

Benthic Population Dynamics within the RUSALCA Program

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Benthic Carbon Cycling and Ecosystem Structure in the Pacific Arctic Region as part of RUSALCA



Objectives

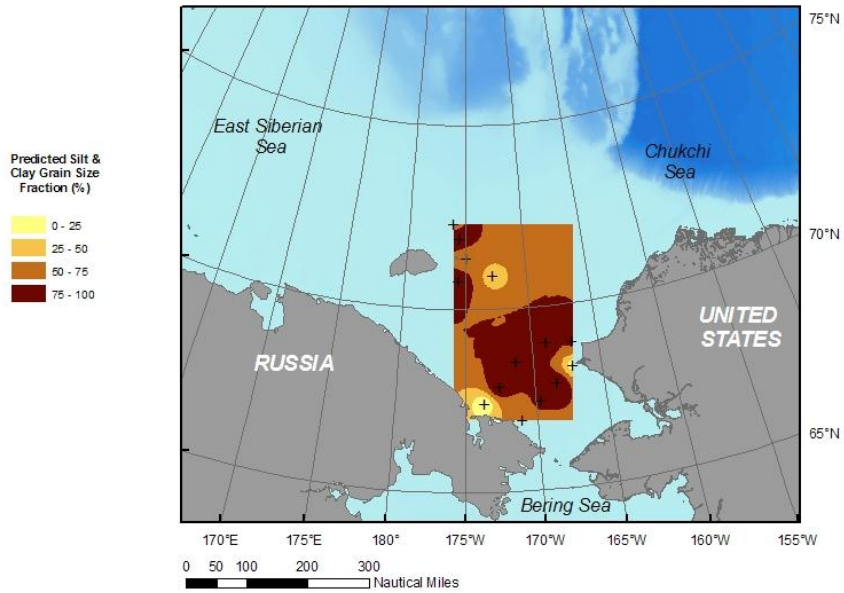
- evaluate carbon export to benthos via sediment oxygen uptake and nutrient exchange studies (HAPS corer)
- sediment indicators (TOC, chl a, grain size)
- benthic infaunal population structure and biomass (133 cm² cores and 0.1 m² van Veen grabs)
- stable and radioisotope analyses

