Science, Service, Stewardship

Latitudinal trends and temporal shifts In the catch composition of bottom Trawls conducted on the eastern Bering Sea shelf

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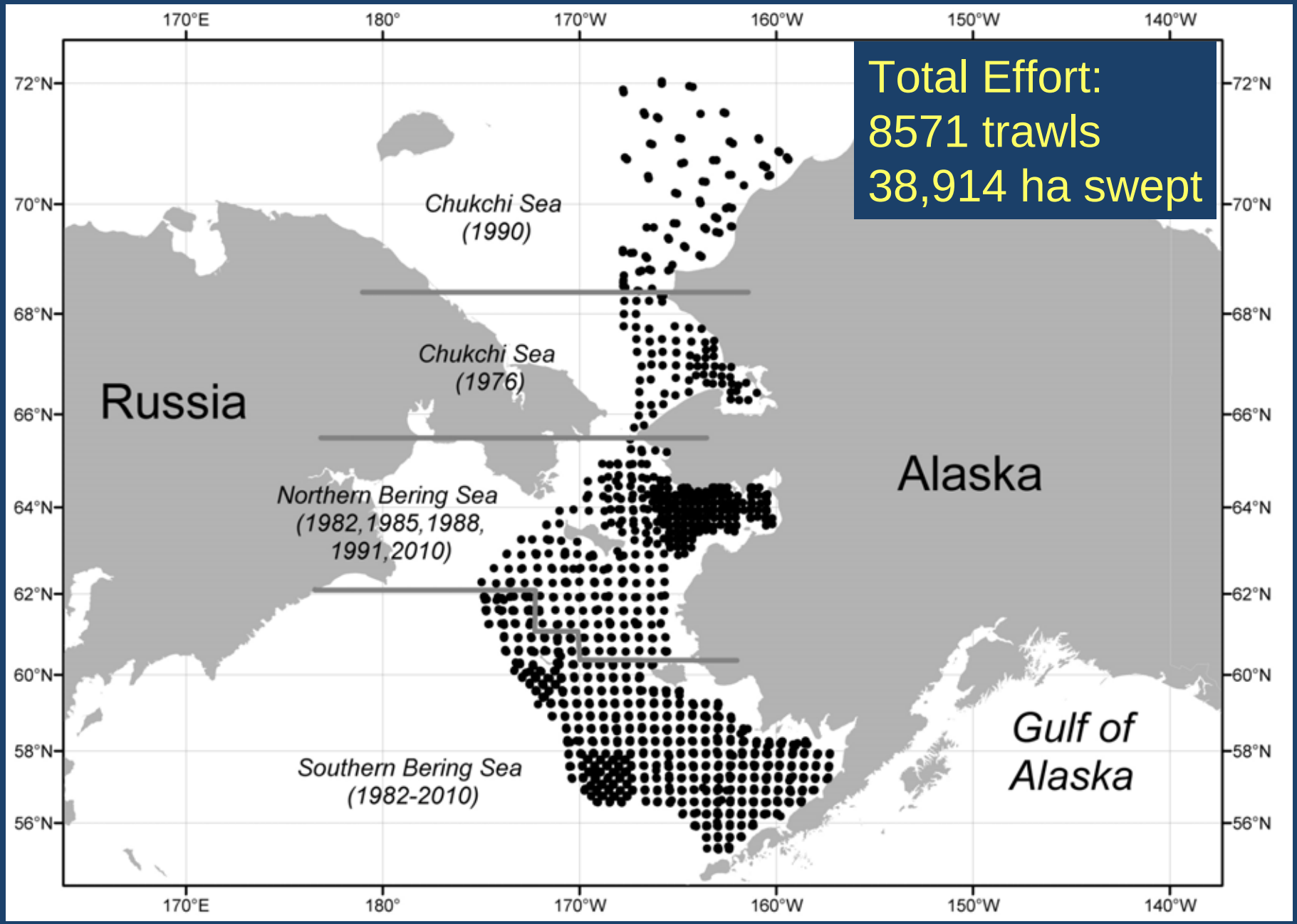
Outline

- The Data Set
- Latitudinal trends in bottom trawl composition in the eastern Bering Sea (1982-2010)
- Brief comments on limited data from the Chukchi Sea
- Temporal trends in the southern Bering Sea (2001-2010)


Total Effort:
8571 trawls
38,914 ha swept
Chukchi Sea
(1990)
Chukchi Sea
(1976)
Russia
Alaska
Northern Bering Sea
(1982,1985,1988,
1991,2010)
Southern Bering Sea
(1982-2010)
Gulf of
Alaska
170°E
180°
170°W
160°W
150°W
140°W
72°N
70°N
68°N
66°N
64°N
62°N
60°N
58°N
56°N

The Data

•Bottom trawl surveys conducted by NMFS AFSC in eastern Bering Sea from 1982-2010 (also Chukchi in 1976, 1990)

•All trawls conducted in summer months (June-August) using 83-112 Eastern otter trawl

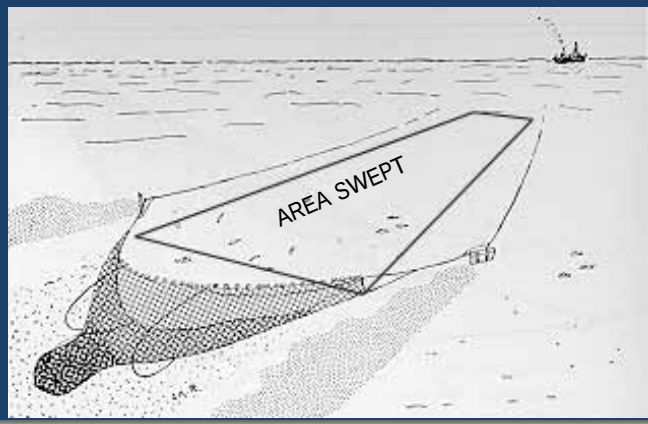
- Net width ~ 16 m
- Distance towed ~ 2.75 km

•Depth limited to 100 m or less, satisfactory gear performance

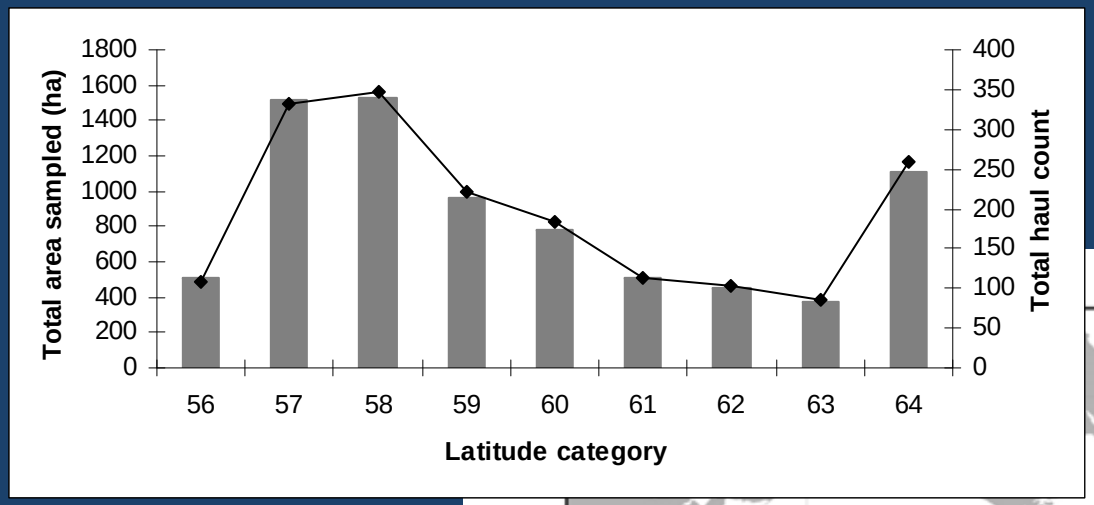
•Catch data converted to CPUE (kg/ha) by dividing weight by area swept

