Climate-mediated processes on the northern and southern shelves of the eastern Bering Sea and some implications for the ecosystem

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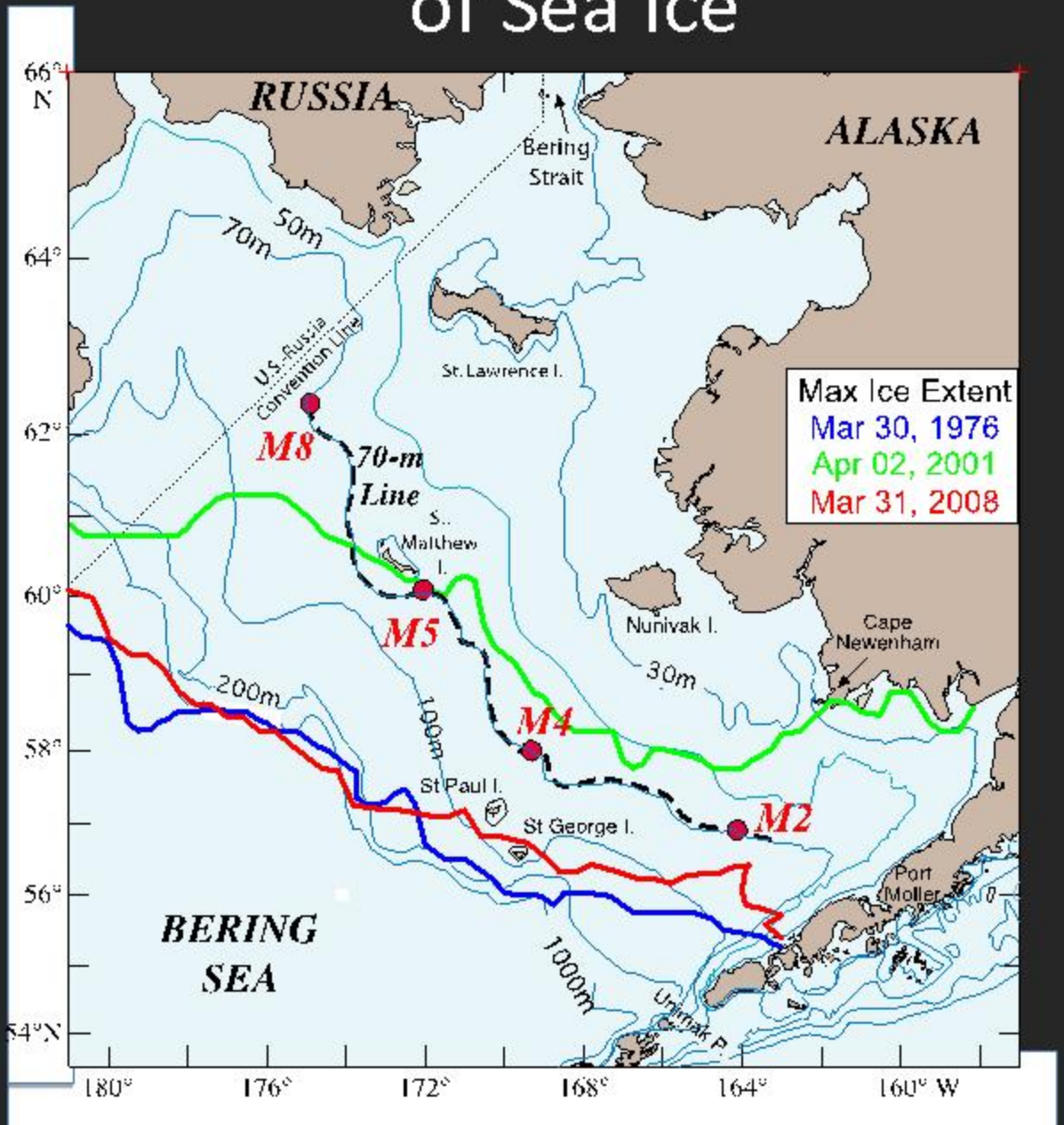
Our Observation System & Annual Extent of Sea Ice