PIs: Jackie Grebmeier and Lee Cooper, UMCES/CBL

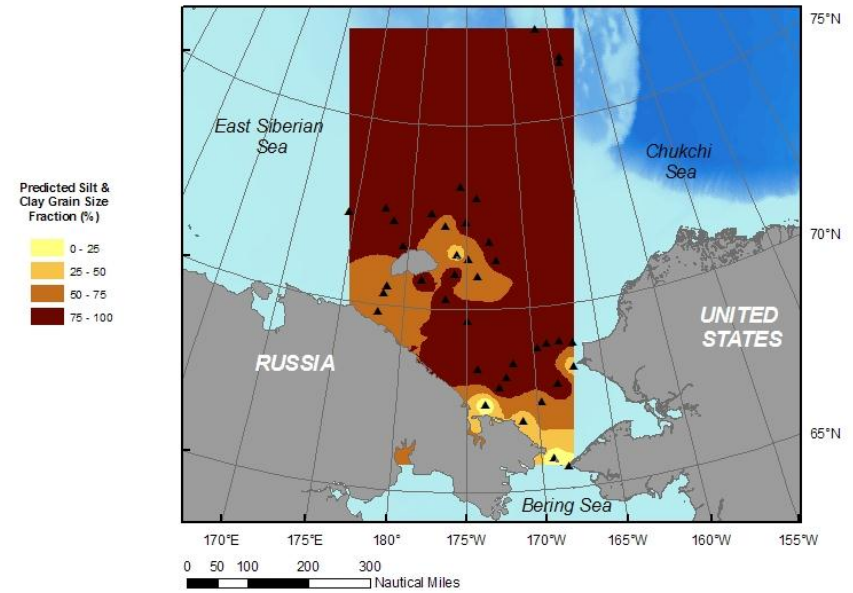


% Silt and clay content-indicator of deposition zones

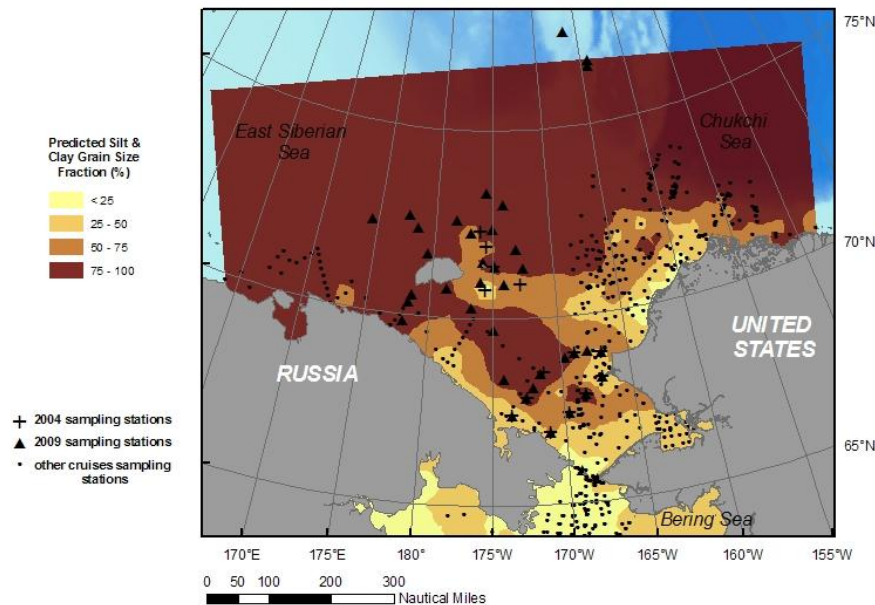
RUSALCA04



RUSALCA09



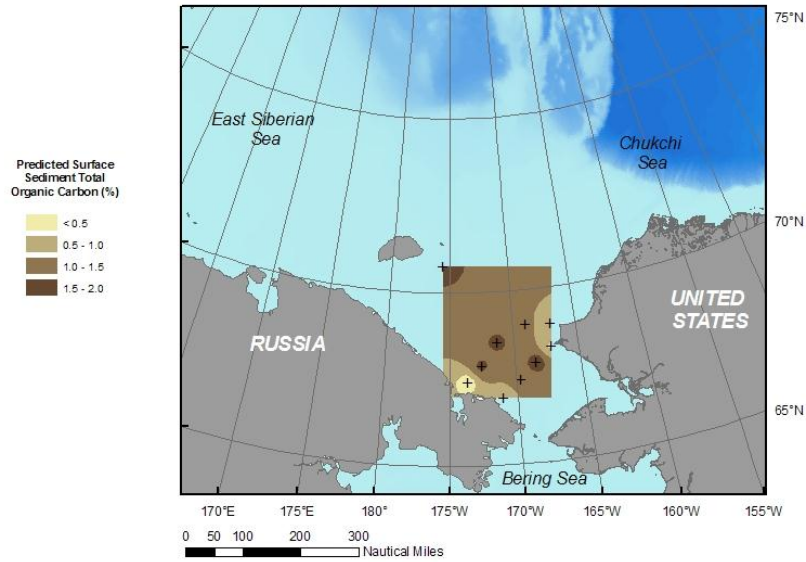
RUSALCA 2004 & 2009



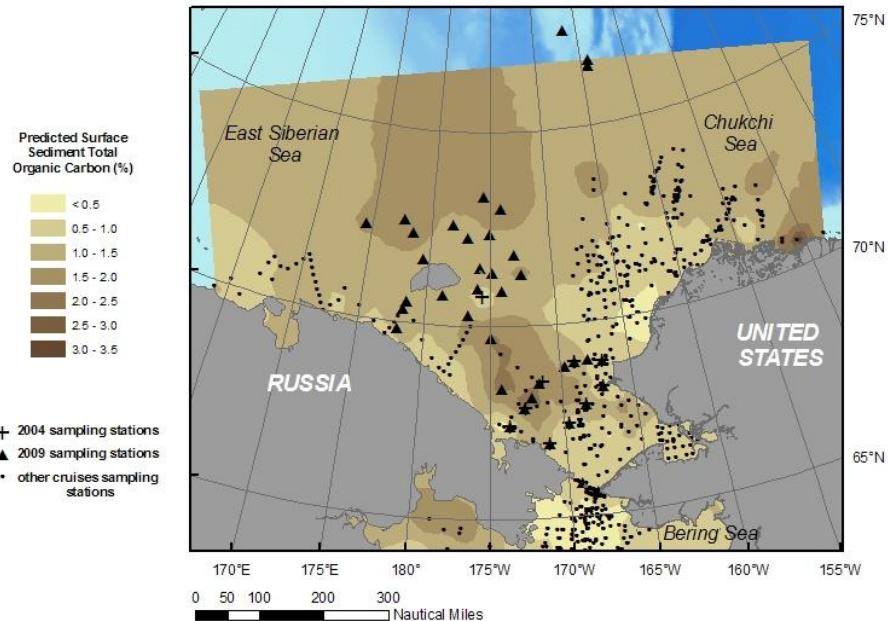
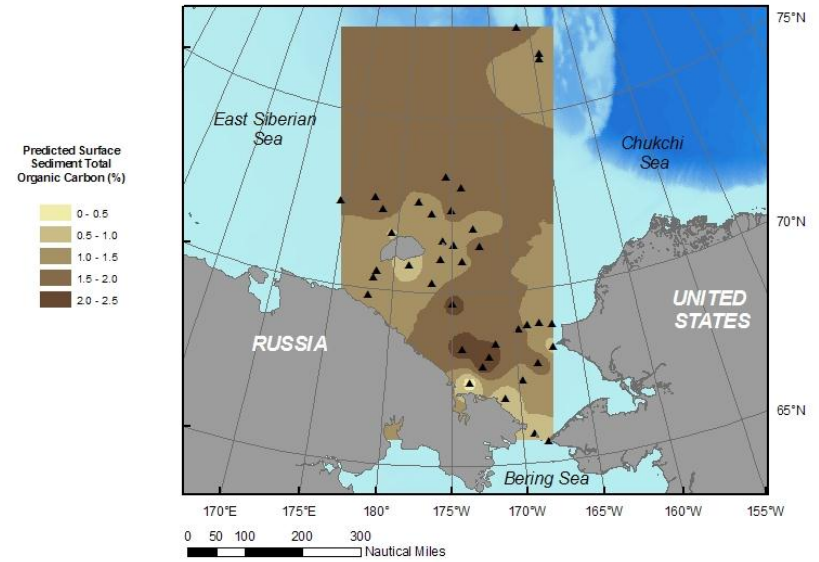
[updated from Grebmeier et al. 2006, Prog. Oceanogr., 71: 331-361]

Total organic carbon content in surface sediments-indicator current speed and material deposition zones

