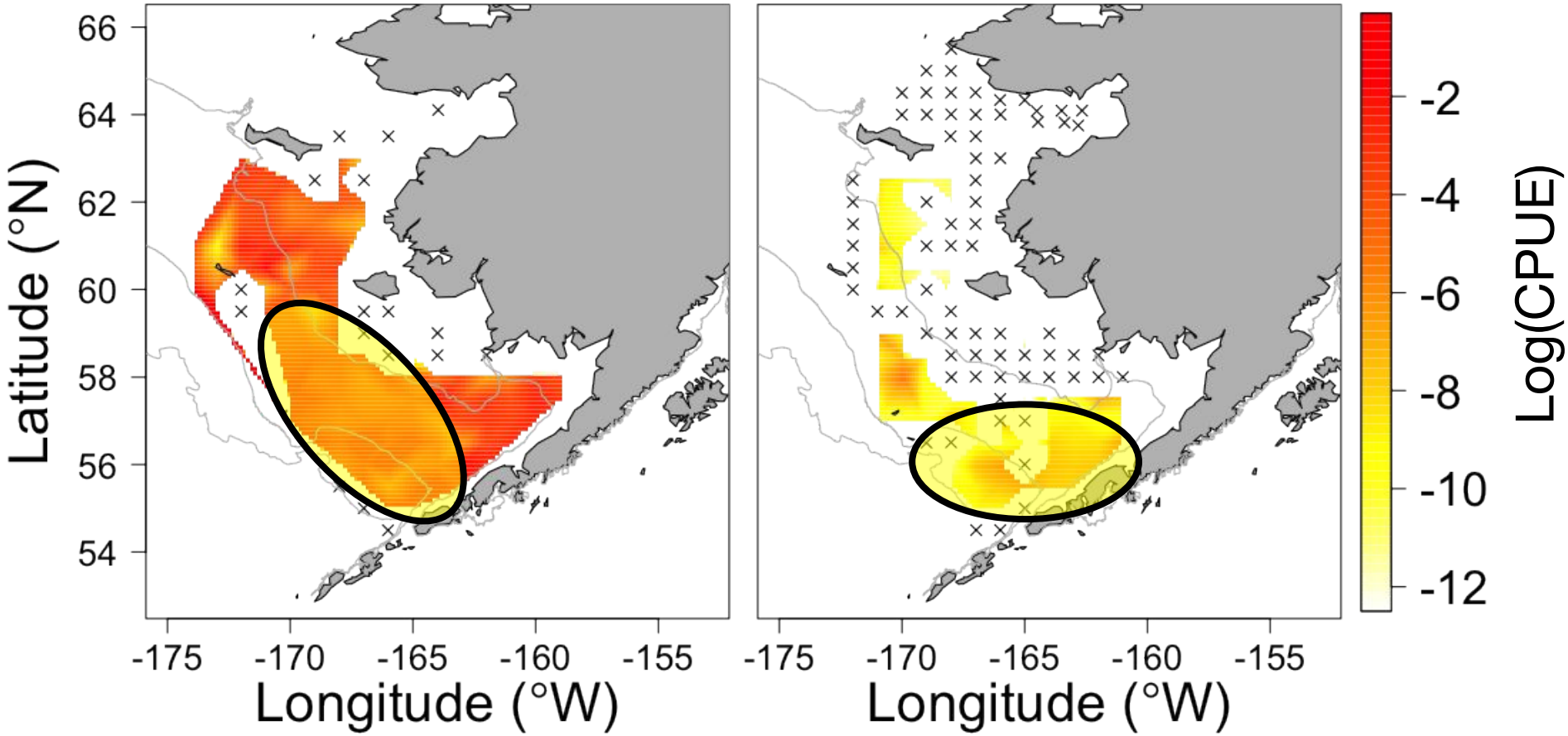
Age-0 walleye pollock abundance

2005:

CPUE = 0.08 fish m^{-2}

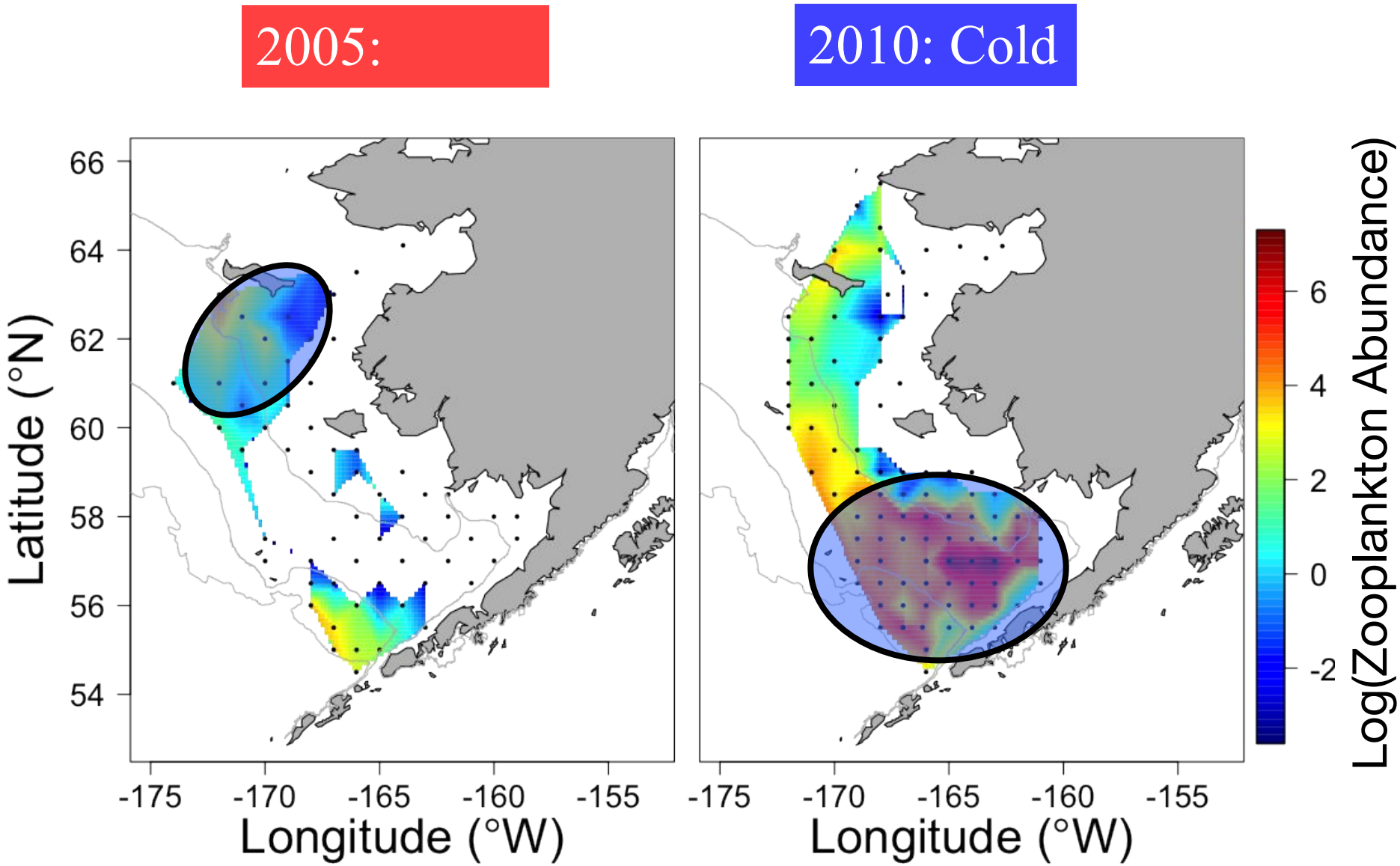
2010: Cold

CPUE = 0.001 fish m^{-2}



Siddon et al., 2013 PLOS ONE

