COMIDA: Pelagic-Benthic Coupling and Benthic Community Structure in the Chukchi Sea

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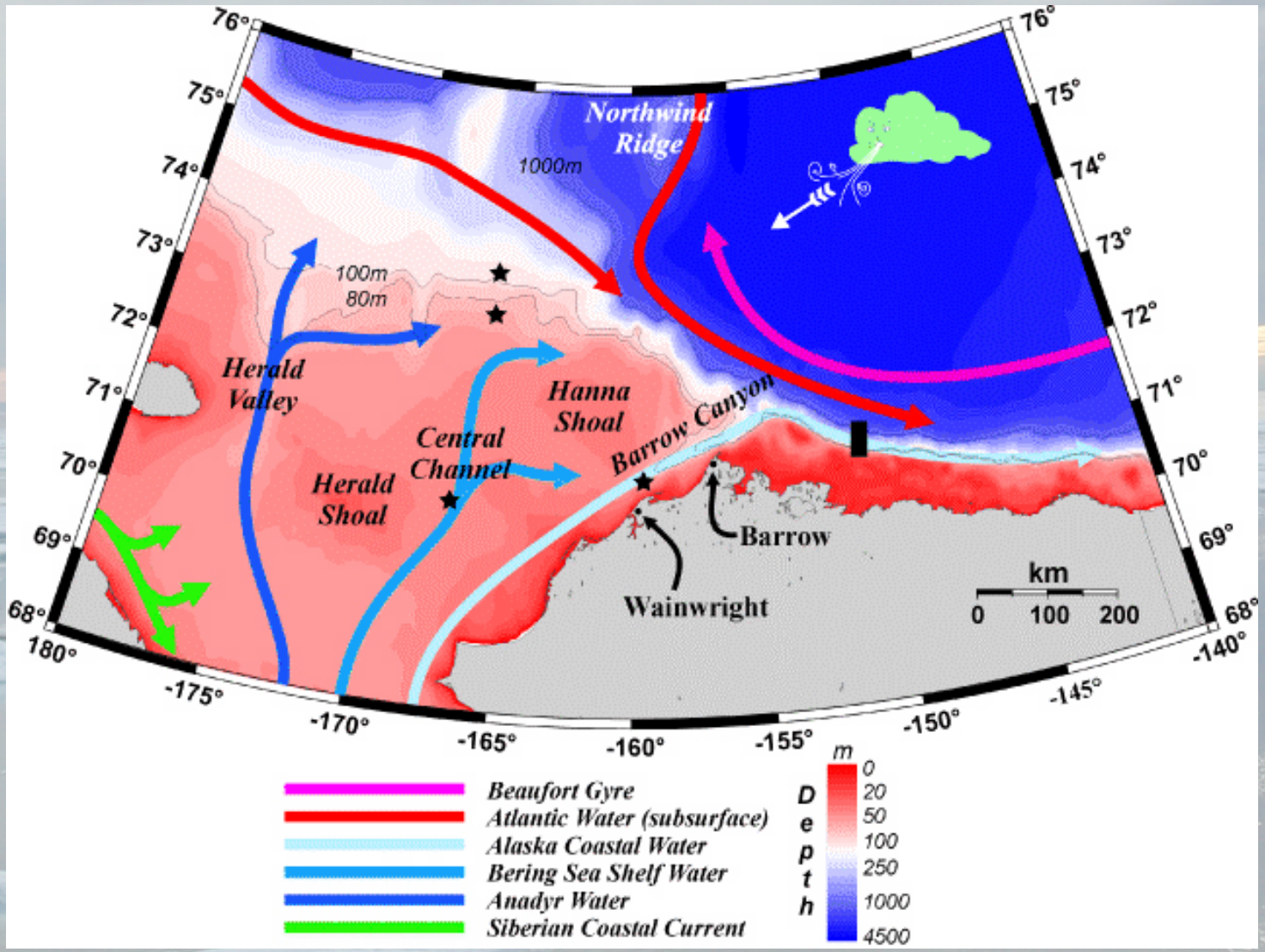
Chukchi Sea Offshore Monitoring in the Drilling Area (COMIDA): Chemical and Benthos (CAB) Program Objectives

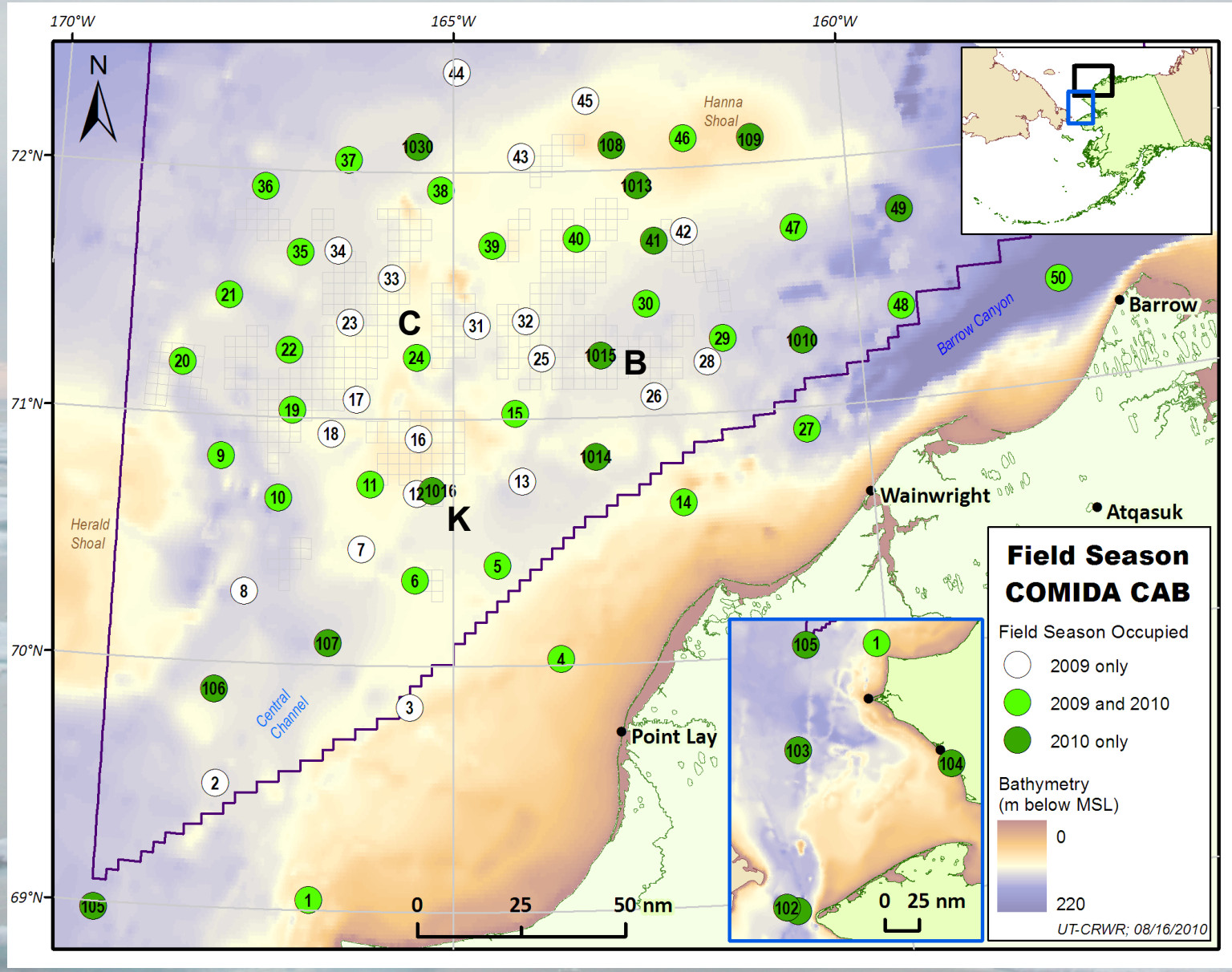
- Conduct open-water baseline measurements of benthic biological resources and biogeochemical indicators
- Examine the current spatial structure of the ecosystem to better understand the seasonal, inter-annual, and long-term climate change impacts on the ecosystem
- Major tasks of infaunal component include: infaunal collections with 0.1 m^2 van Veen grab for population studies, sediment oxygen uptake via HAPS benthic corer, sediment parameters (grain size, total organic carbon, C/N)