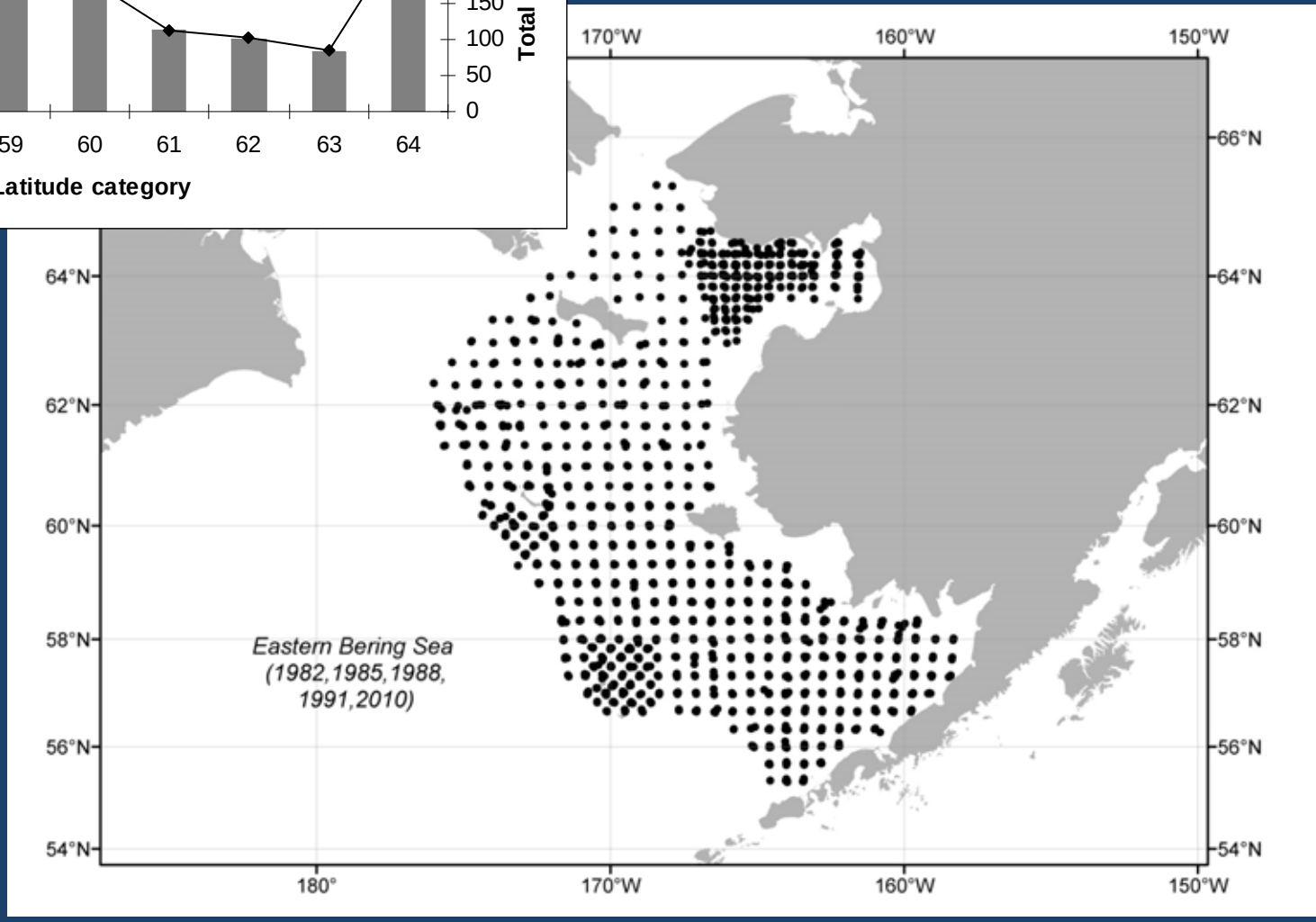
•Bottom temp reported as average of all readings taken by bathythermograph during on-bottom time