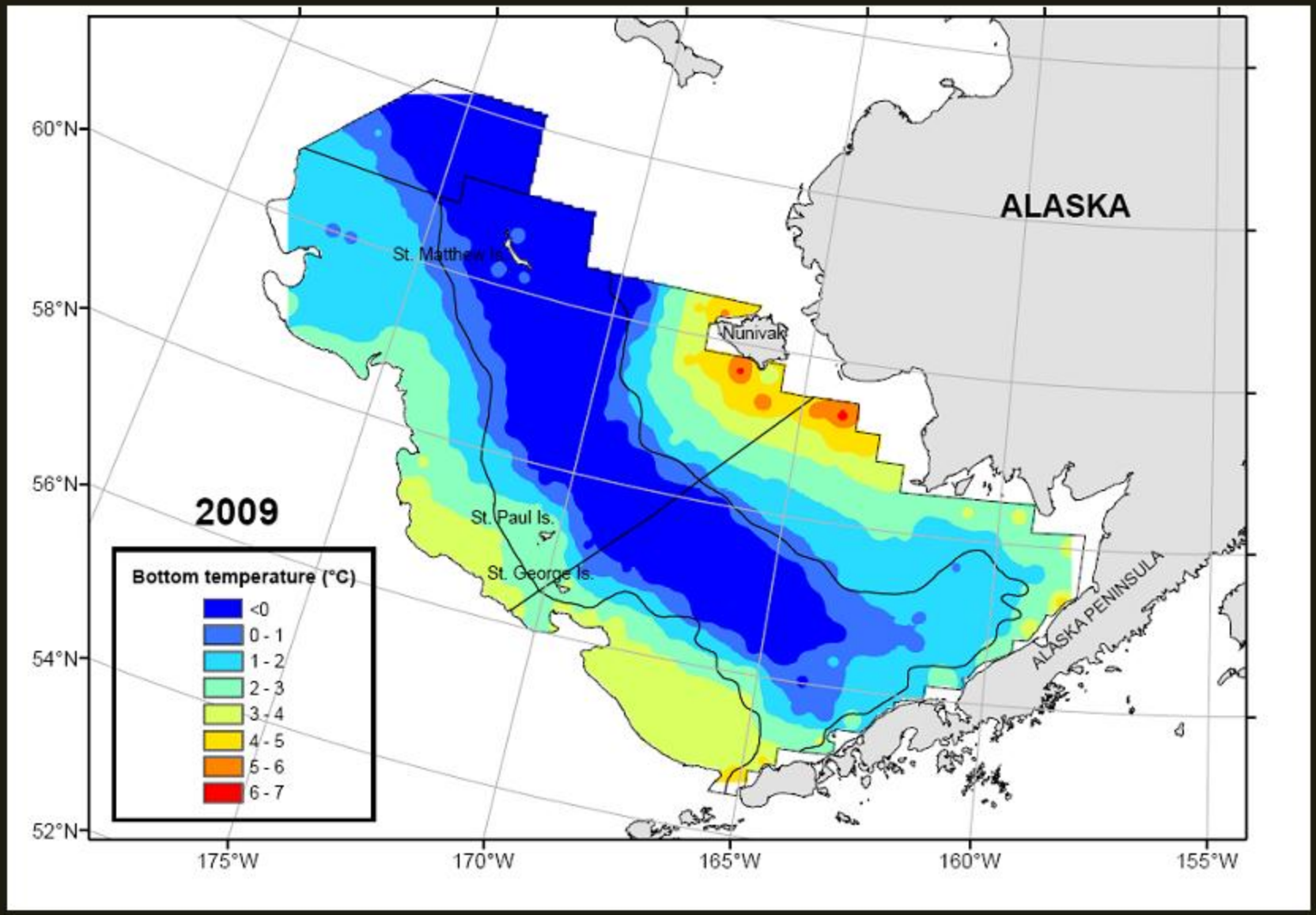


Stabeno et al., 2012, *Deep-Sea Res. II*

BEST-BSIERP Bering Sea Project

bsierp.nprb.org

The Cold Pool



R. Lauth, AFSC/RACE Groundfish Assessment Program

BEST-BSIERP Bering Sea Project

bsierp.nprb.org

Long Term Sea Ice Projections For The Bering Sea

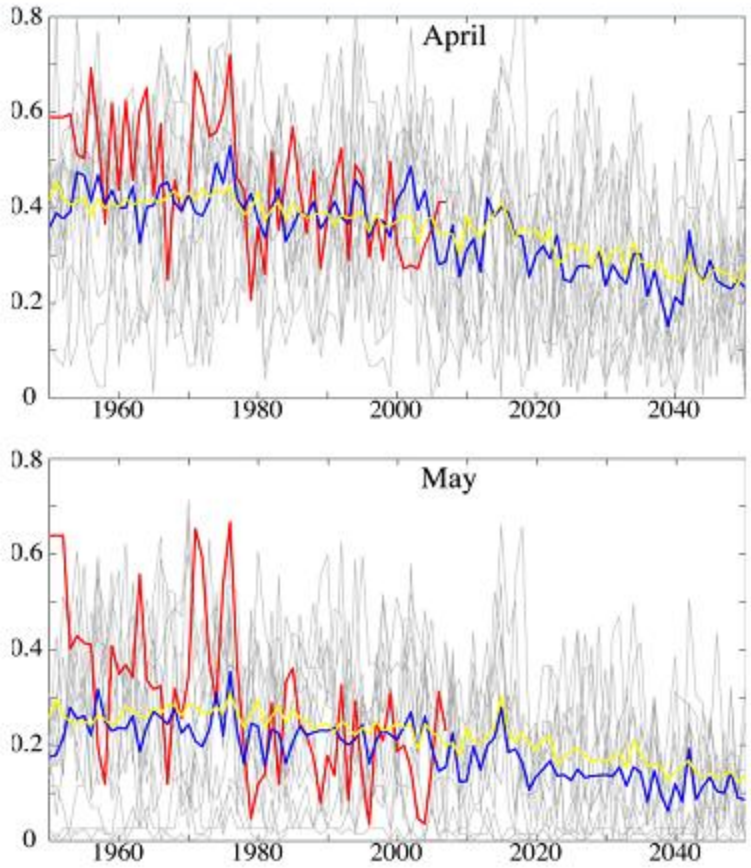


Figure 5. Sea ice area for the Bering Sea (red line) and projections from IPCC AR4 model. Gray lines are individual model projections from four models that simulate Bering Sea ice area well over 1980-1999, and the blue line is the mean value for each year averaged over these individual projections. The yellow line is the mean value for the projections of all 23 IPCC AR4 climate models.