Water mass structure in the Chukchi Sea

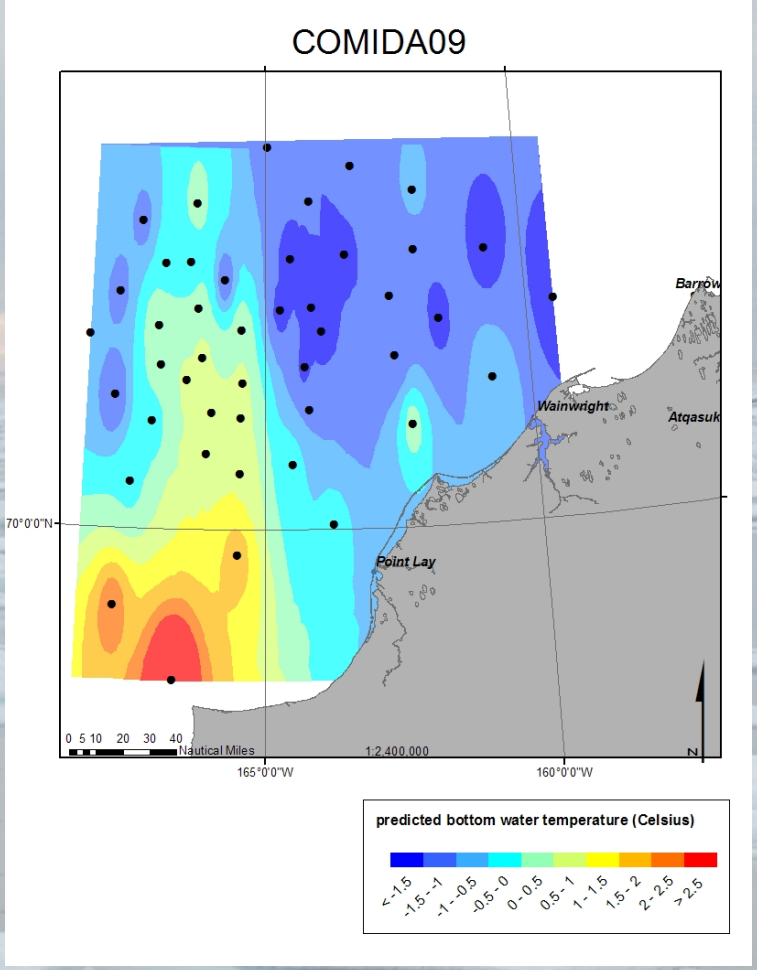


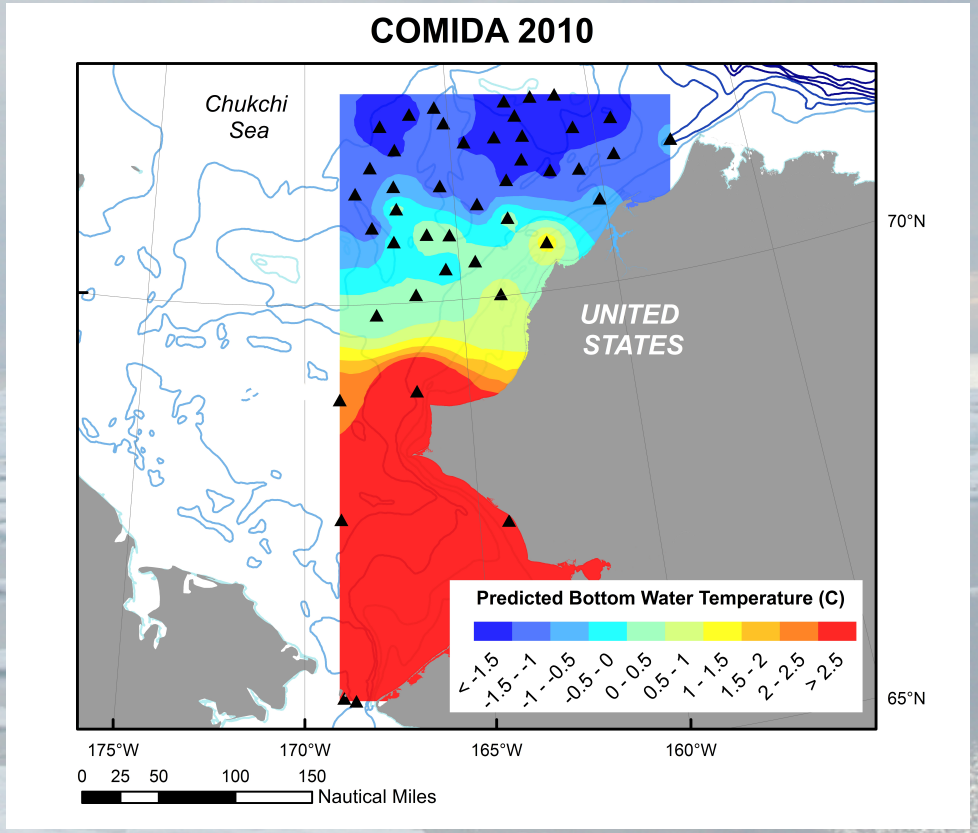
[courtesy Tom Weingartner and Seth Danielson]