•Latitude categories - start latitude rounded to nearest degree

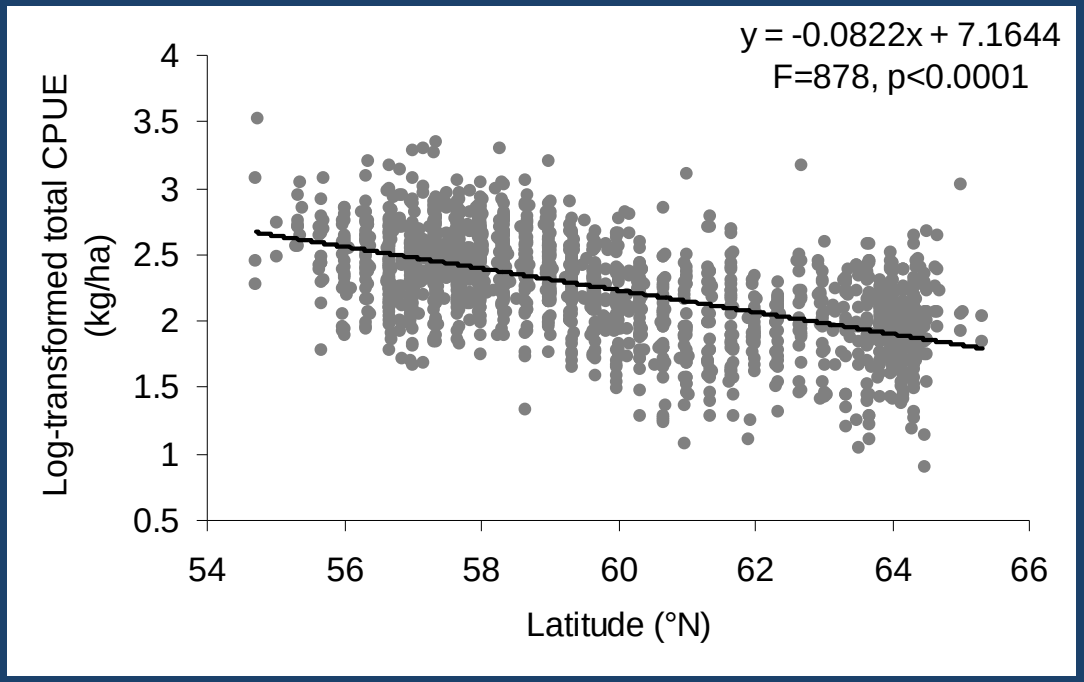


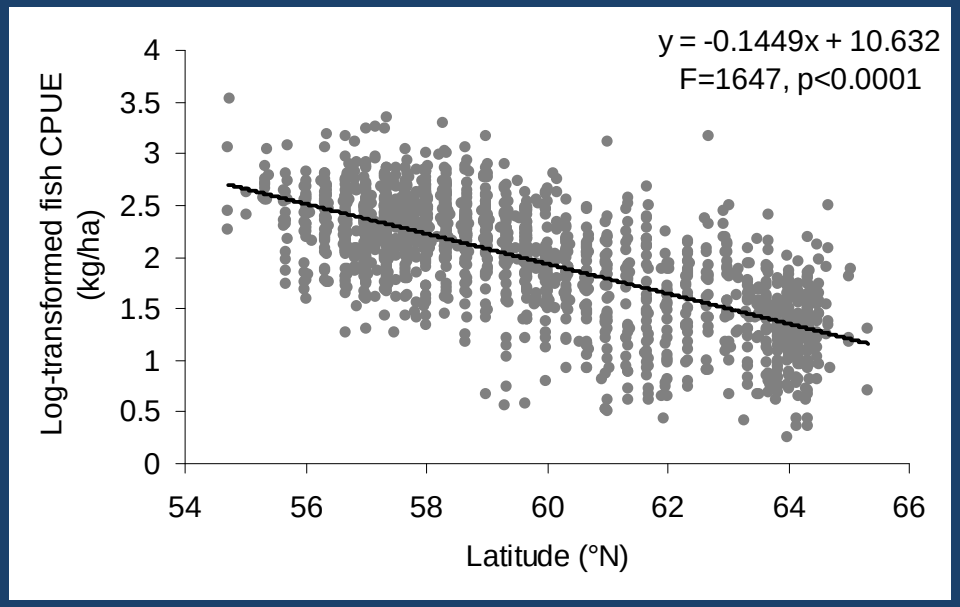
Latitudinal Trends – Data set

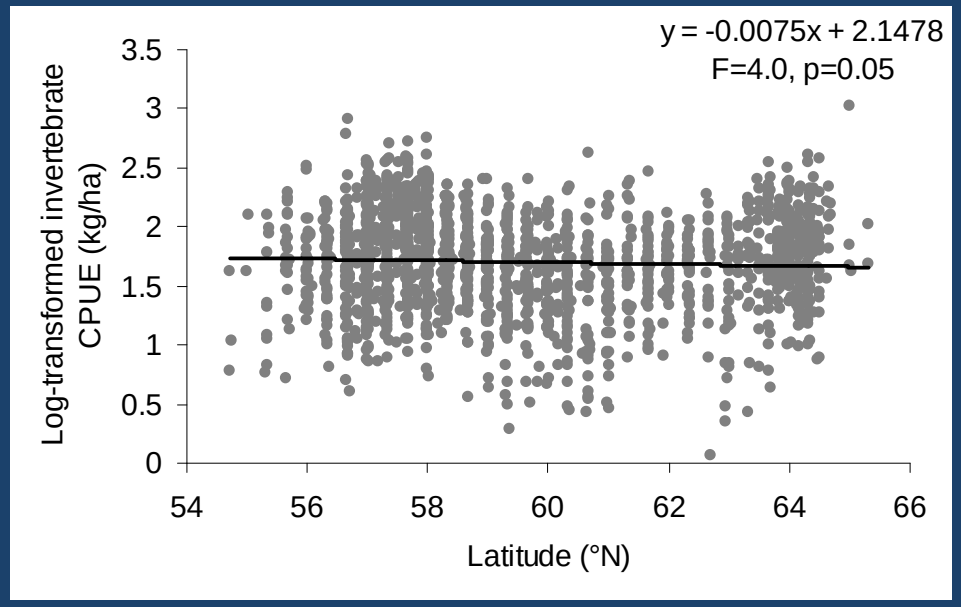




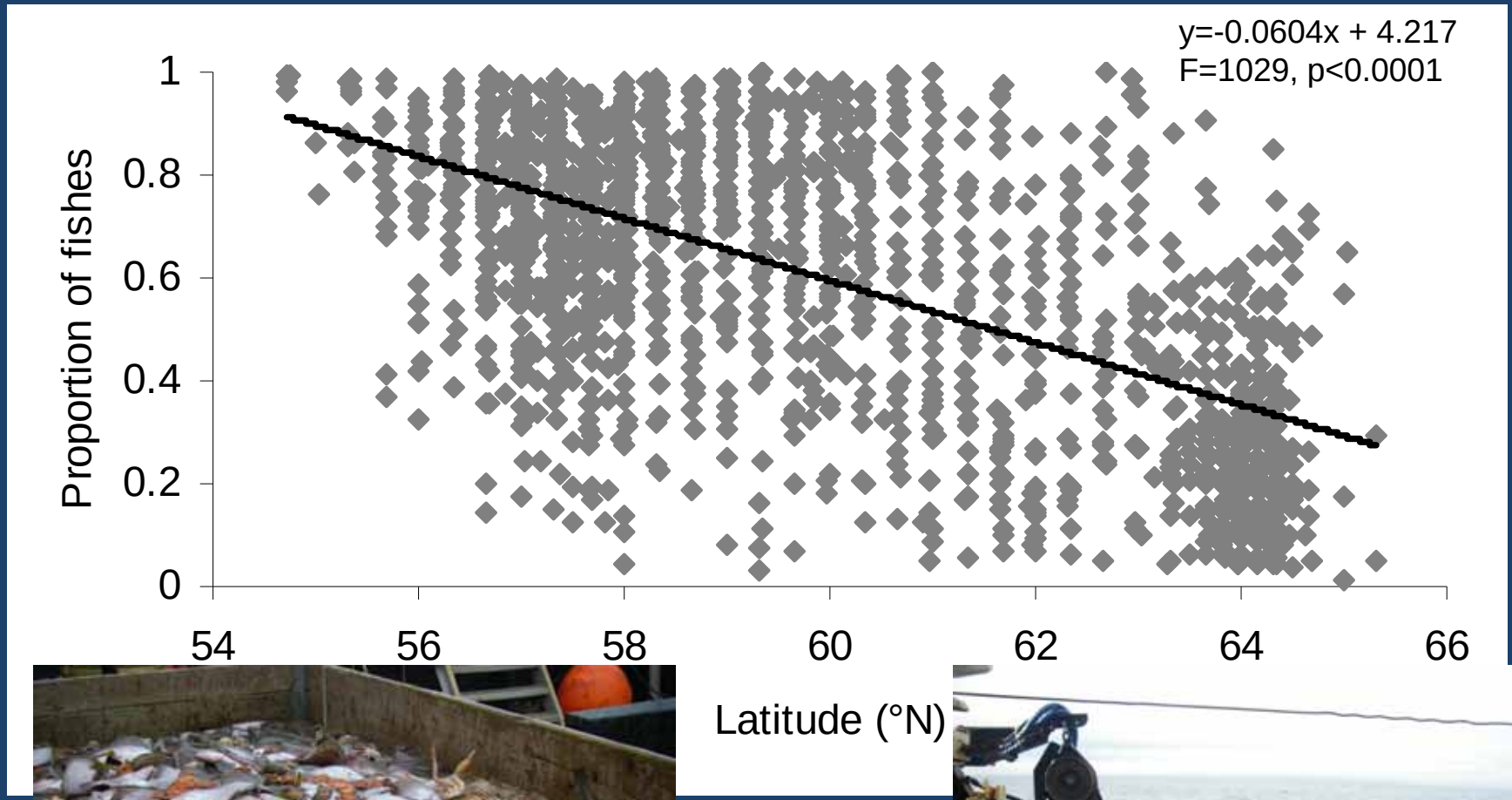
Latitudinal Trends – CPUE







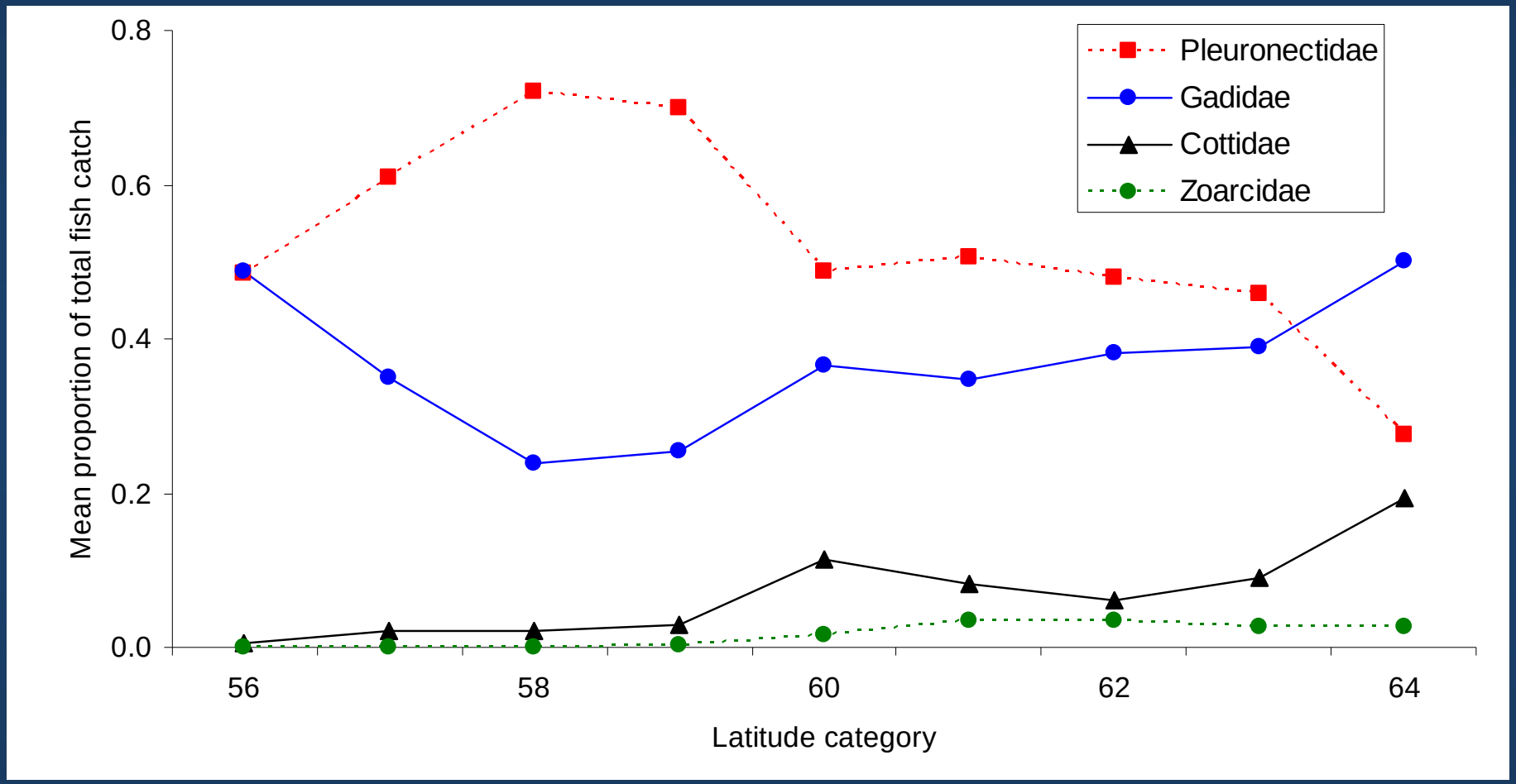
Latitudinal Trends – Proportion



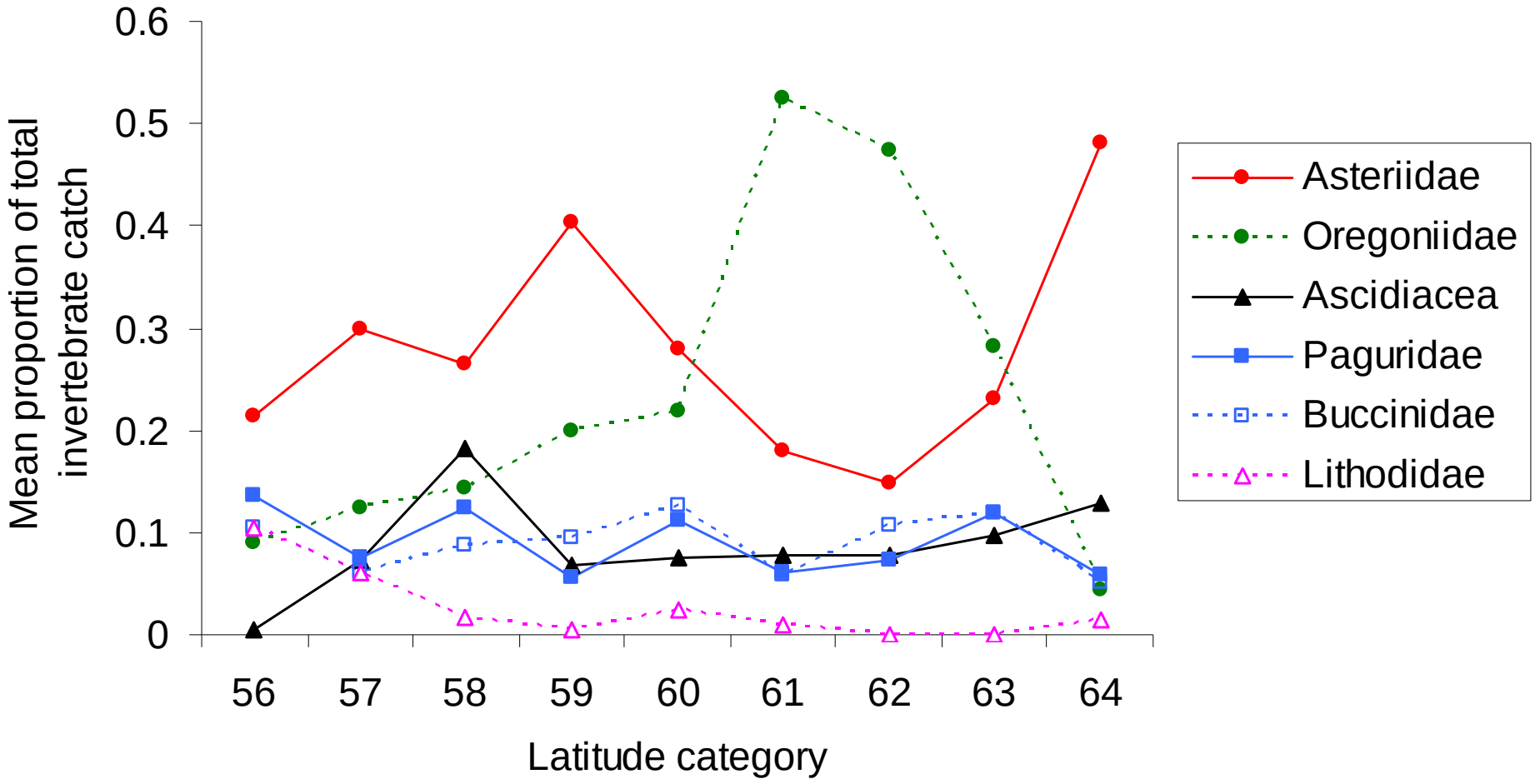
Latitudinal Trends – Dominant taxa

Taxon	Mean CPUE	Taxon	Mean CPUE
Fishes		Invertebrates	
Pleuronectidae	111.1 ± 3.7	Asteriidae	23.5 ± 0.8
Gadidae	59.1 ± 3.4	Oregoniidae	12.3 ± 0.6
Cottidae	6.3 ± 0.4	Ascidiacea	8.1 ± 0.8
Rajidae	3.4 ± 0.2	Paguridae	6.7 ± 0.3
Clupeidae	1.1 ± 0.6	Buccinidae	6.0 ± 0.3
Zoarcidae	0.9 ± 0.1	Lithodidae	2.1 ± 0.2
Agonidae	0.5 ± 0.0	Porifera	1.9 ± 0.6
Osmeridae	0.2 ± 0.0	Gorgonocephalidae	1.7 ± 0.1
Liparidae	0.2 ± 0.0	Actiniaria	1.5 ± 0.2
Hemitripteridae	0.2 ± 0.0	Strongylocentrotidae	0.7 ± 0.2