Stabeno et al., 2012, *Deep-Sea Res. II*

A Pan Arctic Warm Event

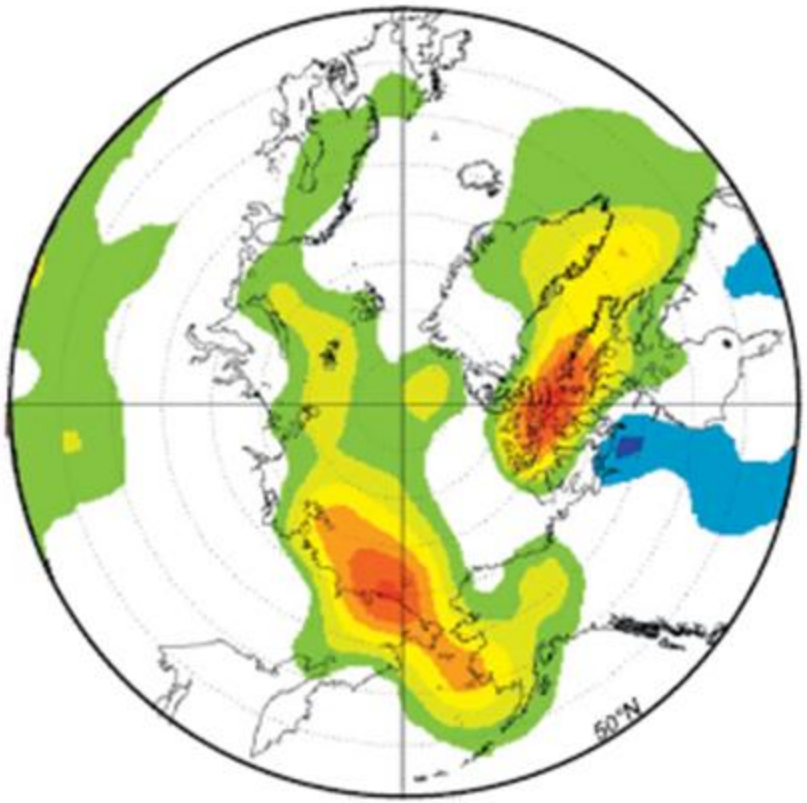
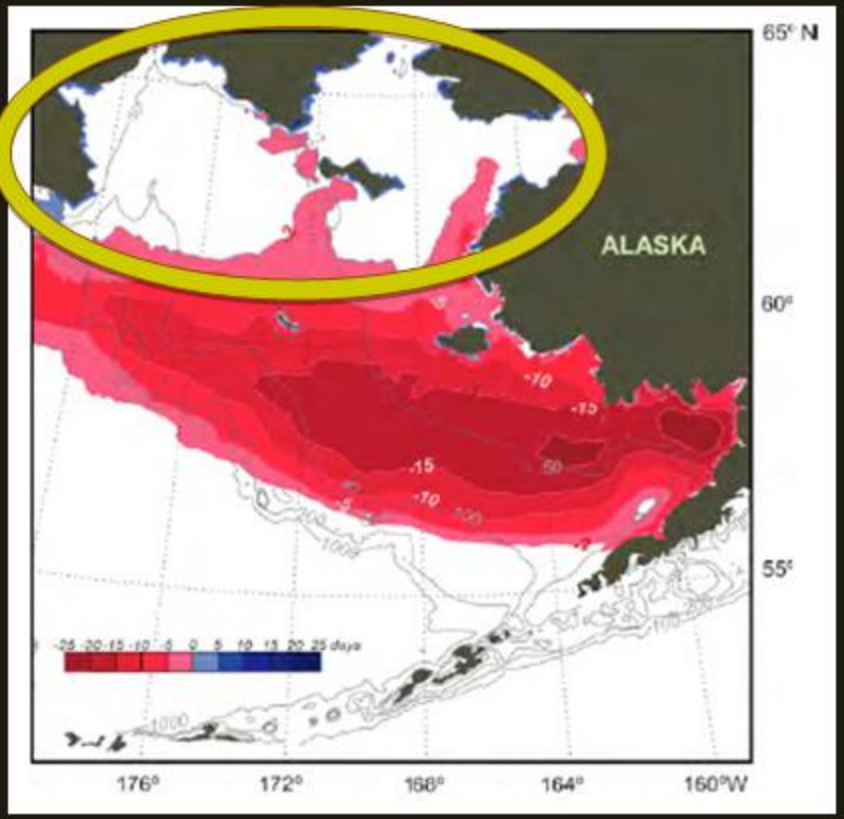


Fig. 5. Near-surface air temperature anomaly (°C) for January through May and composited for the years 2000 through 2005. This figure shows the Arctic-wide nature of recent positive temperature anomalies.