COMIDA sampling sites in 2009 and 2010



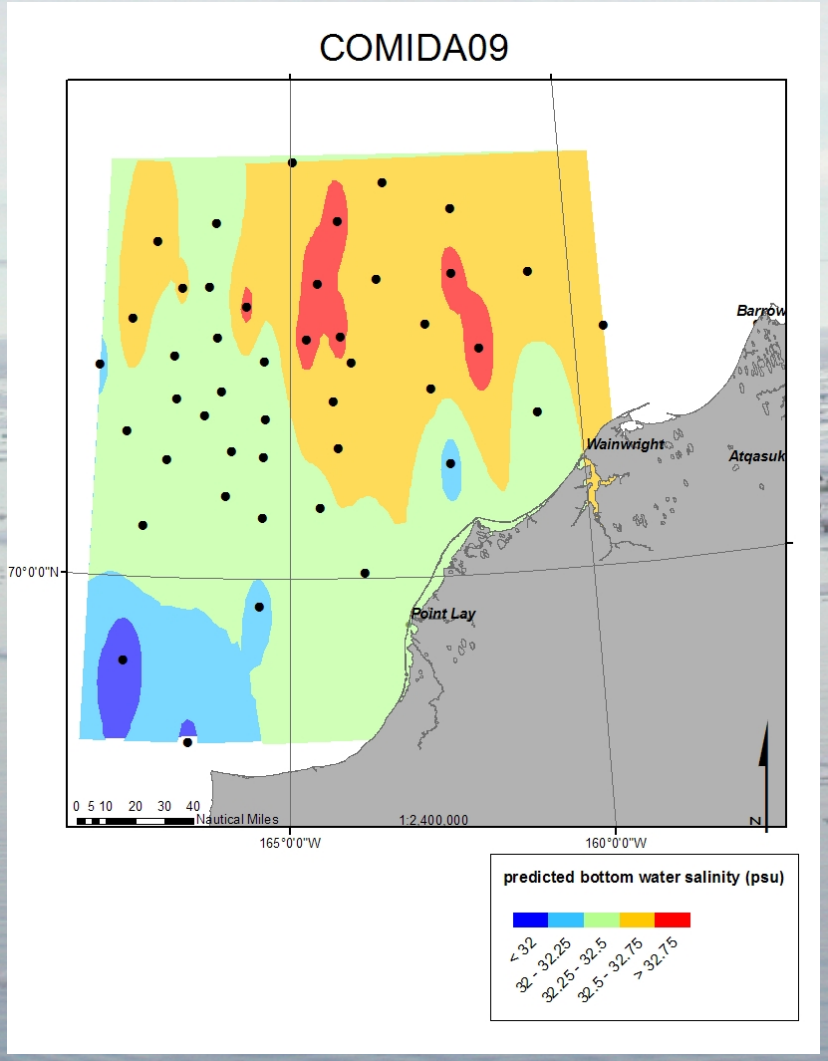
Bottom water temperature during COMIDA 2009 and 2010

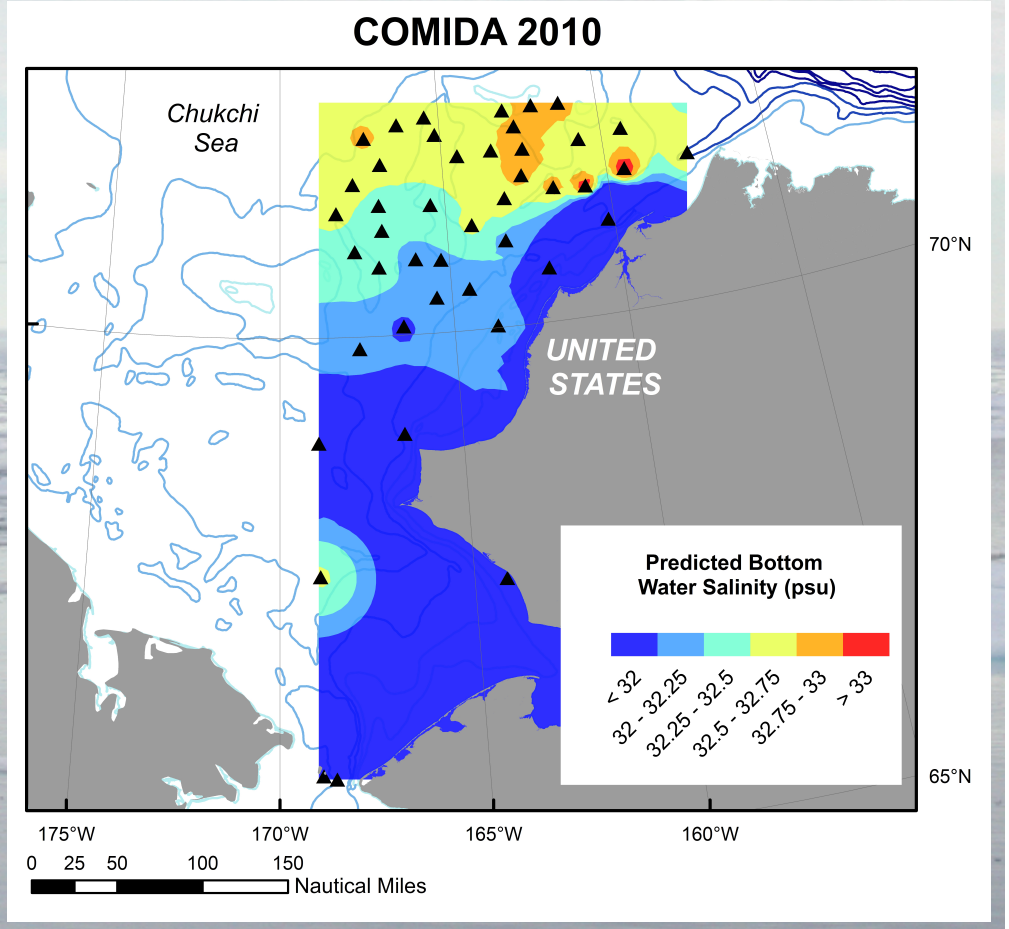




- warmer water in nearshore Alaska Coastal water in 2010

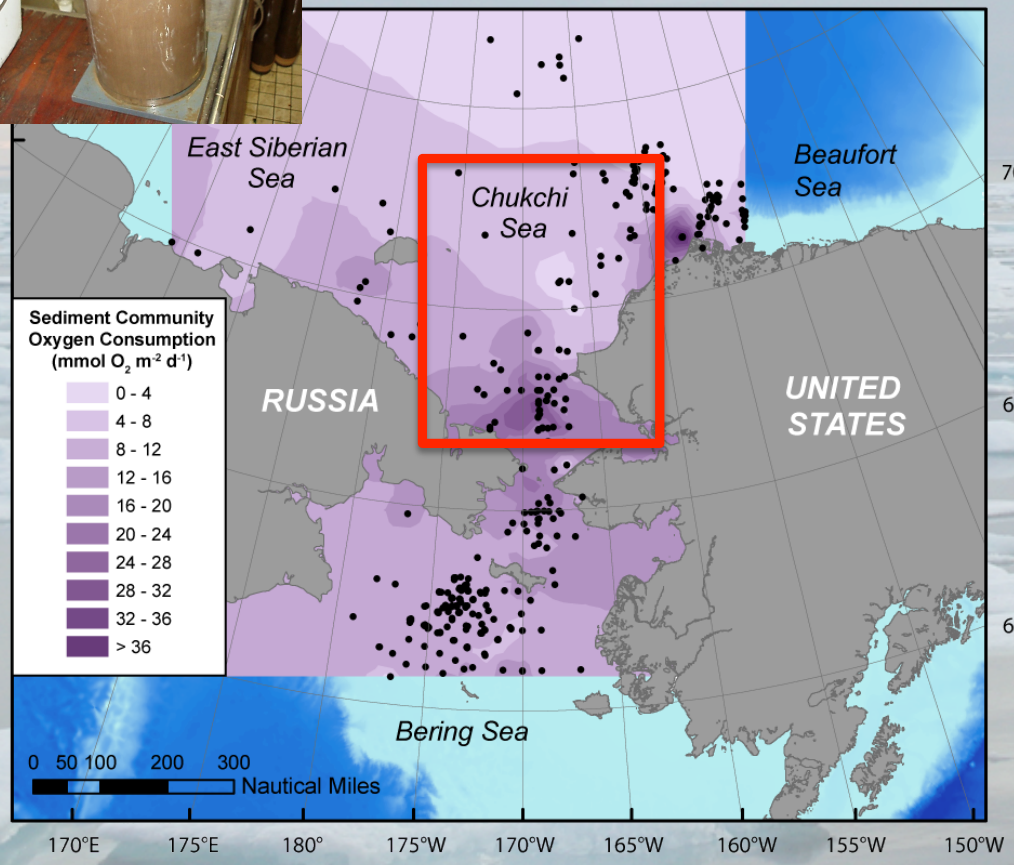
Bottom water salinity during COMIDA 2009 and 2010