Optimal prey size

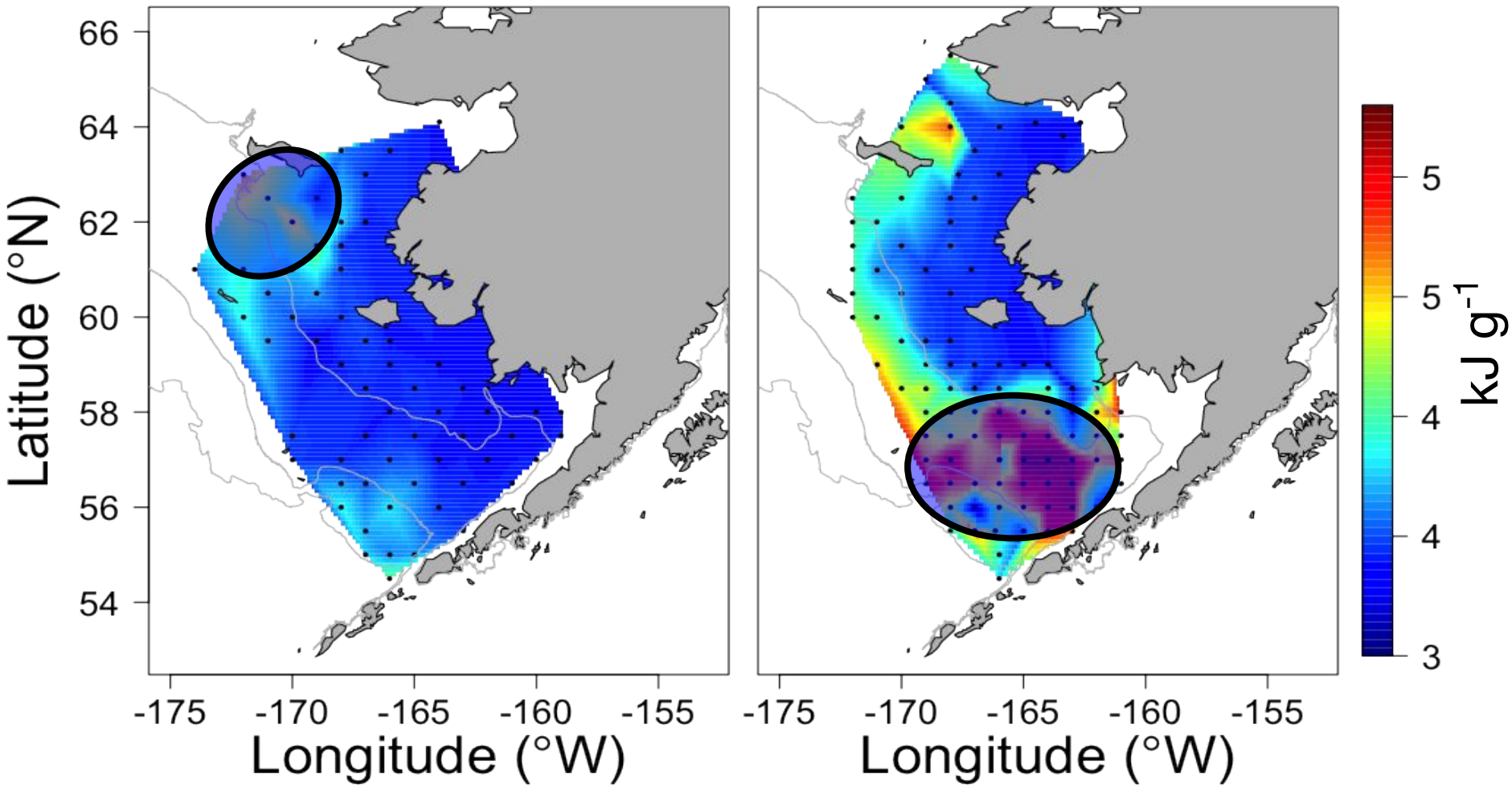


Siddon et al., 2013 PLOS ONE

Prey energy content

2005:

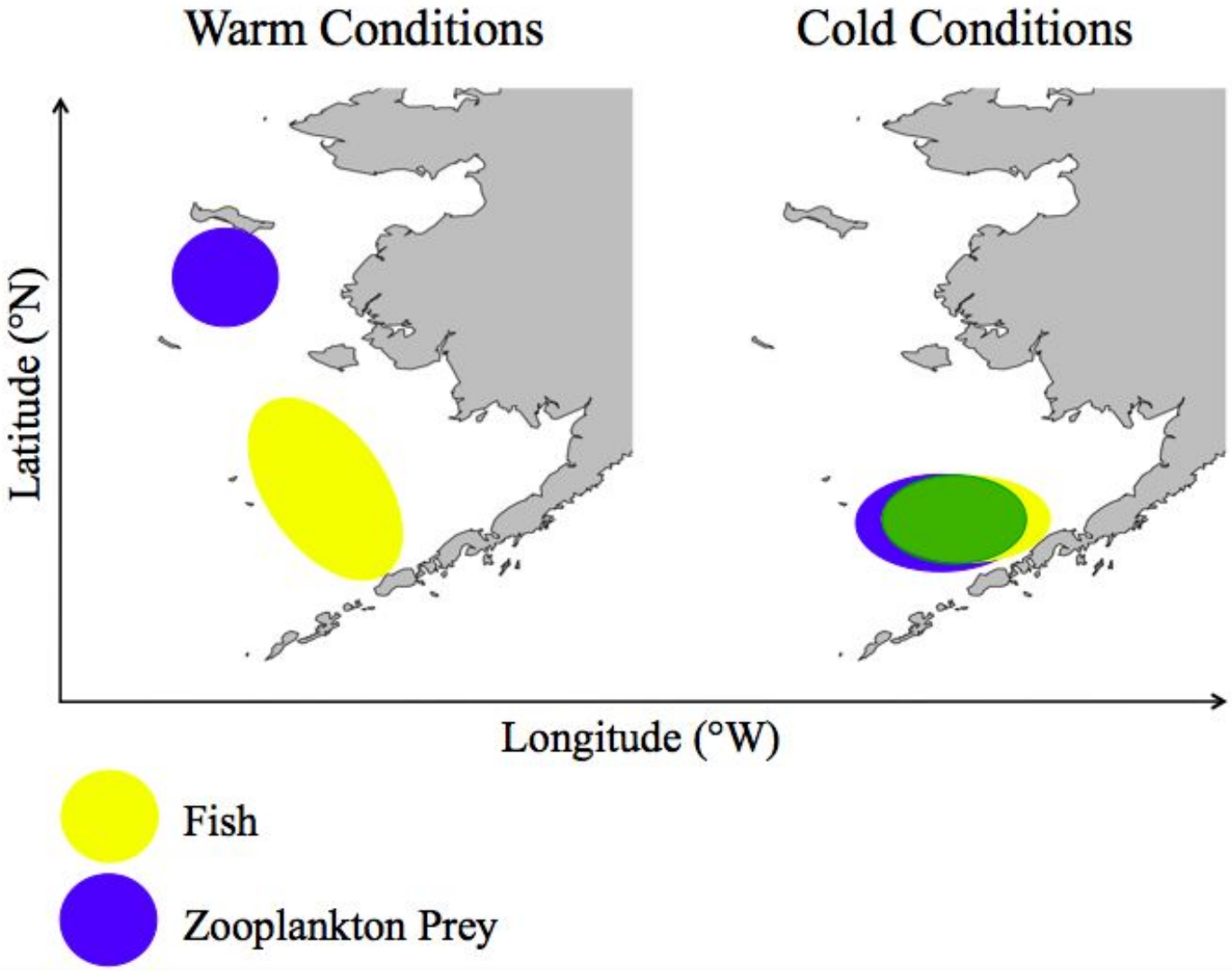
2010: Cold



Siddon et al., 2013 PLOS ONE

Spatial match-mismatch

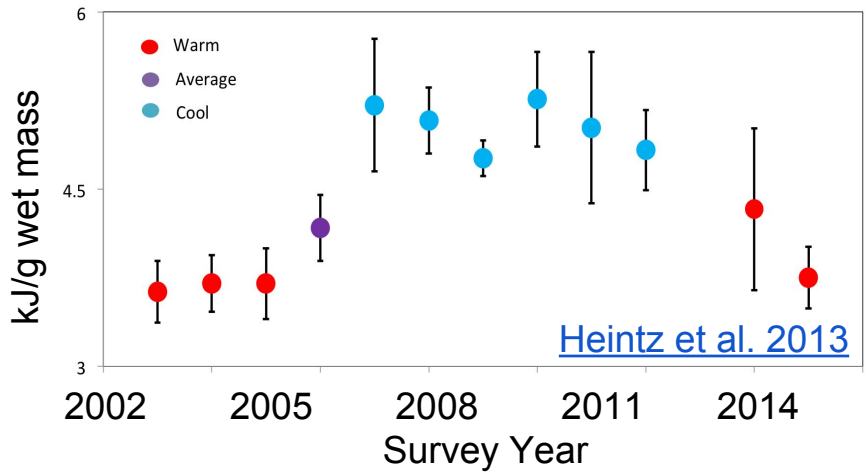
helps explain recruitment variability



Siddon et al., 2013 PLOS ONE

Fall condition of age-0 walleye pollock predicts recruitment of age-3 pollock

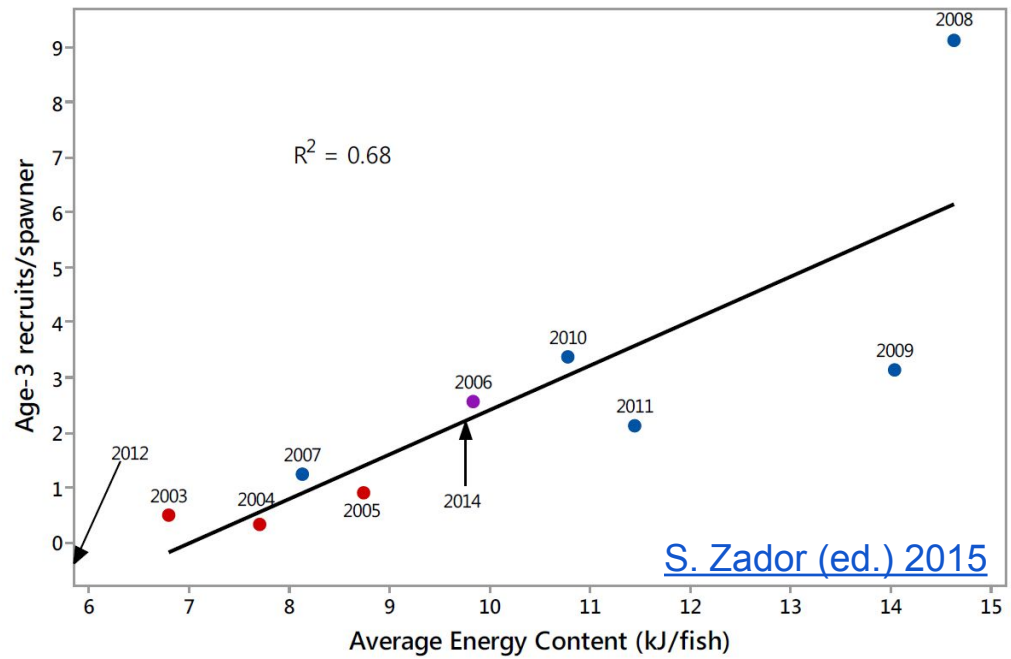
Energy density of age-0s



Energy density influenced by thermal regime; fish size less so

	warm	cool
mass	2.15 g	2.18 g
length	72.6 mm	67.6 mm

Average Energy Content in fall vs. age-3 R/S



Average energy content of age-0 pollock accounted for 68% of the variation in number of age-3 recruits per spawner

2014 energy content indicates age-3 will be intermediate in 2017

TORs 6-8

Ecosystem Considerations

Alaska Marine Ecosystem Considerations