RUSALCA04

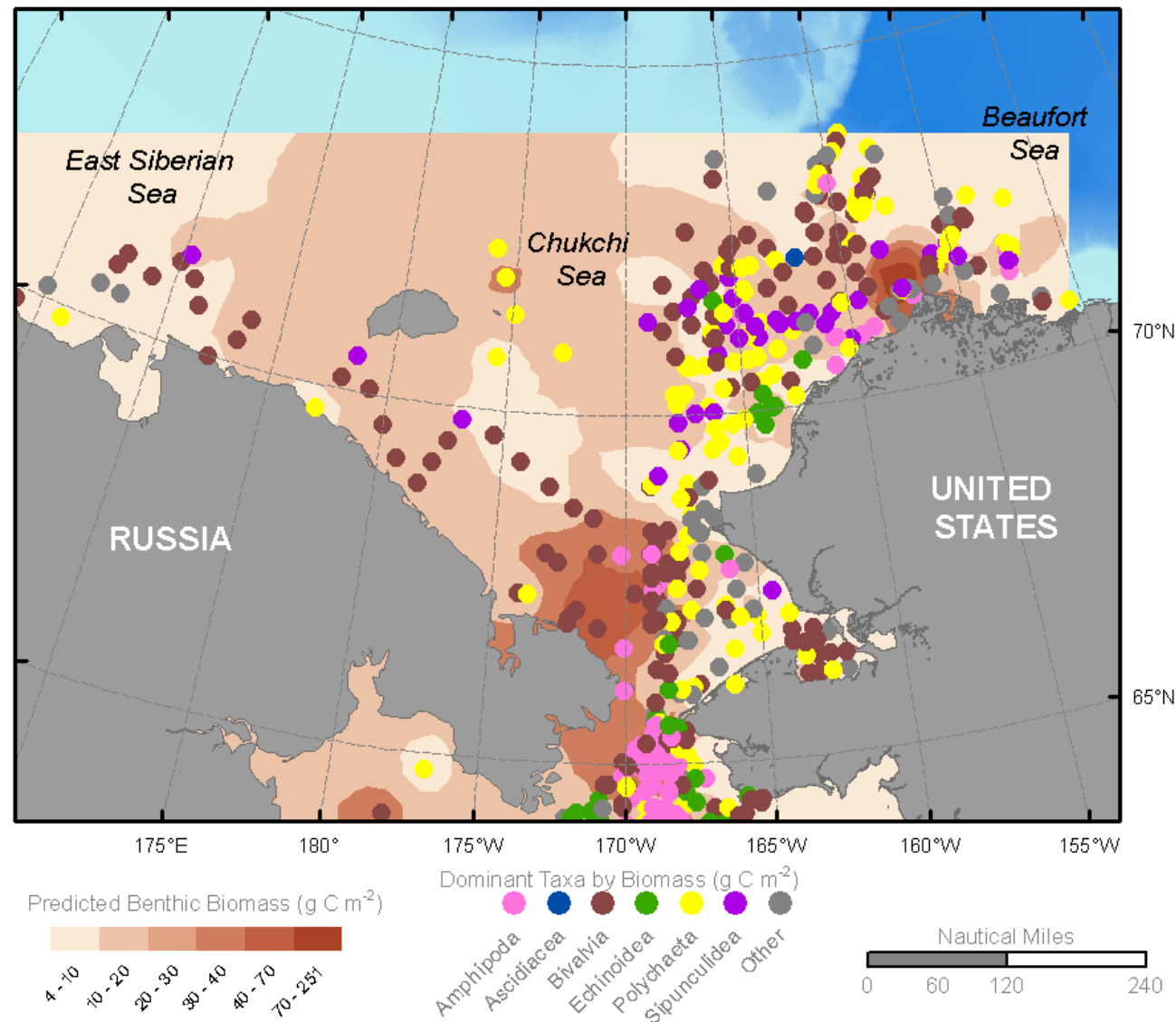


RUSALCA09



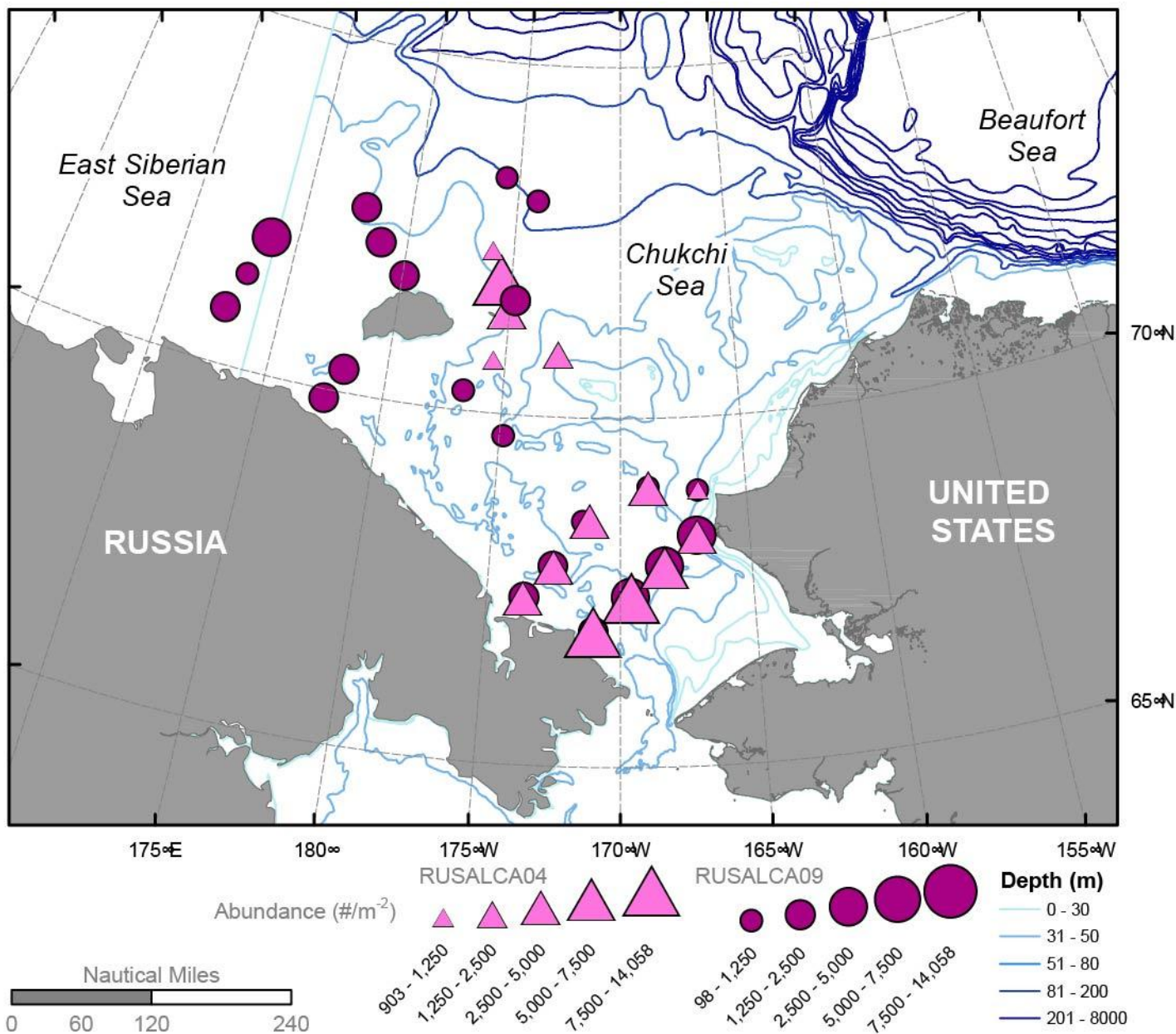
[updated from Grebmeier et al. 2006, Prog. Oceanogr., 71: 331-361]