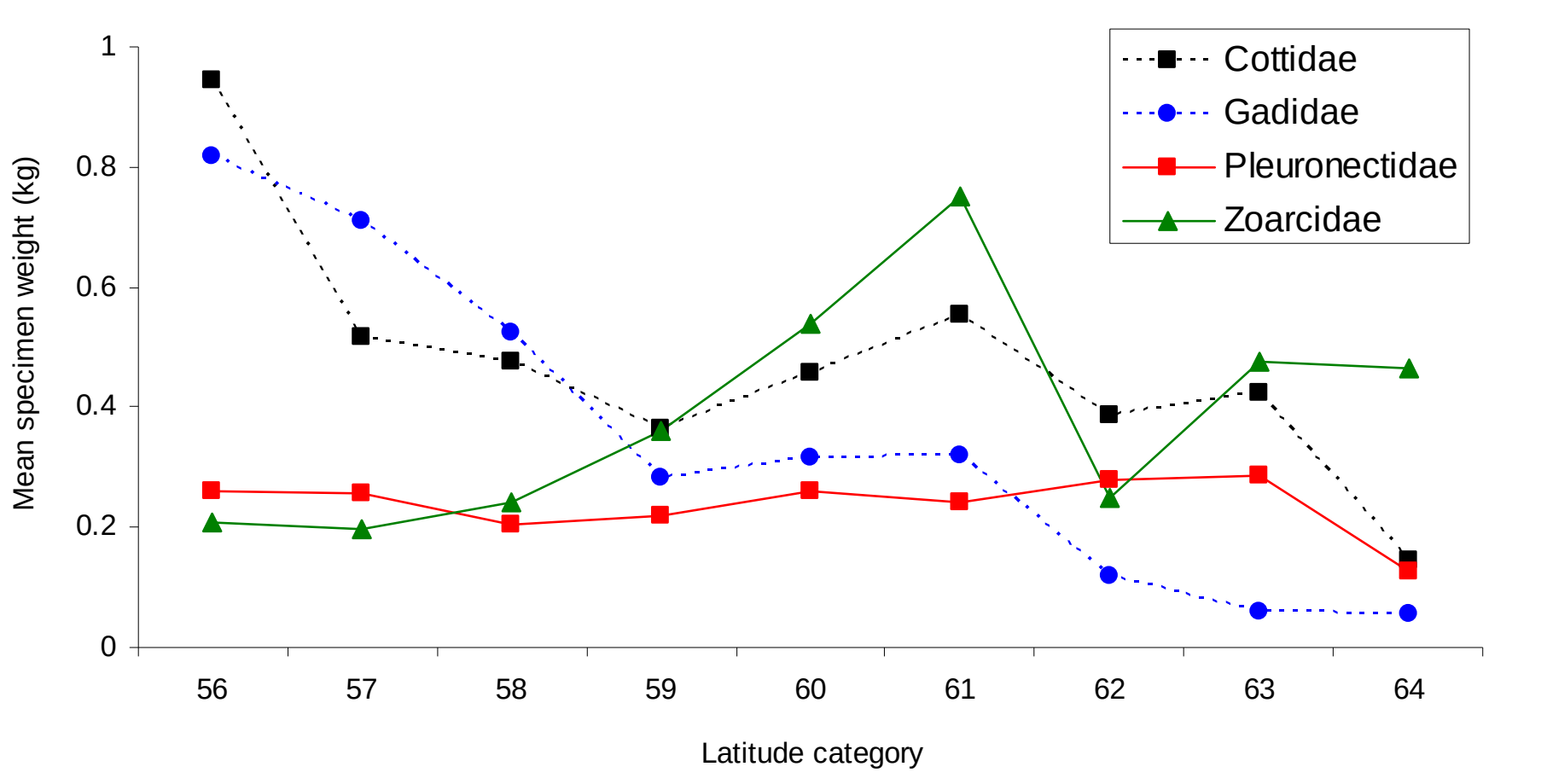
Latitudinal Trends – Fish taxa



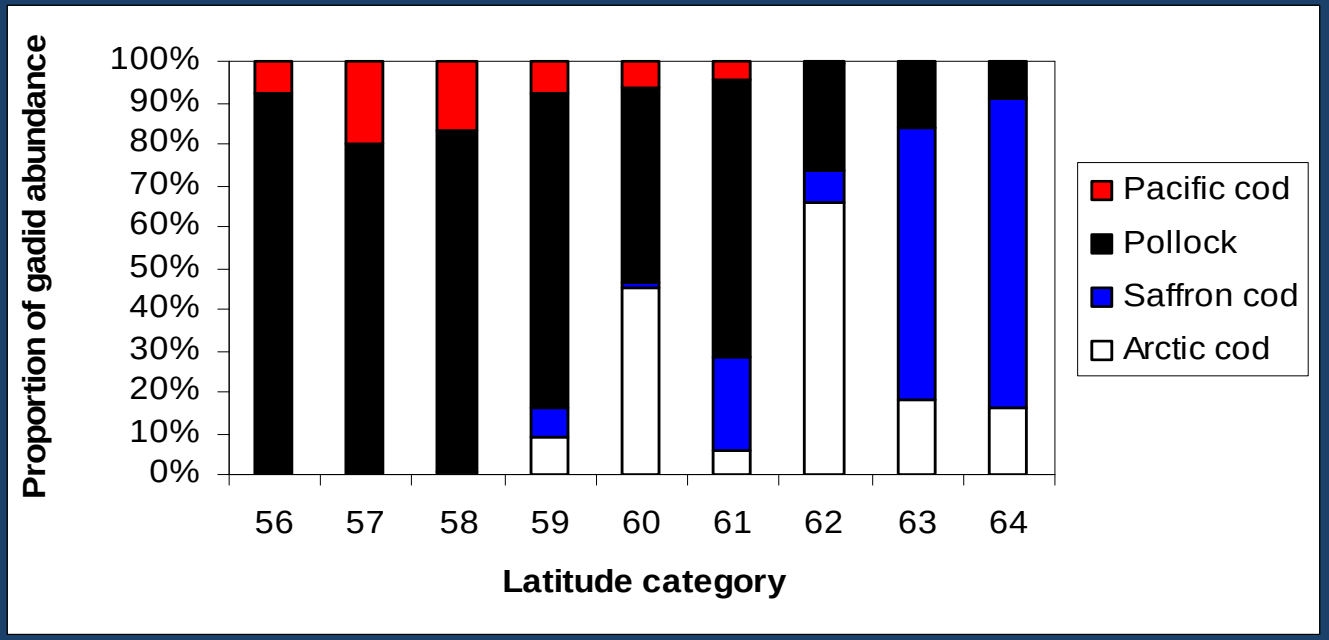
Latitudinal Trends – Invert taxa

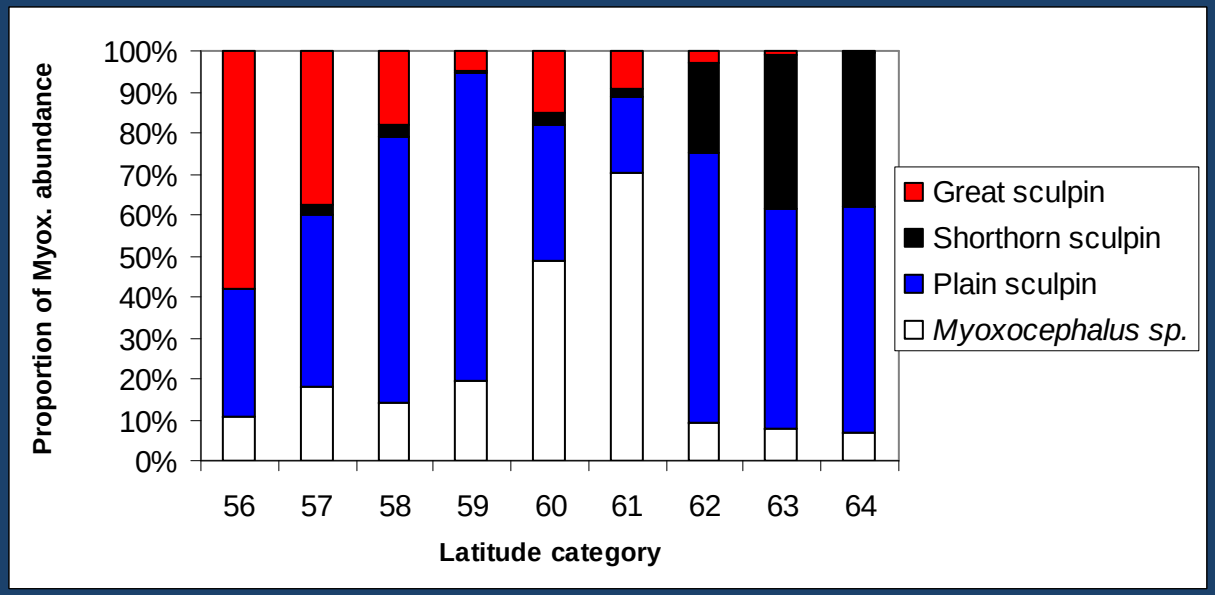


Latitudinal Trends – Fish size



Latitudinal Trends – Species turnover

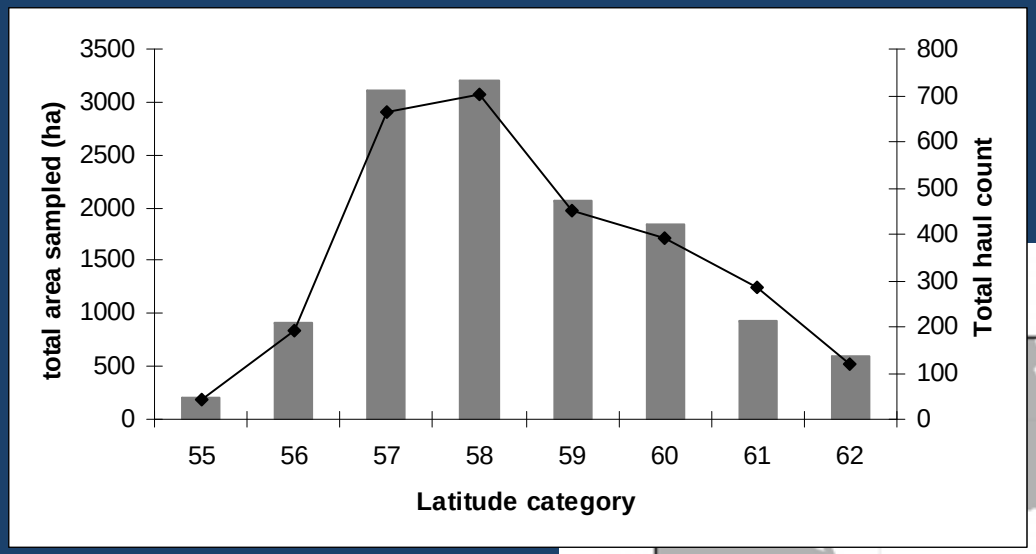


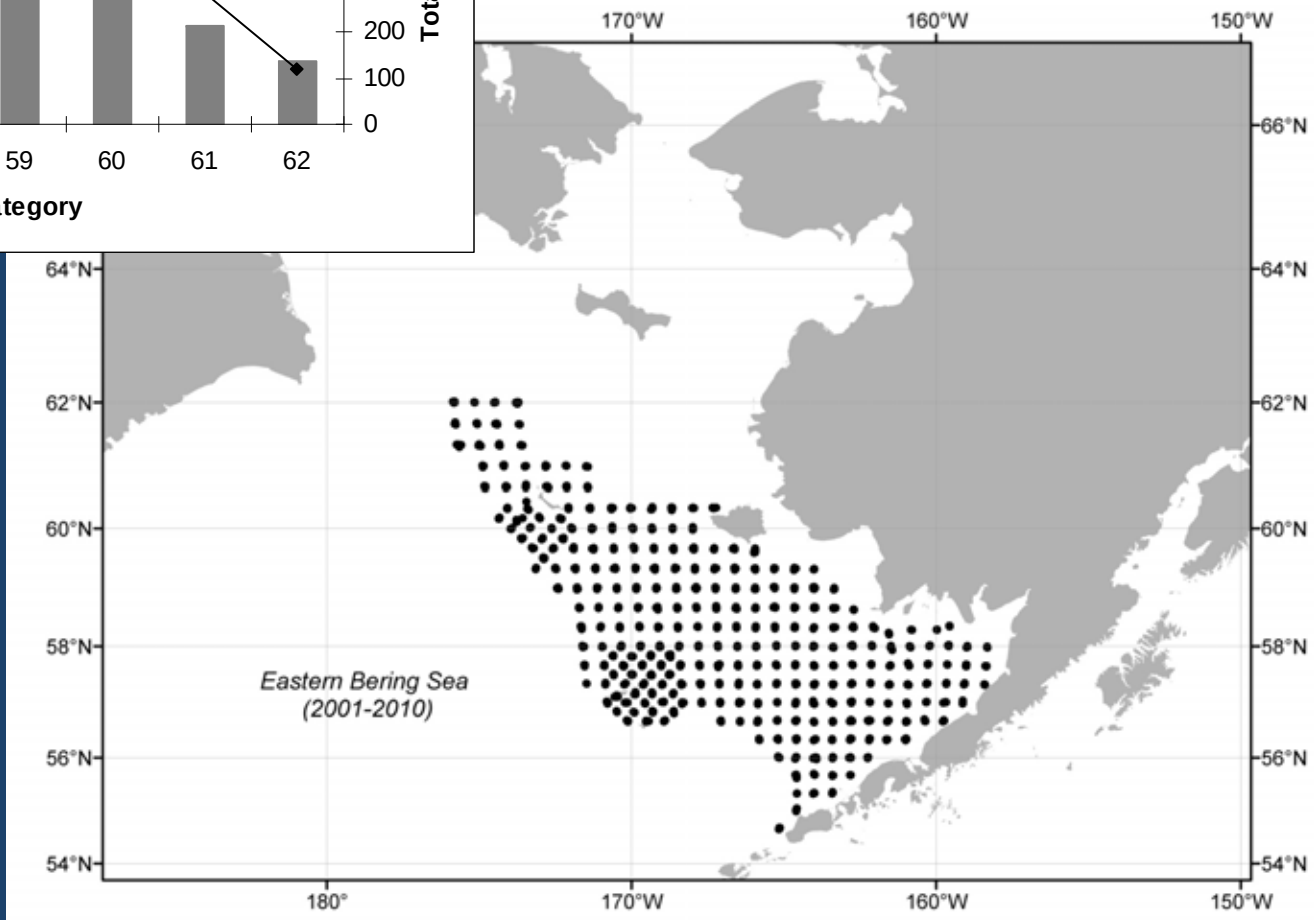