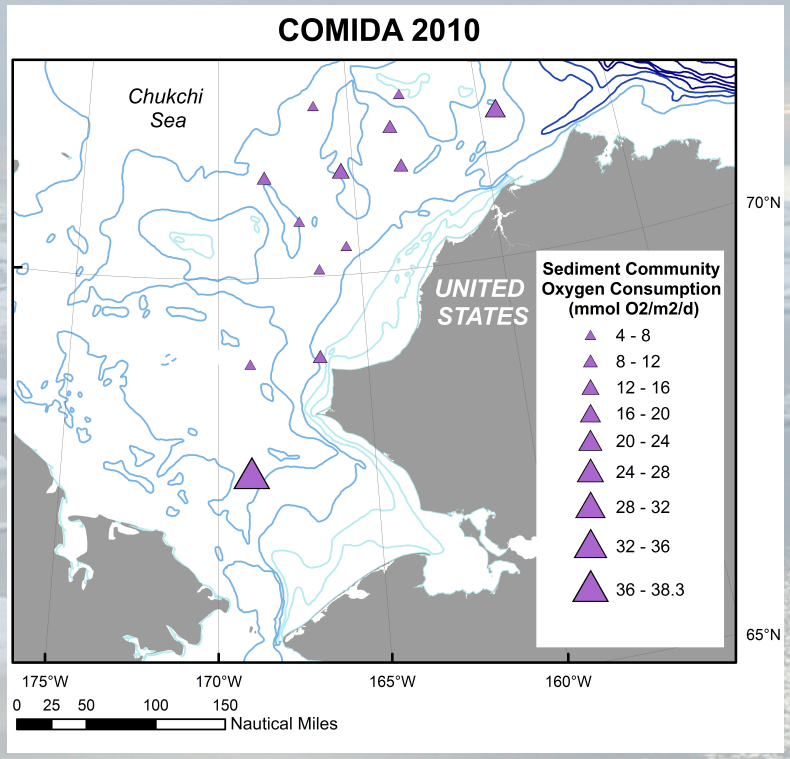




- Increased freshening in nearshore Alaska Coastal water in 2010

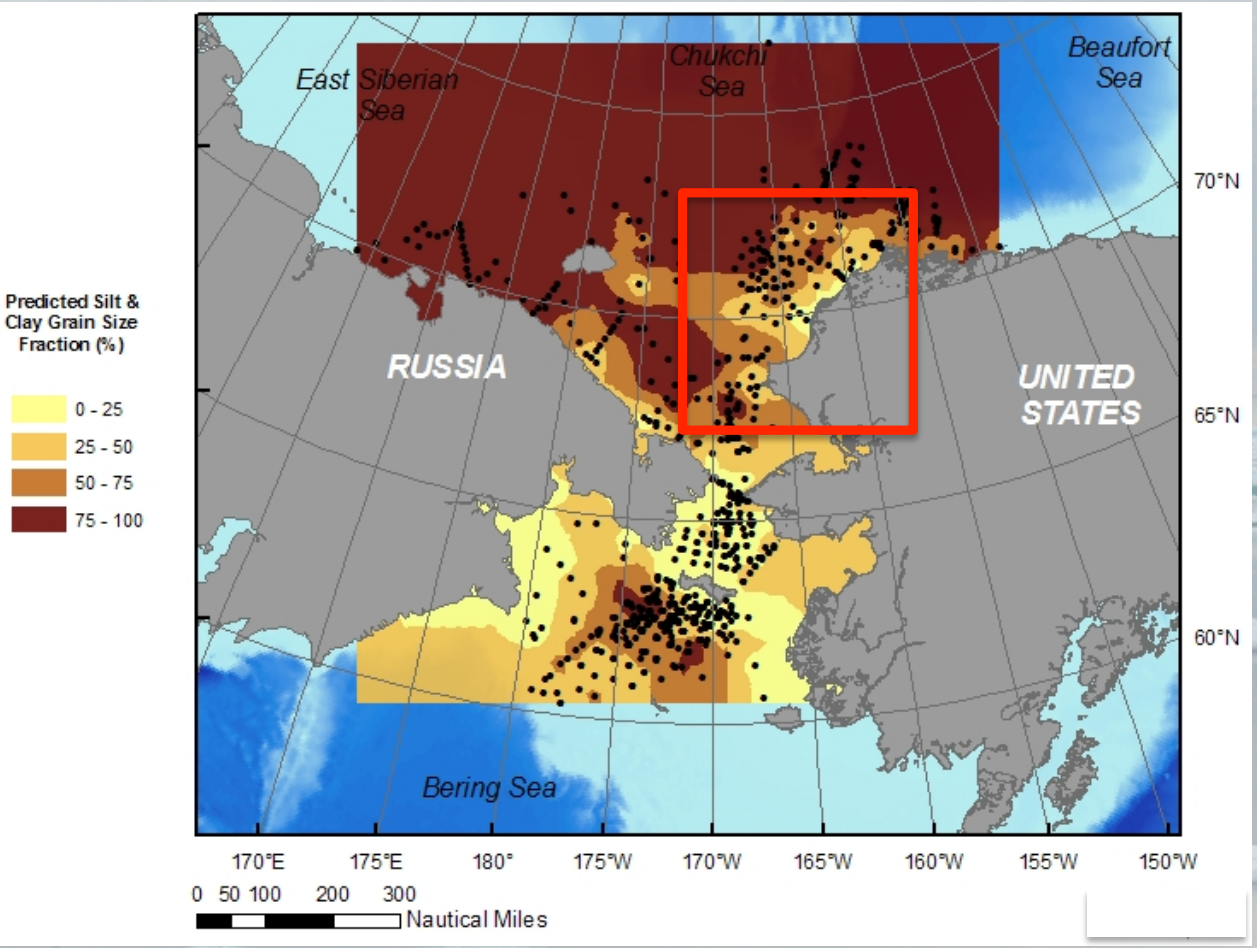
Sediment community oxygen consumption: spatial patterns indicate variation organic carbon deposition to the sediments