Rich benthic communities on the western side of the Bering/Chukchi Sea system 1970-2010

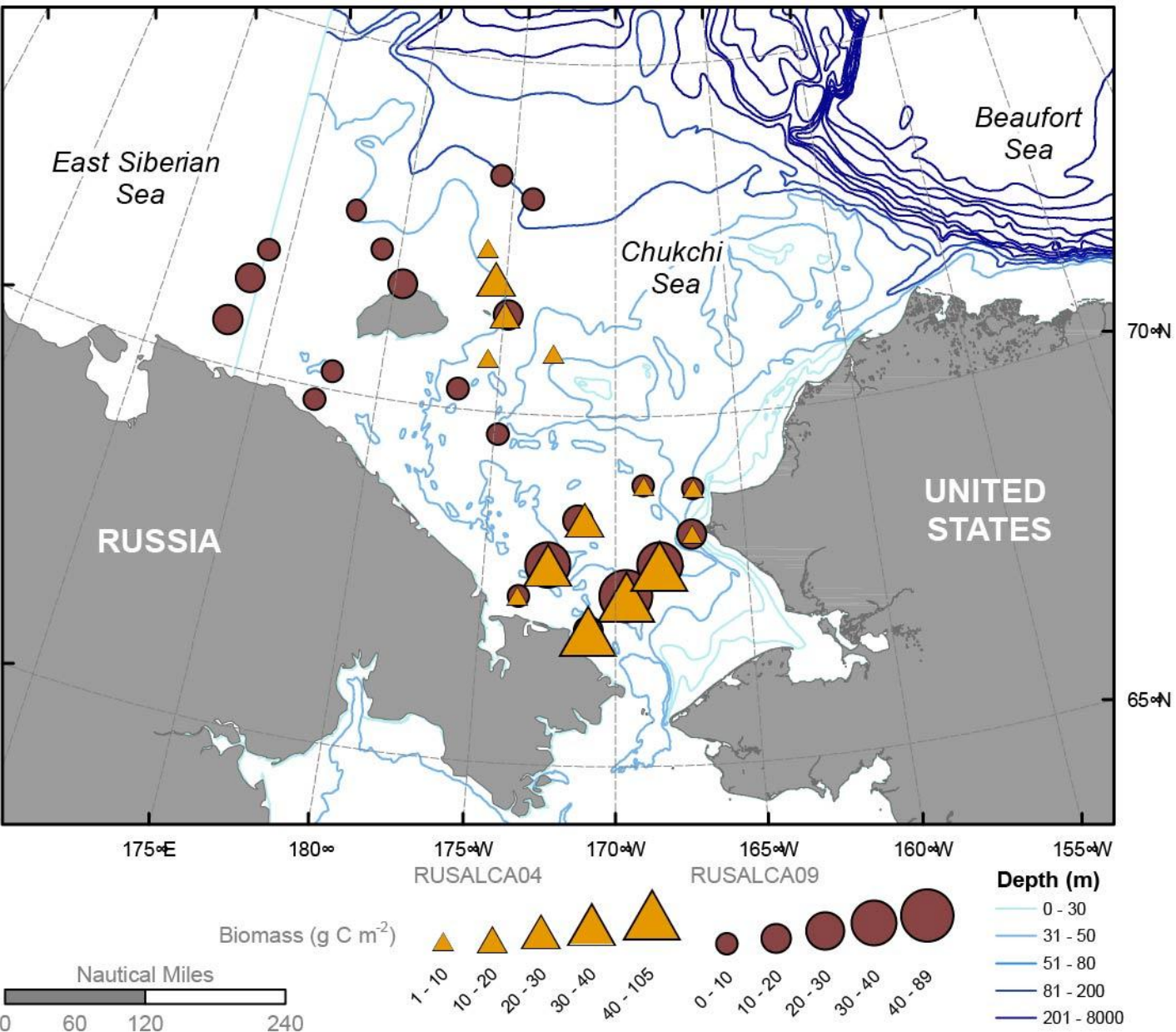


- “footprints” of high benthic biomass reflect pelagic-benthic coupling and export of carbon to sediments
- advection of organic carbon also influences biomass patterns