Chukchi Sea – General trends

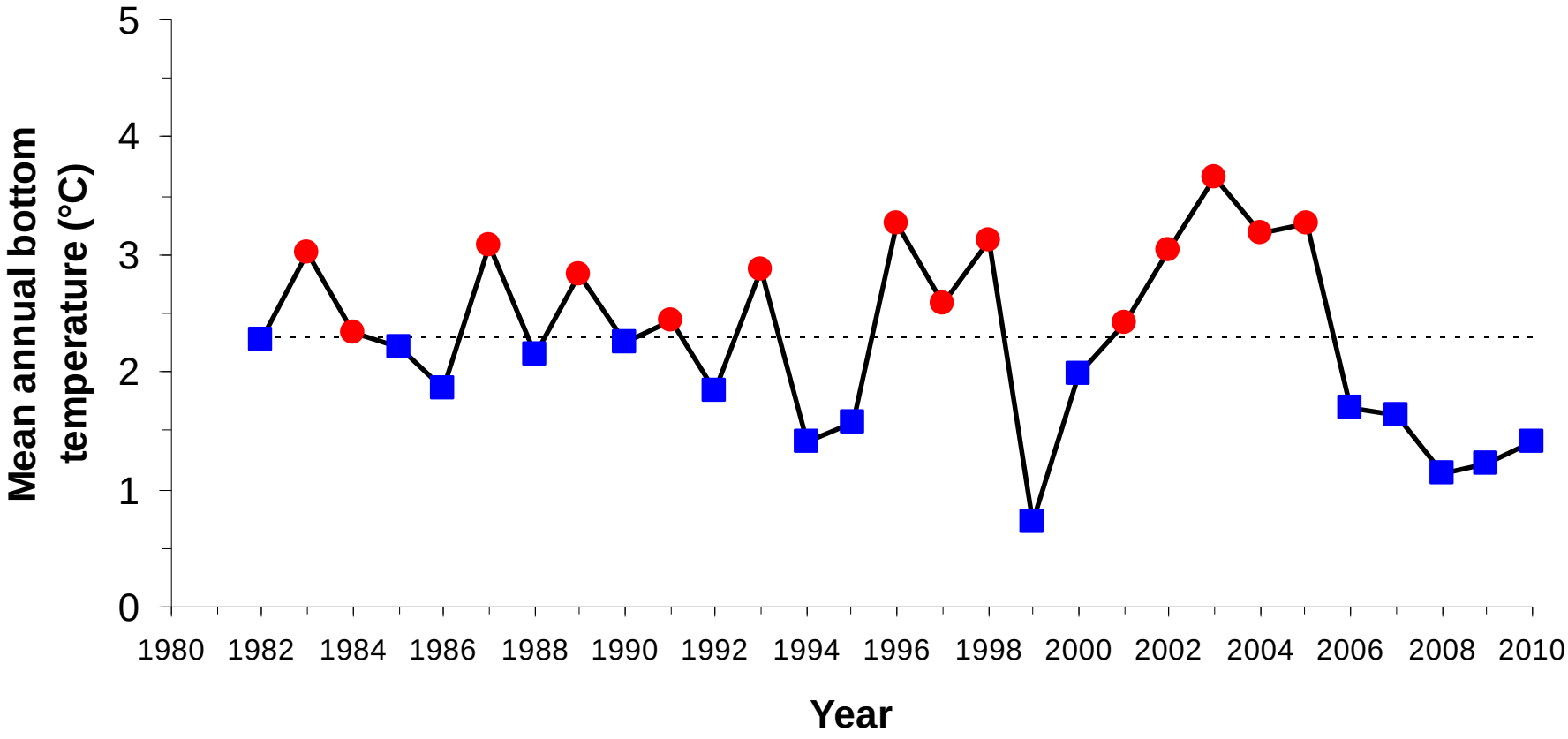
- Fish CPUE continues to decline, but invert CPUE increases
- Fish biomass is very low (~10% of catch)
- Average fish size continues to decline (overall mean ~0.02 kg)
- Gadids (particularly Arctic cod) increasingly dominate ichthyofauna: as much as 90% of fish biomass
- No clear trend in dominant inverts