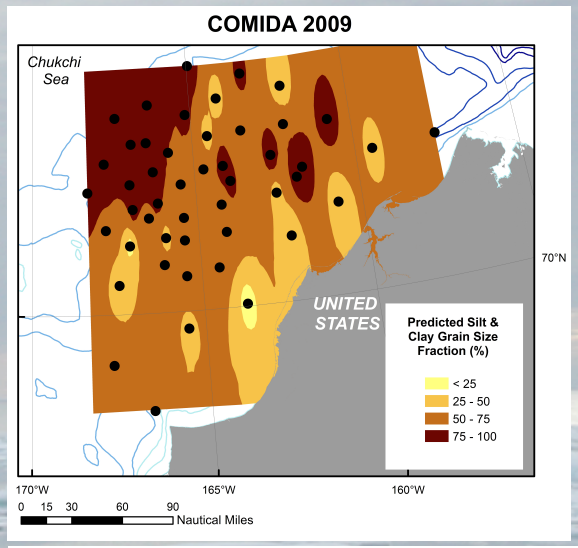


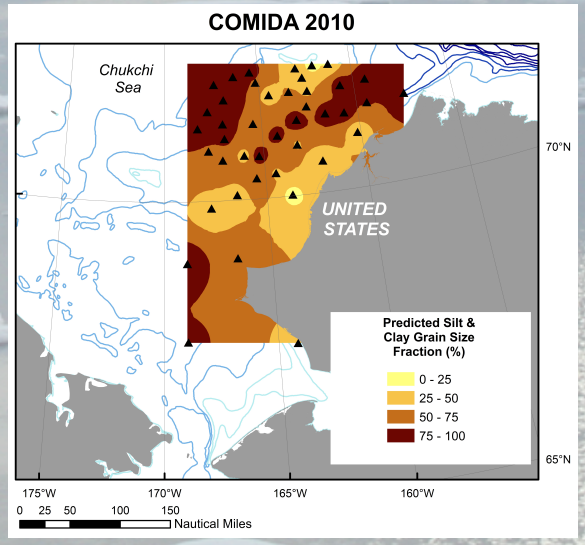
[updated from Grebmeier et al. 2006; in prep.]

Surface sediment silt and clay content is related to current speed

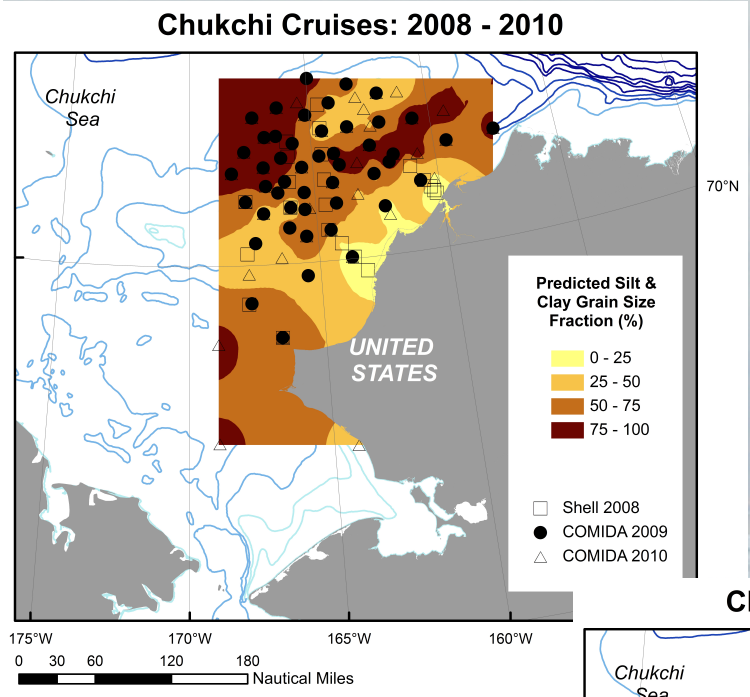


[Time composite 1970-2010, Grebmeier et al. in prep.]