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The Ecosystem Considerations report is produced annually to compile and summarize information about the status of the Alaska Marine Ecosystem for the North Pacific Fisheries Management Council, the scientific community and the public. The report includes ecosystem report cards, ecosystem assessments, and ecosystem and ecosystem-based management indicators for the Eastern Bering Sea (EBS), Aleutian Islands (AI), the Gulf of Alaska (GOA), and Arctic ecosystems.

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- Assessment
- Report Card

Gulf of Alaska
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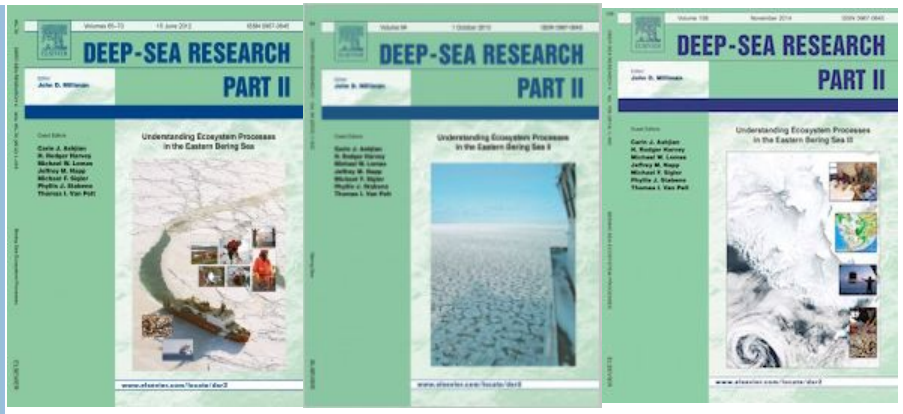
- Hot Topics
  - Too Warm?
  - Age-0 Pollock
  - Marine Mammals

Arctic
- Assessment
- Hot Topics
  - Polar Bears



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Peer-reviewed research publications will be the core outcome of the Bering Sea Project.

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