Temporal Trends (2001-2010) – Data set

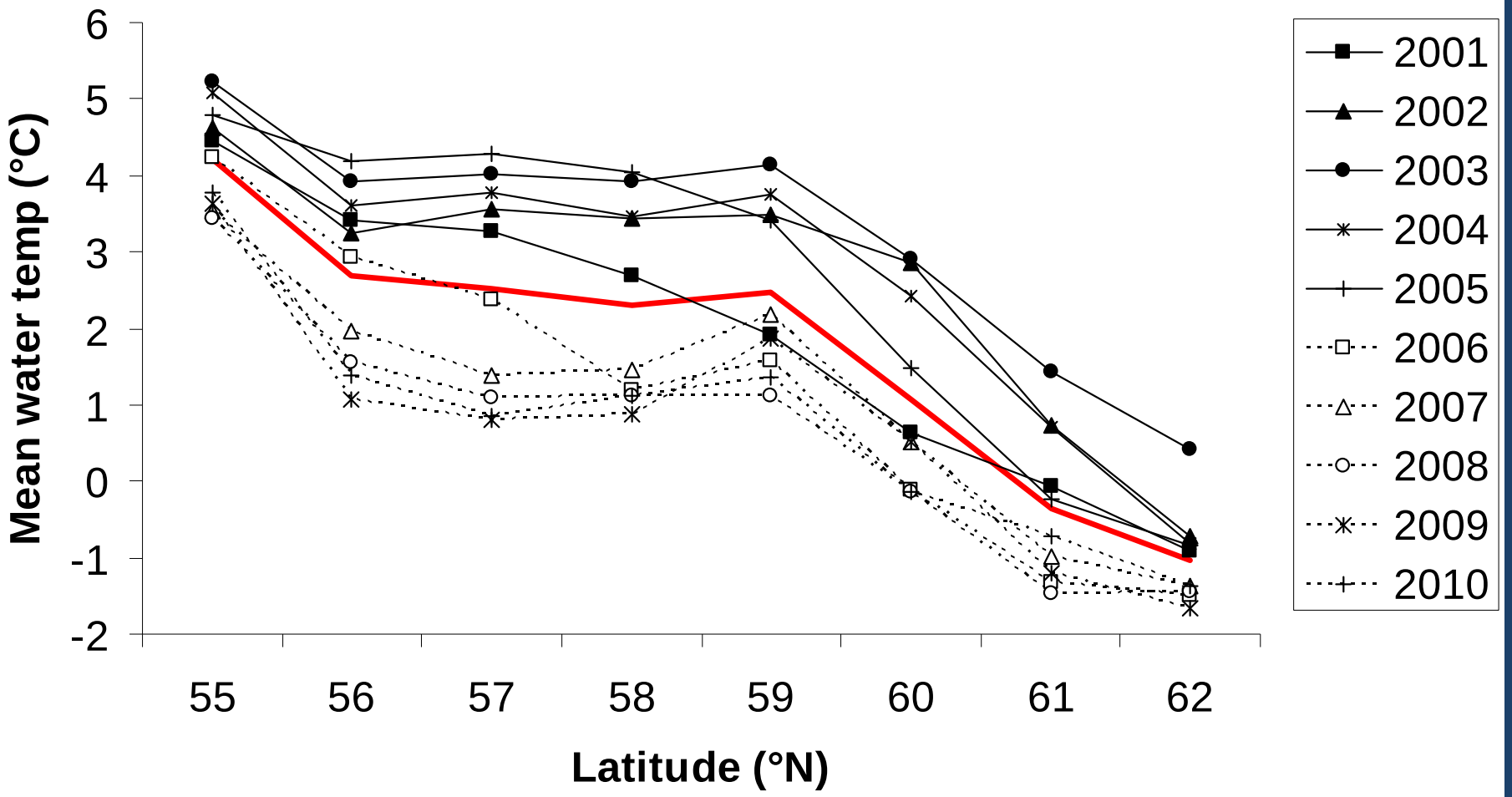




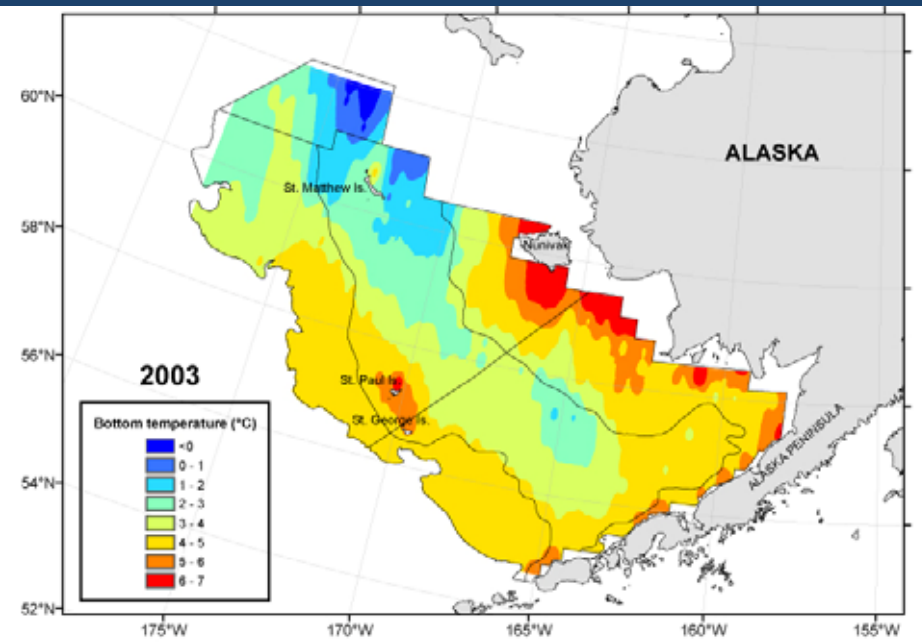
Temporal Trends

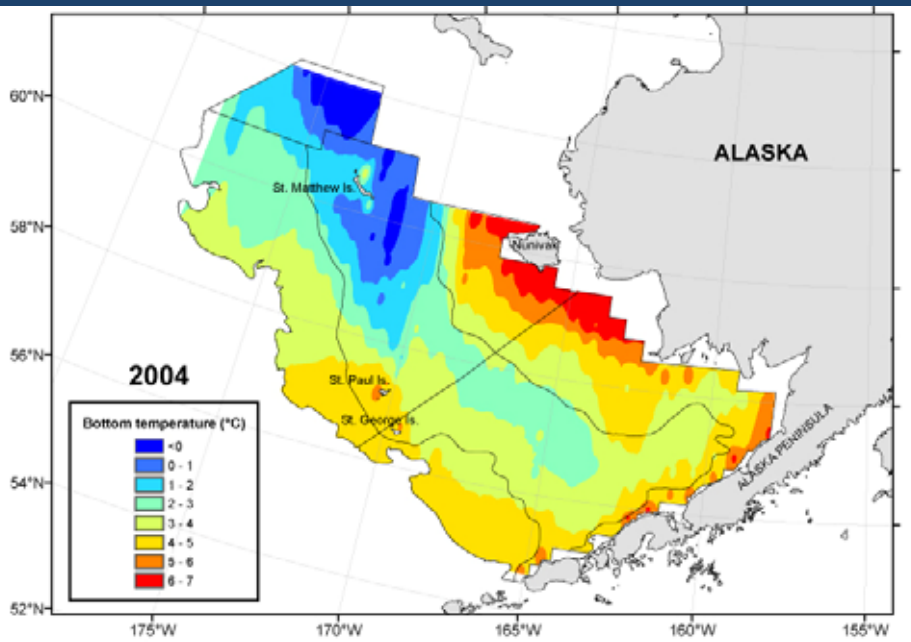