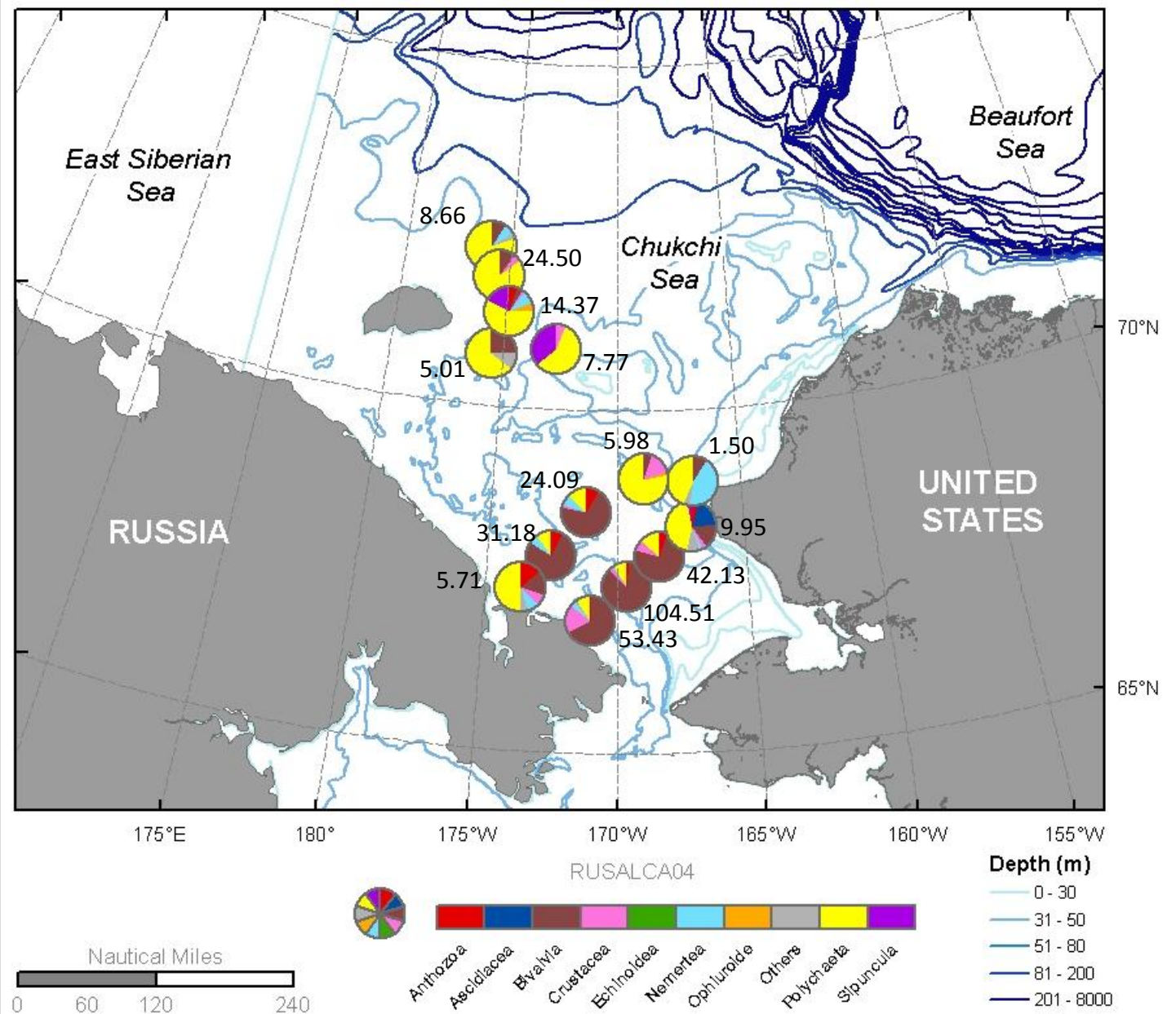
Benthic macroinfaunal abundance during RUSALCA 2004 and 2009



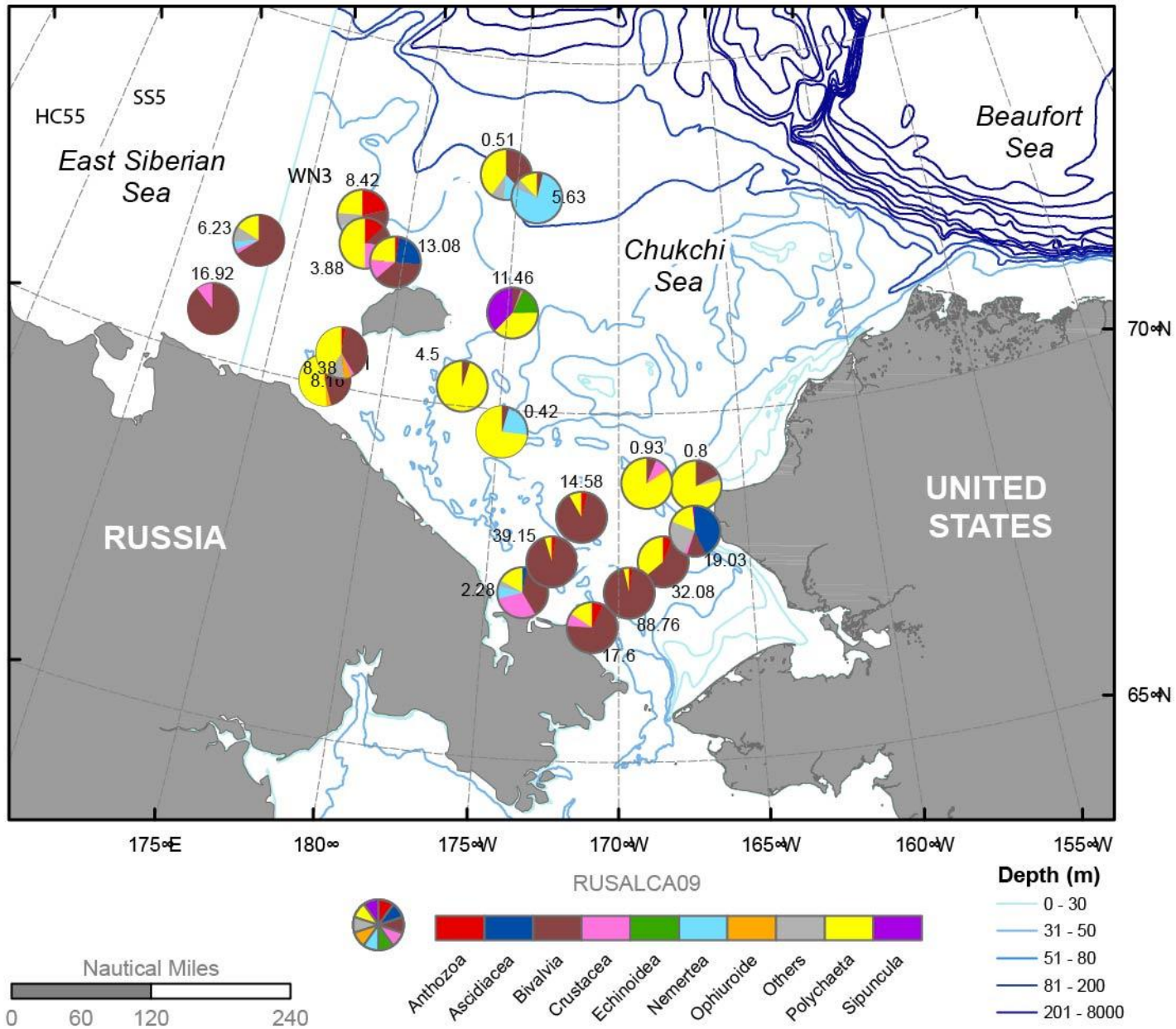
Benthic macroinfaunal biomass (gC m⁻²) during RUSALCA 2004 and 2009