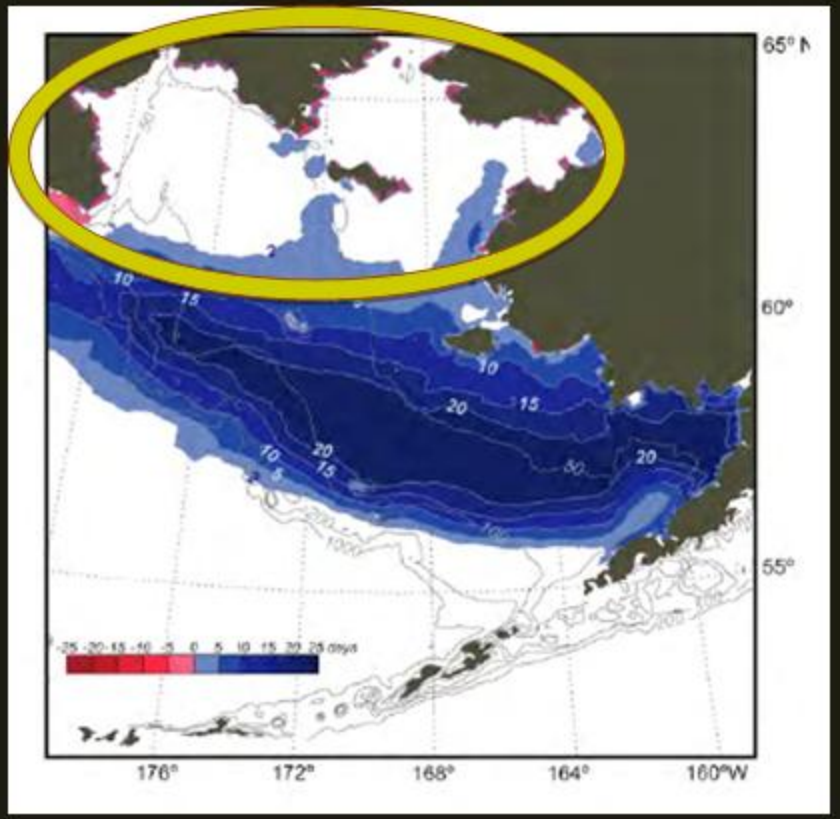
Overland et al., 2012, *Deep-Sea Res. II*