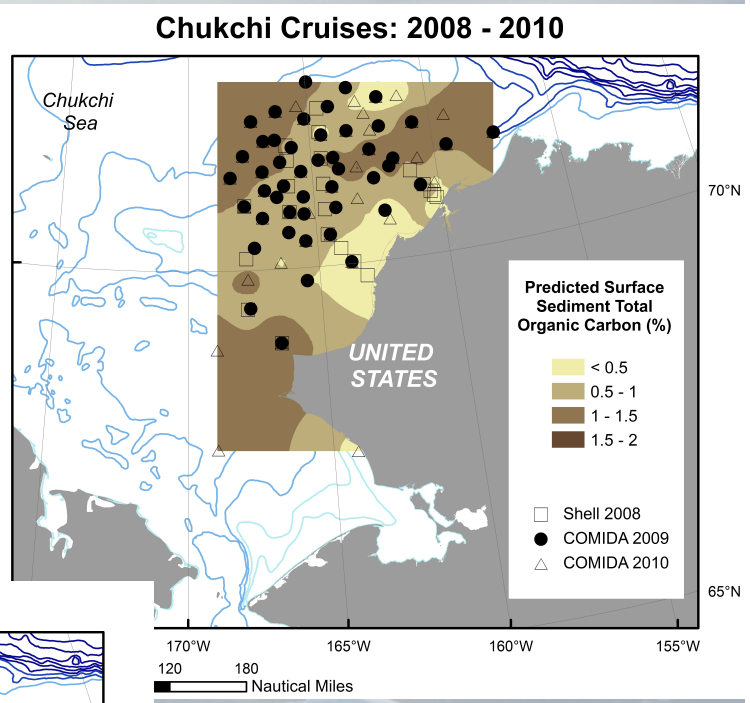


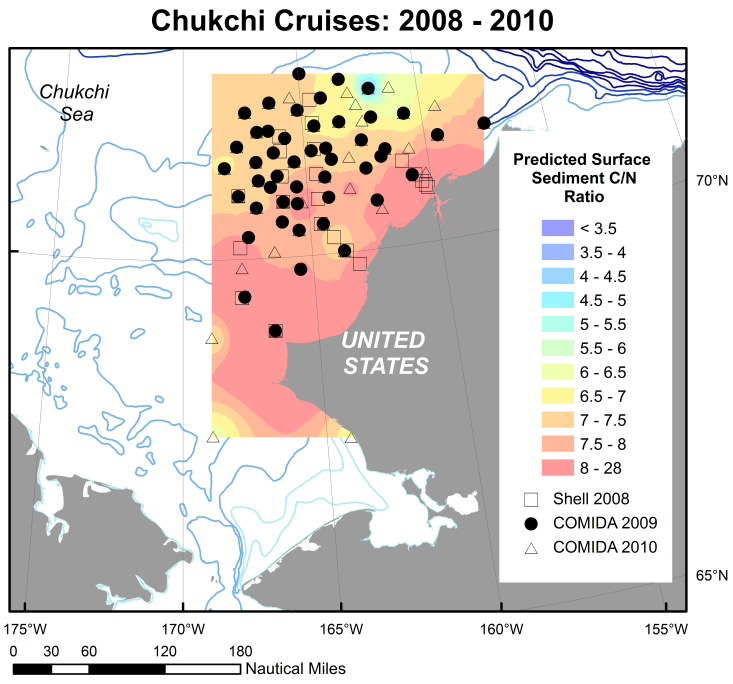


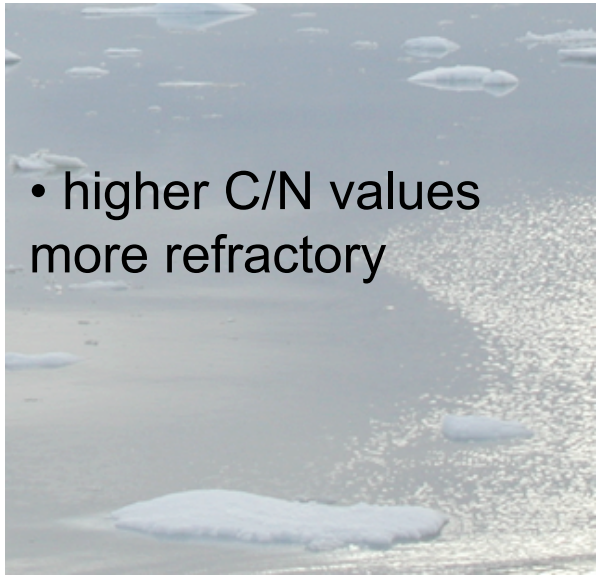
Surface sediment indicators from 2008-2010