Infaunal community composition during RUSALCA04

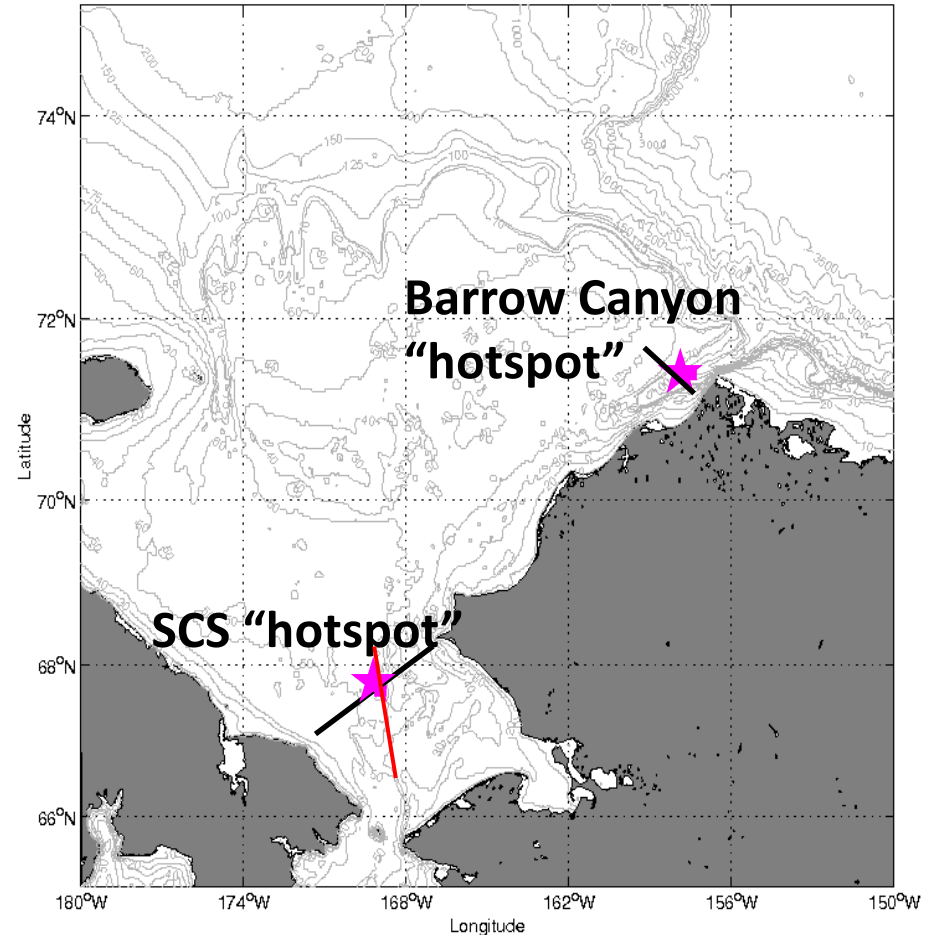


Infaunal community composition during RUSALCA09

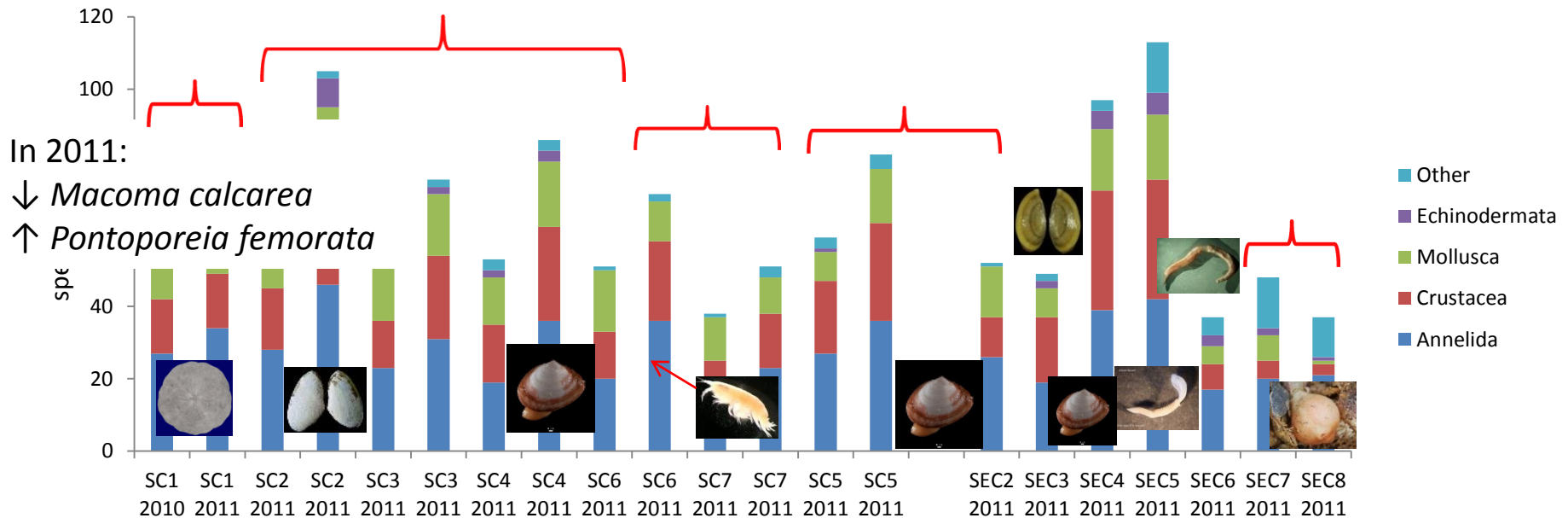


Distributed Biological Observatory (DBO)

- Aim: identification and consistent sampling of biophysical responses to ocean climate variability at biological ‘hotspot’ locations across a latitudinal gradient.
- The DBO depends on international cooperation to sample oceanographic stations over temporal and spatial scales and conduct joint analysis of shared data.