Spatial Distribution of Sea Ice Anomalies

Warm years
2001-2005

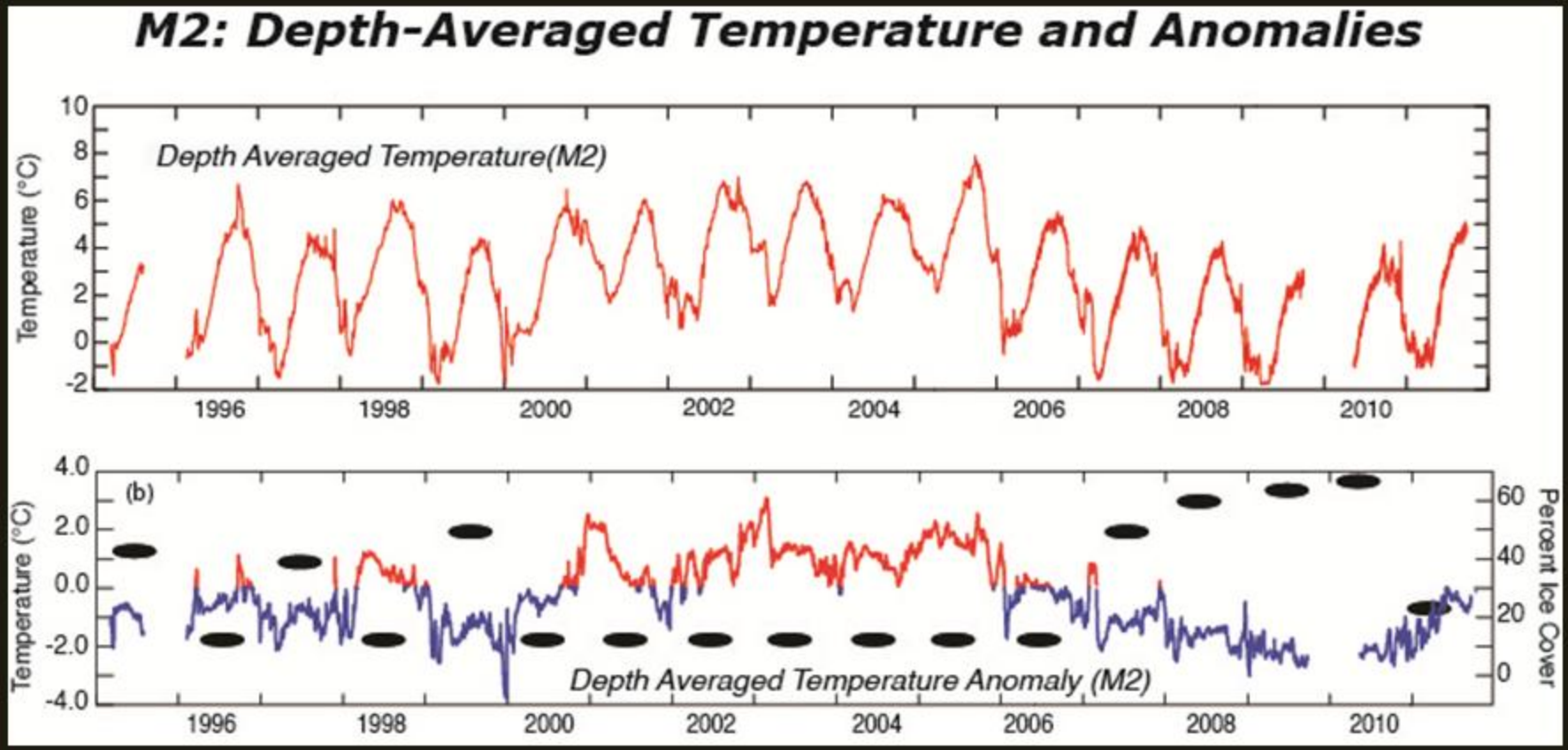


Cold years
2007-2010



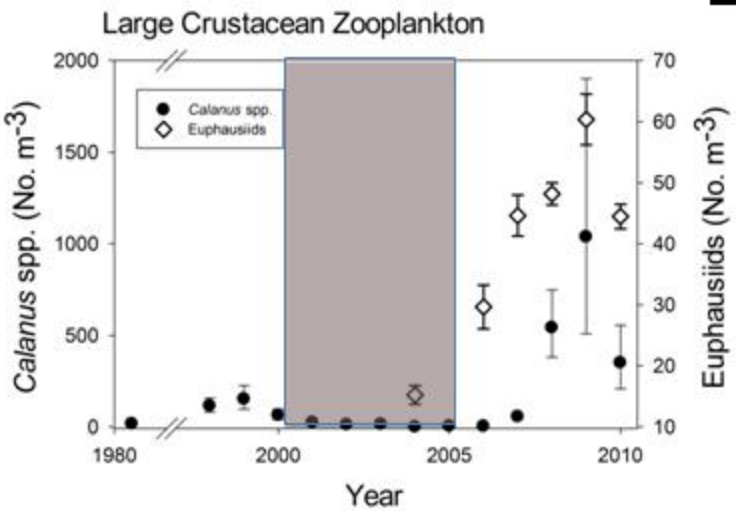
Stabeno et al., 2012, *Deep-Sea Res. II*