- Total organic carbon correlated to silt and clay content



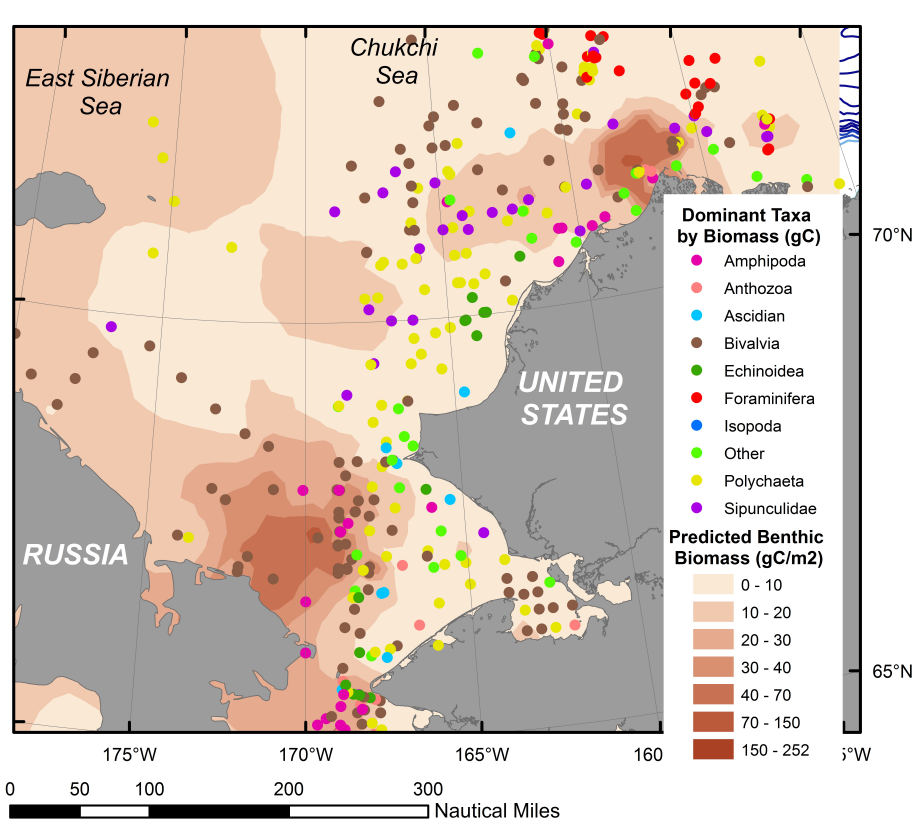


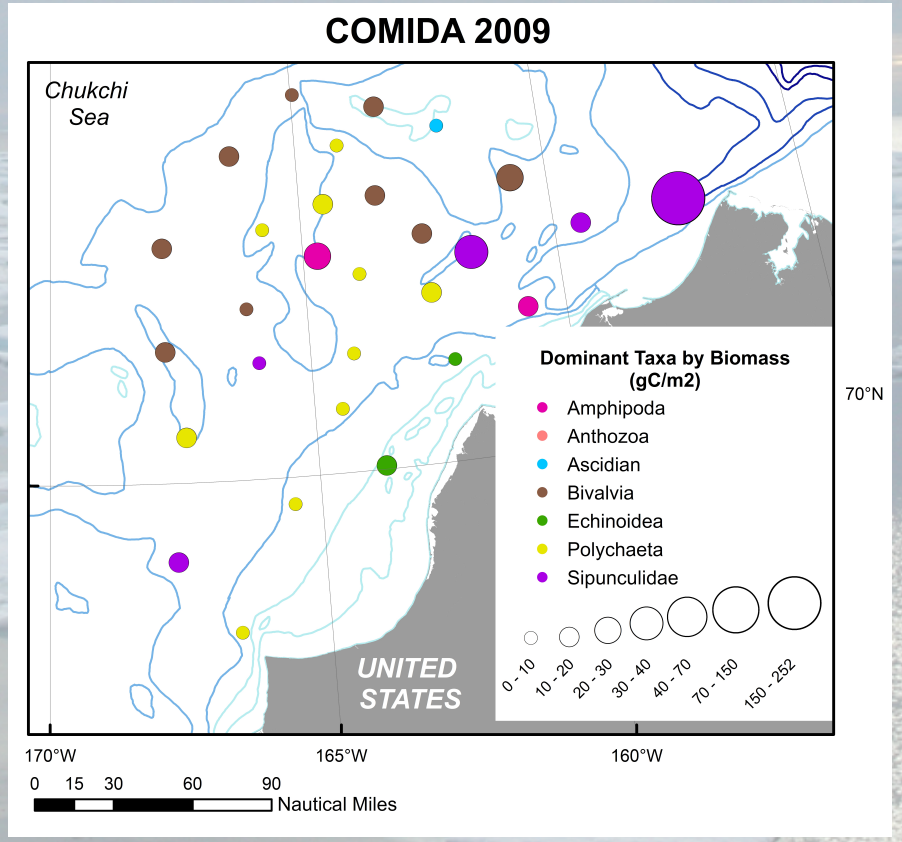


- higher C/N values more refractory

Rich benthic communities on the western side of the Chukchi Sea system

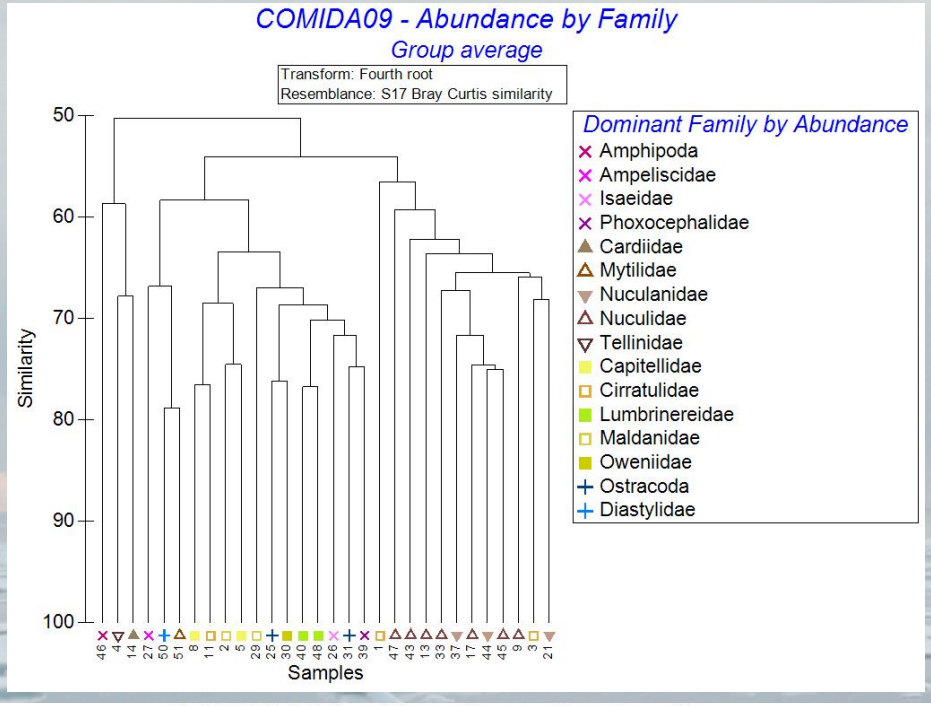
- **"foot prints"** of high benthic biomass reflect pelagic-benthic coupling and export of carbon to sediments
- macroinfaunal biomass dominated by bivalves, polychaetes, amphipods and sipunculids



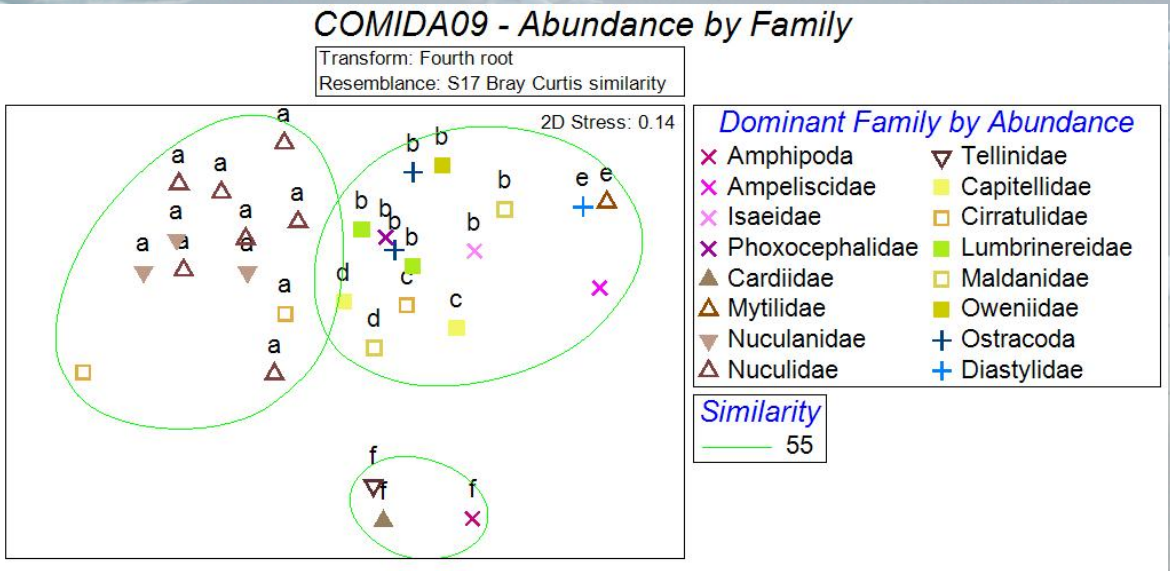


[modified from Grebmeier et al. 2006; in prep.]

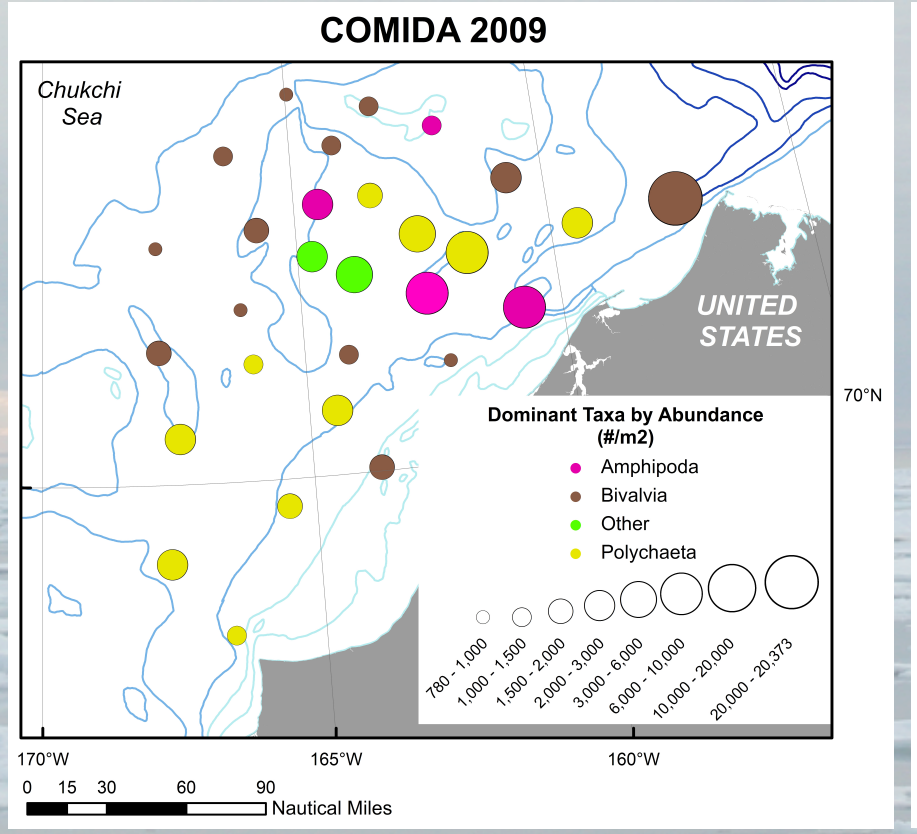
Dendrograms and MDS for family abundance