Southern and southeastern Chukchi Sea



- **SC:** Dominating surface deposit feeders: *Macoma calcarea* and *Telina spp.*, *Protomedeia spp* and *Pontoporeia femorata*
 suspension feeder *E. parma*: indicator of hydrodynamic stress
- **SEC:** Surface deposit feeders at first 4 station of the transect: *Pontoporeia femorata* and *Protomedeia spp*
 Towards the shore suspension feeders: *Chone sp.*, *Hiatella arctica* and ascidians

Southern and southeastern Chukchi Sea

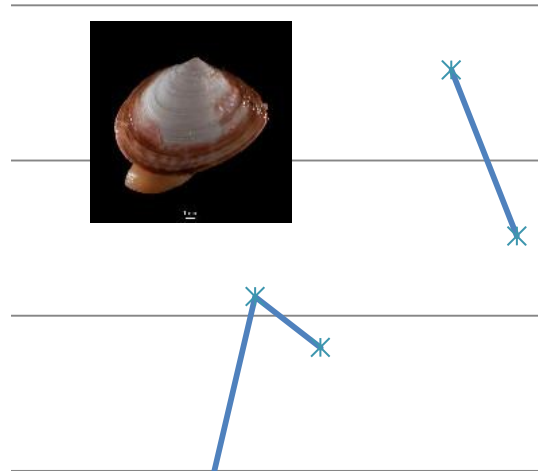
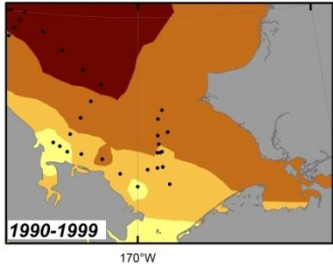
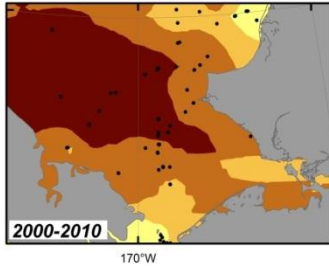
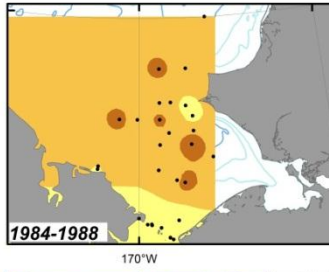
Southern Chukchi

↓ *Macoma calcaria*

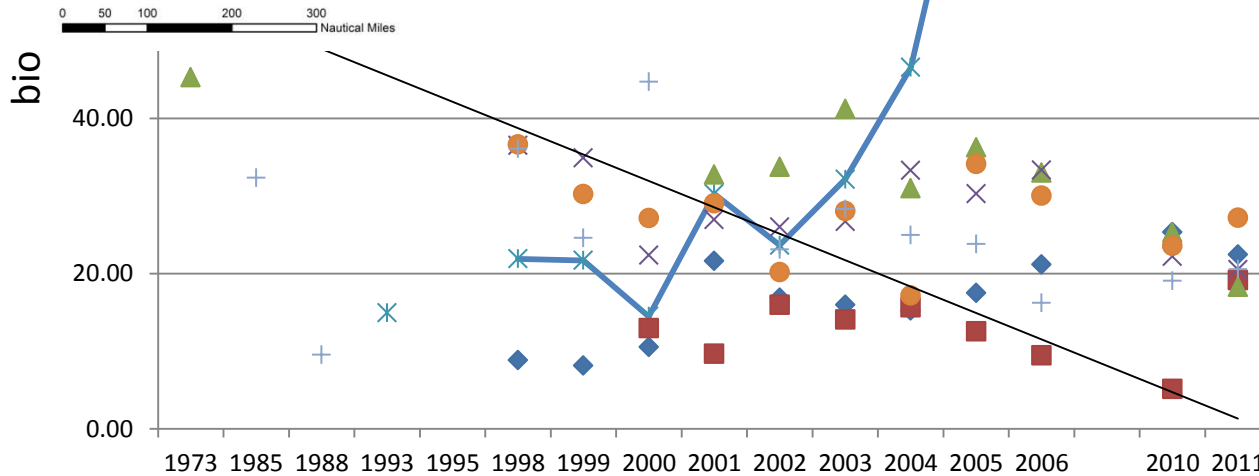


Predicted Silt & Clay Grain Size Fraction (%)