Temperatures Over The Southeastern Middle Shelf



Stabeno et al., 2012, *Deep-Sea Res., II*

Large Zooplankton Declined In Warm Years

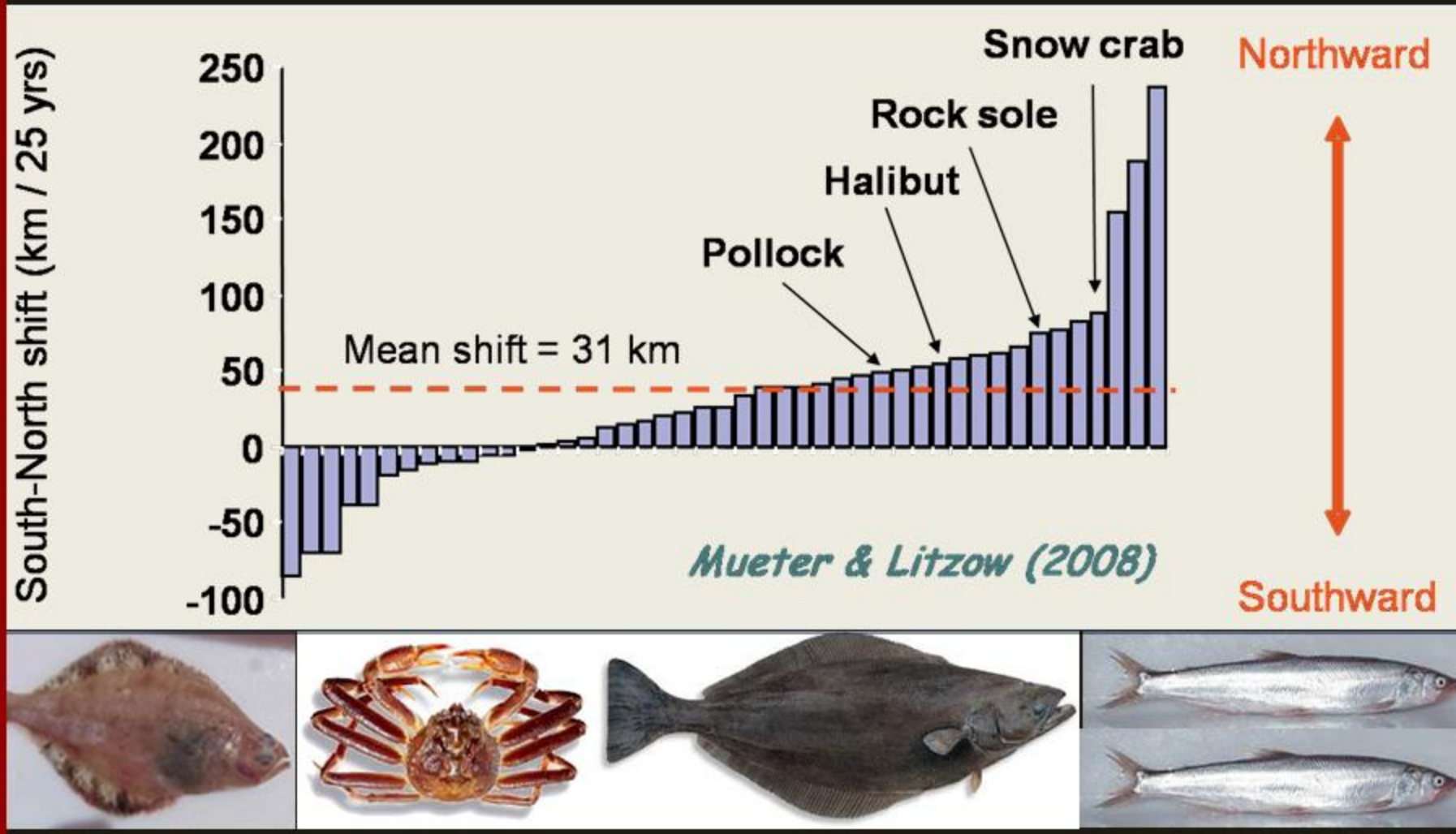


Napp & Ressler, unpublished

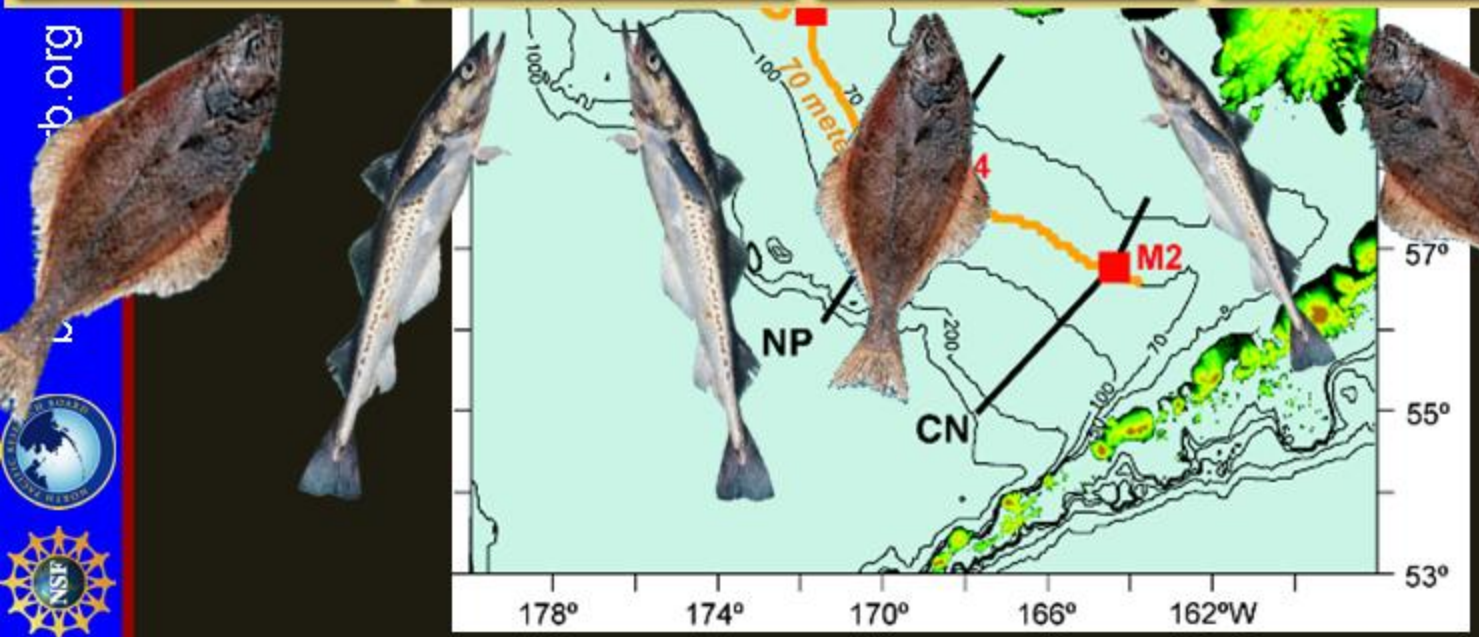
- Decline occurred in all domains except northern inner shelf.
- Small copepods (except *Acartia*) increased in warm years, but only in southern middle shelf.

Eisner, Pinchuk, Napp and Mier, in prep.