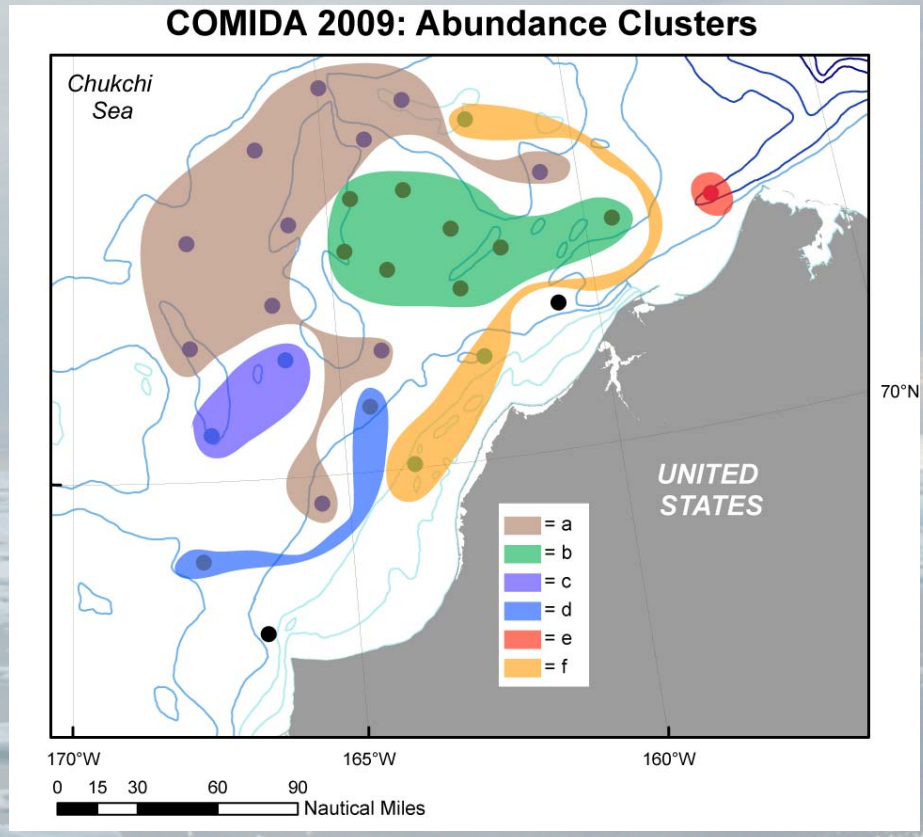


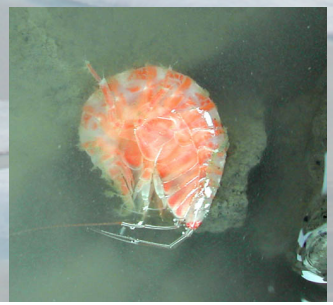
- 6 major groups clustering at about 65% similarity
- dominated by amphipods, bivalves, and polychaetes



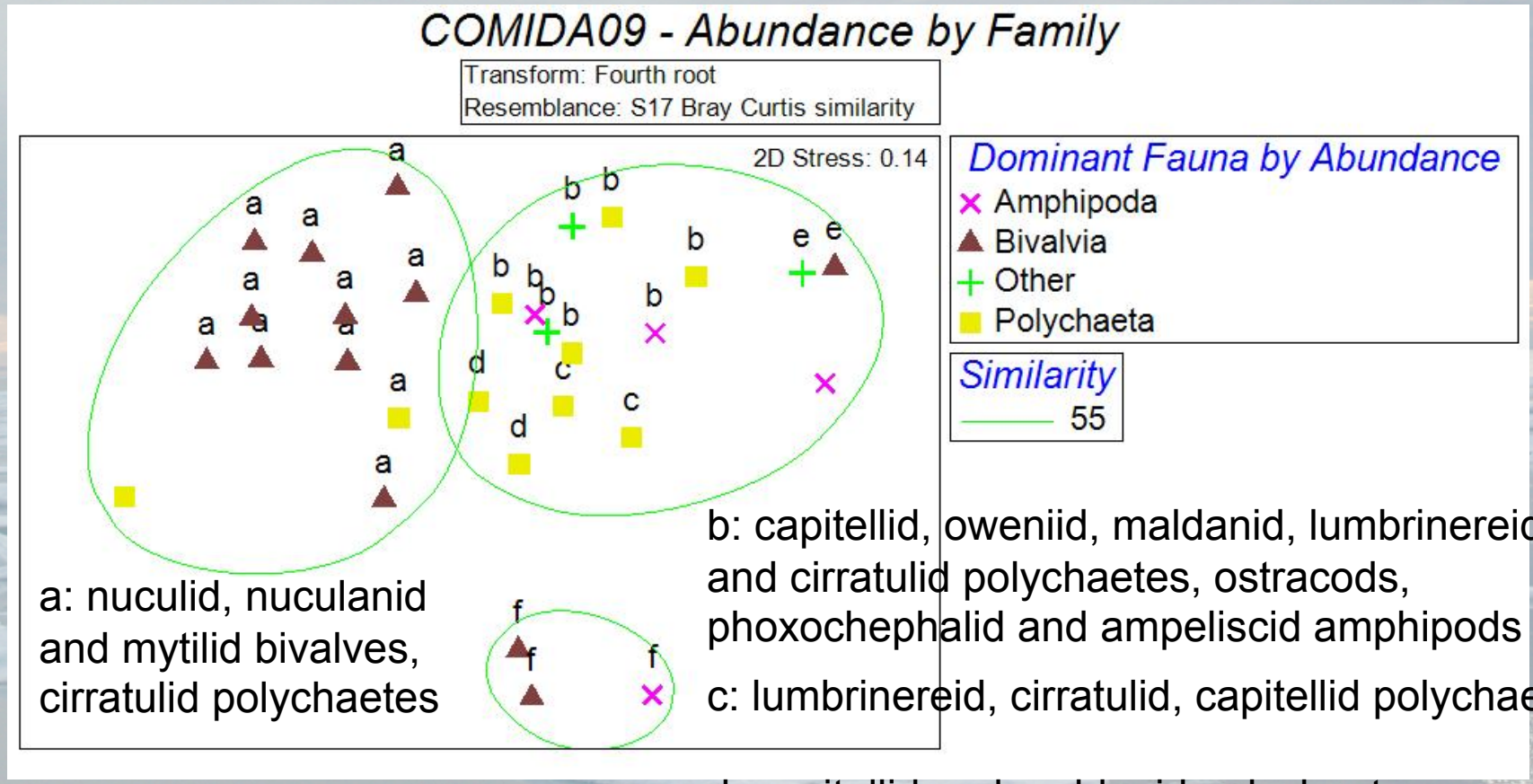
Six dominant cluster groups by abundance







MDS of dominant faunal cluster station groups by abundance and faunal type



a: nuculid, nuculanid and mytilid bivalves, cirratulid polychaetes

b: capitellid, oweniid, maldanid, lumbrinereid, and cirratulid polychaetes, ostracods, phoxochephalid and ampeliscid amphipods

c: lumbrinereid, cirratulid, capitellid polychaetes

d: capitellid and maldanid polychaetes

e: mytilid bivalves, diastylid cumaceans

f: cardiid and tellinid bivalves, amphipod sp.

[using PRIMER 6 statistical package]

Summary

- Chukchi Sea is experiencing changing in sea ice cover and hydrographic forcing that can influence ecosystem trophic structure, pelagic-benthic coupling and sediment structure

- Infaunal abundance highest in troughs between the Alaska coast and offshore shoals compared to shallow nearshore and offshore shoals

- Infaunal benthic biomass was more variable, with the highest macroinfaunal biomass in the Chukchi shelf troughs and at the head of Barrow Canyon

- Sediment organic carbon highest in offshore fine silt and clay sediments, with C/N ratios lowest in offshore waters (=labile carbon), compared to more refractory organic materials (C/N>8) in nearshore surface sediments

- Both spatial and time series sites important to track status and change of the benthic system with sea ice change

Thank you. Any questions?

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