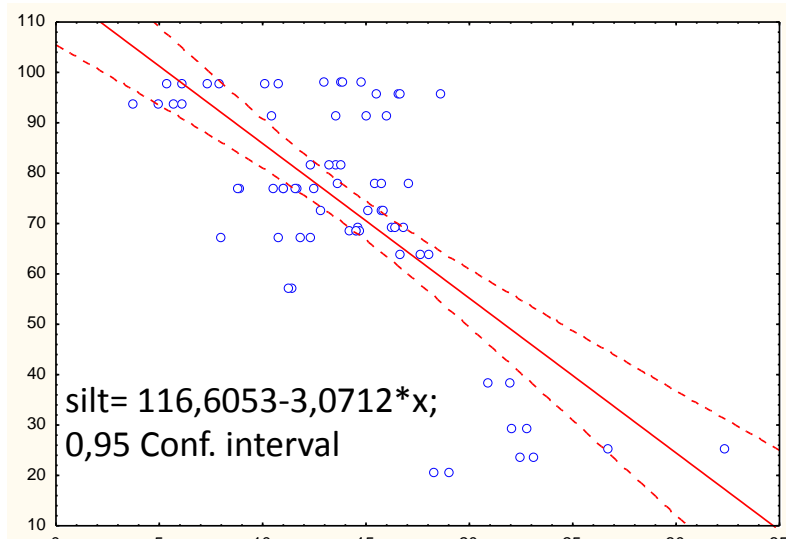
- 0 - 25
- 25 - 50
- 50 - 75
- 75 - 100



- ◆ UTN1
- UTN2
- ▲ UTN3
- × UTN4
- ★ UTN5 On CS line
- UTN6
- + UTN7

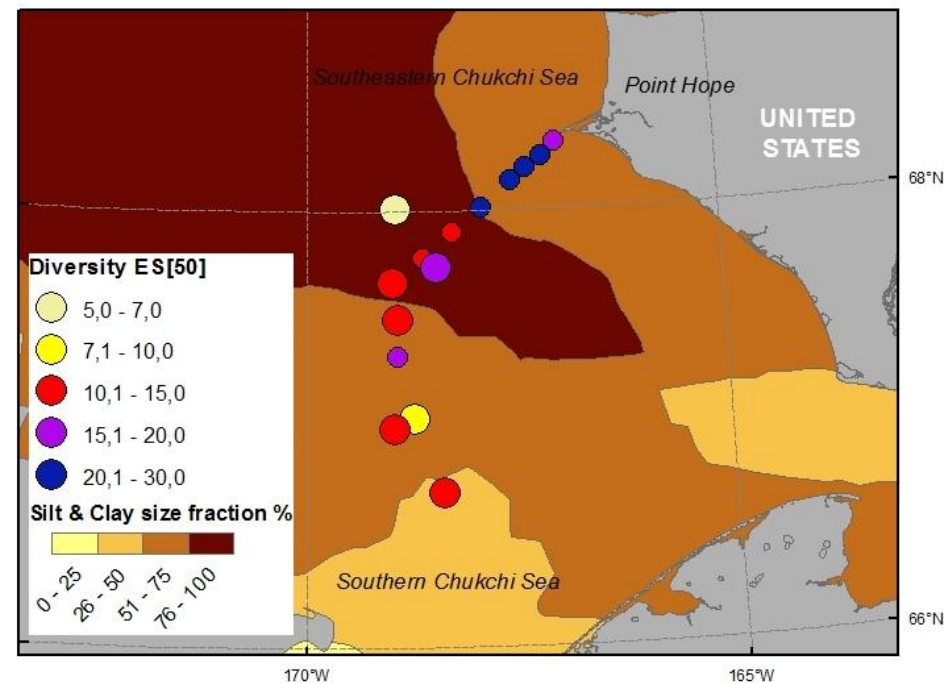
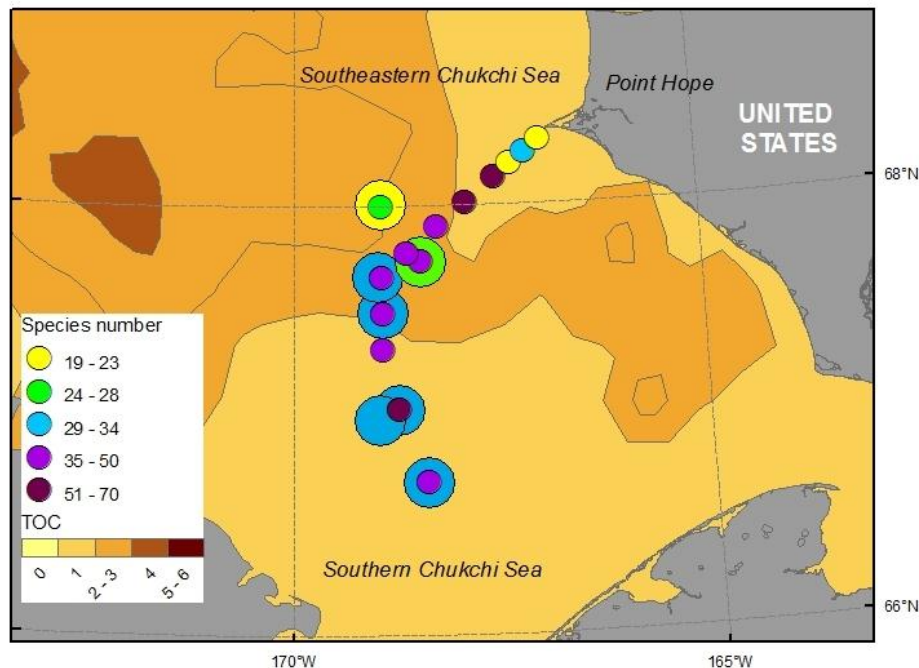


Southern and southeastern Chukchi Sea



Spearman correlations:
Diversity & coarse sand/gravel: 0.51*
Diversity & fine sand: 0.47*
Diversity & silt: -0.52*
Diversity & TOC : -0.57*

[Monika Kedra, CBL]



SUMMARY

1. Highest observed infaunal benthic biomass was observed at the head of Herald Valley in the southeast Chukchi Sea in the known “hotspot” of *Macoma* bivalves the extends from across the US-Russian boundary. This high biomass region results for the high productivity of the Anadyr Water and tight pelagic-benthic coupling between the upper water column production zone and underlying benthos during annual primary production.
2. Areas of highest carbon export to the benthos (SCOC, sed chl a) coincident with highest areas of infaunal biomass (gC/m²) which are important prey to walrus gray whales, and bearded seals.
3. Significant changes were observed between years; declining trend (biomass) is observed in the southern Chukchi Sea which along with species shift may have consequences for the higher trophic levels.

Thank you. Any questions?

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