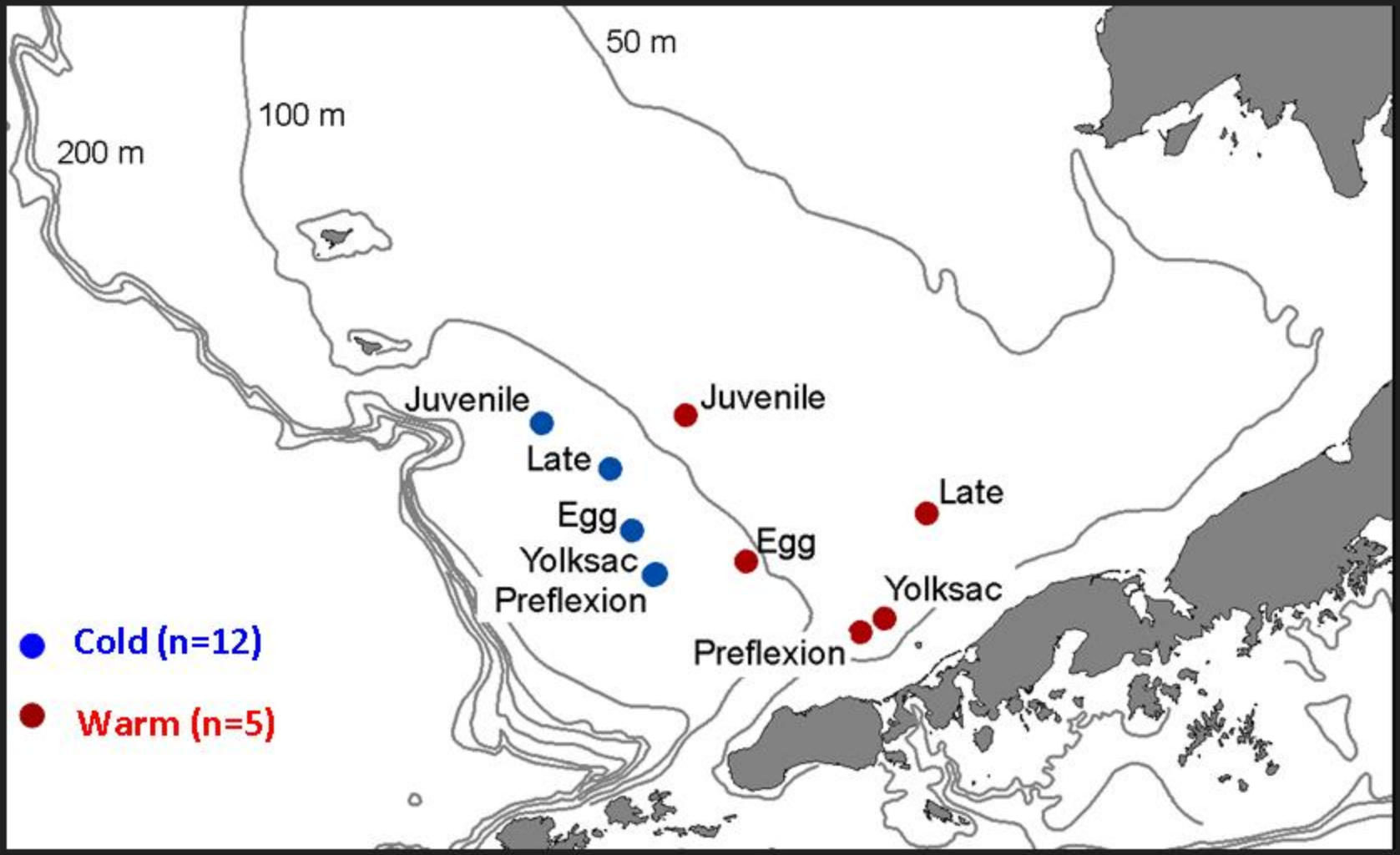
Demersal Species Moved Northward As The Bering Sea Warmed



North-South Barrier ?

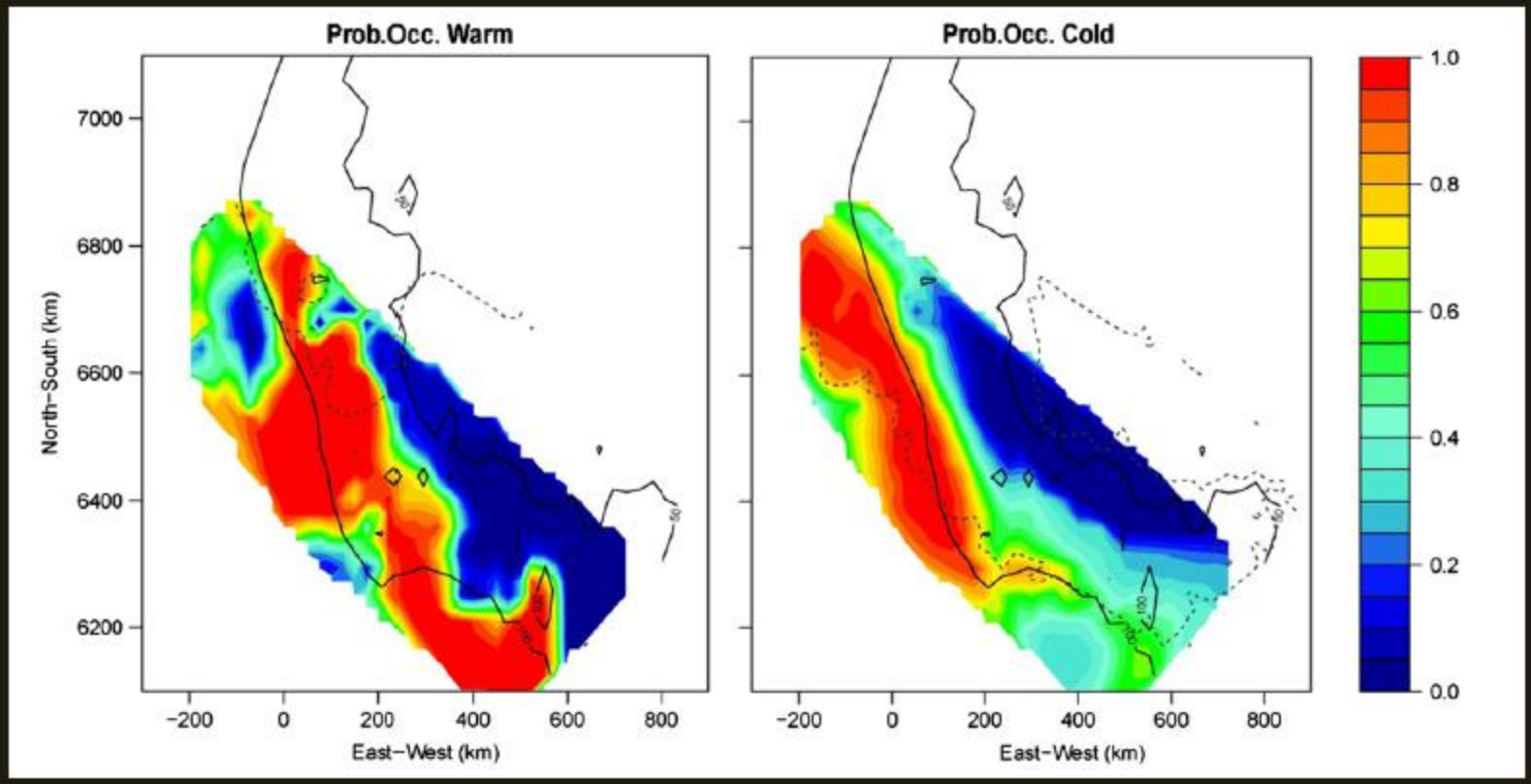


Distribution Of Walleye Pollock Early Life History Stages



Smart et al., 2012, *Deep-Sea Res., II*

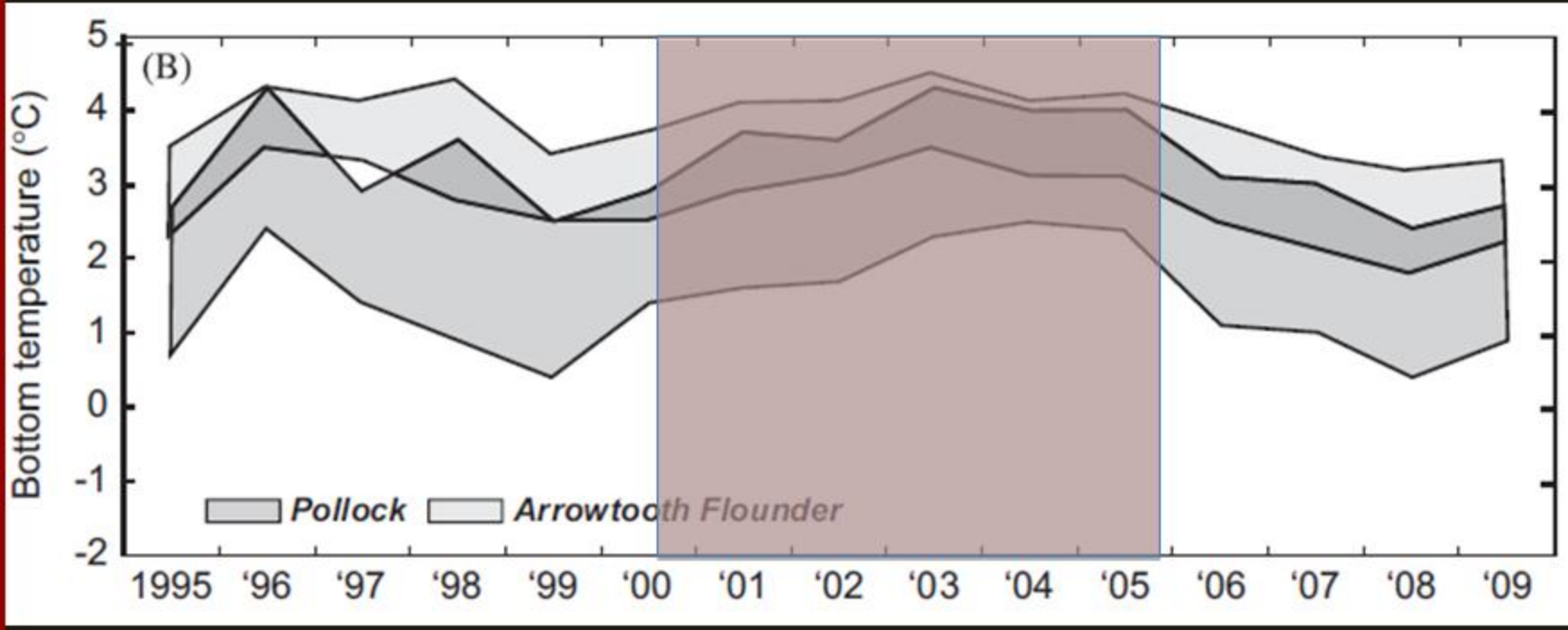
Distribution Of Walleye Pollock Juvenile (Age – 1)



GAM predicted probability of occurrence spatial surfaces derived from acoustic survey estimates of age-1 walleye pollock for years with warm (2004, left) and colder (2006-2009, right) spring water temperatures. Isobaths are 100 and 50 m.

Hollowed et al., 2012, *Deep-Sea Res. II*

When Temperature Affects Spatial Patterns It Can Affect Species Interactions



Range of bottom temperatures for arrowtooth flounder and pollock 1995 to 2009. Ranges shown are the 20th and 80th percentiles of the cumulative frequency of fish density (weight per unit area).

Stabeno et al., 2012, *Deep-Sea Res. II*

Summary

- Our understanding of the ecosystem response to climate variability has dramatically advanced due to our observations systems and support for large integrative ecosystem programs.
- The landscape ecology of the eastern Bering Sea is complex; 3 north – south regions, and 3 east west regions.
- The eastern Bering Sea is a high latitude LME where arctic and subarctic species coexist; it is very sensitive to climate variability.
- The biomass of large zooplankton was reduced in both the southern & central regions during the recent warm period; changes in large crustacean zooplankton had an impact on the system.
- If the cold pool remains in the central eastern Bering Sea, then it may block the northern progression of subarctic species, however there are ways around the cold pool and temperature is not the only affect that should concern us.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Thank you!