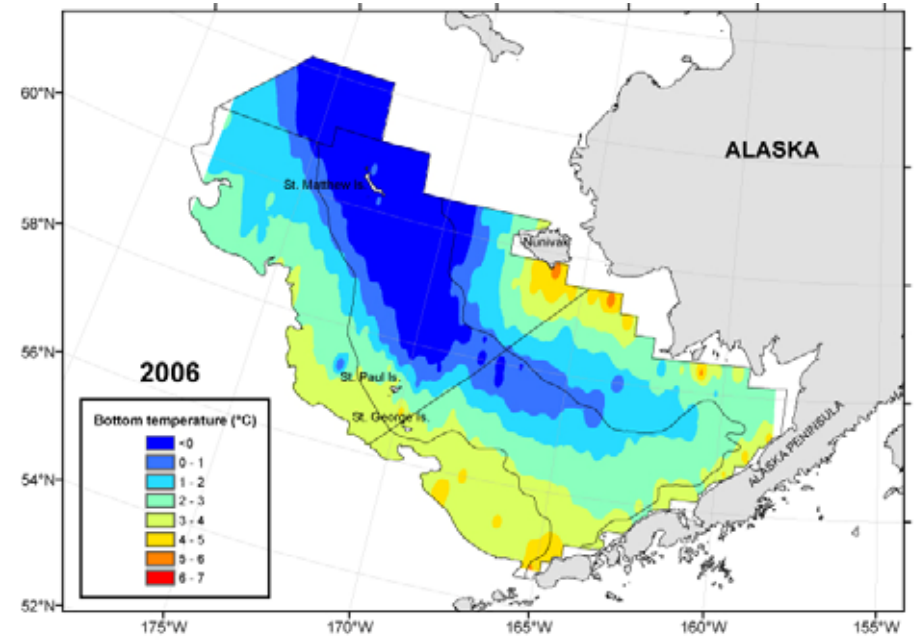
Temporal Trends – 2001-2010

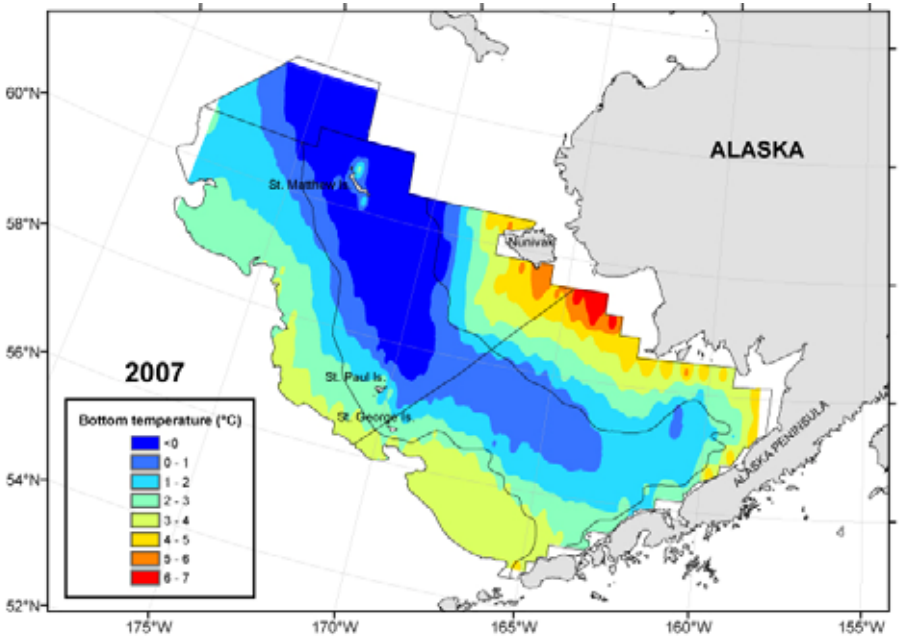


Temporal Trends – 2001-2010

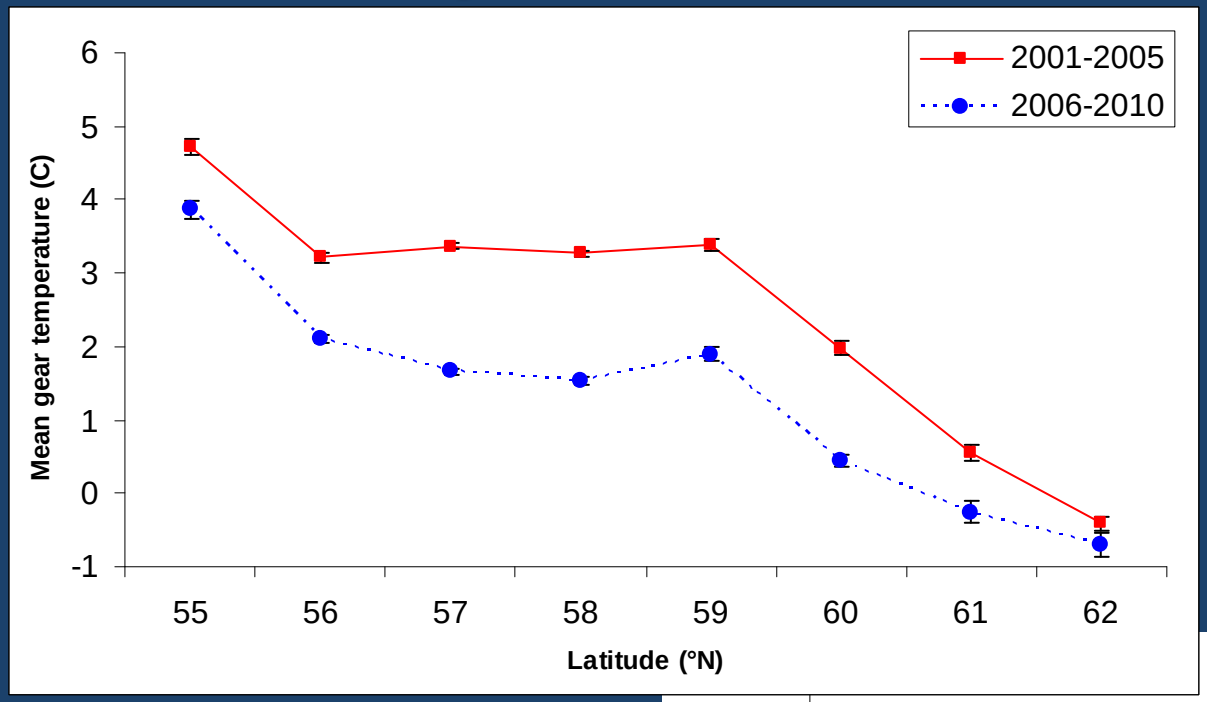


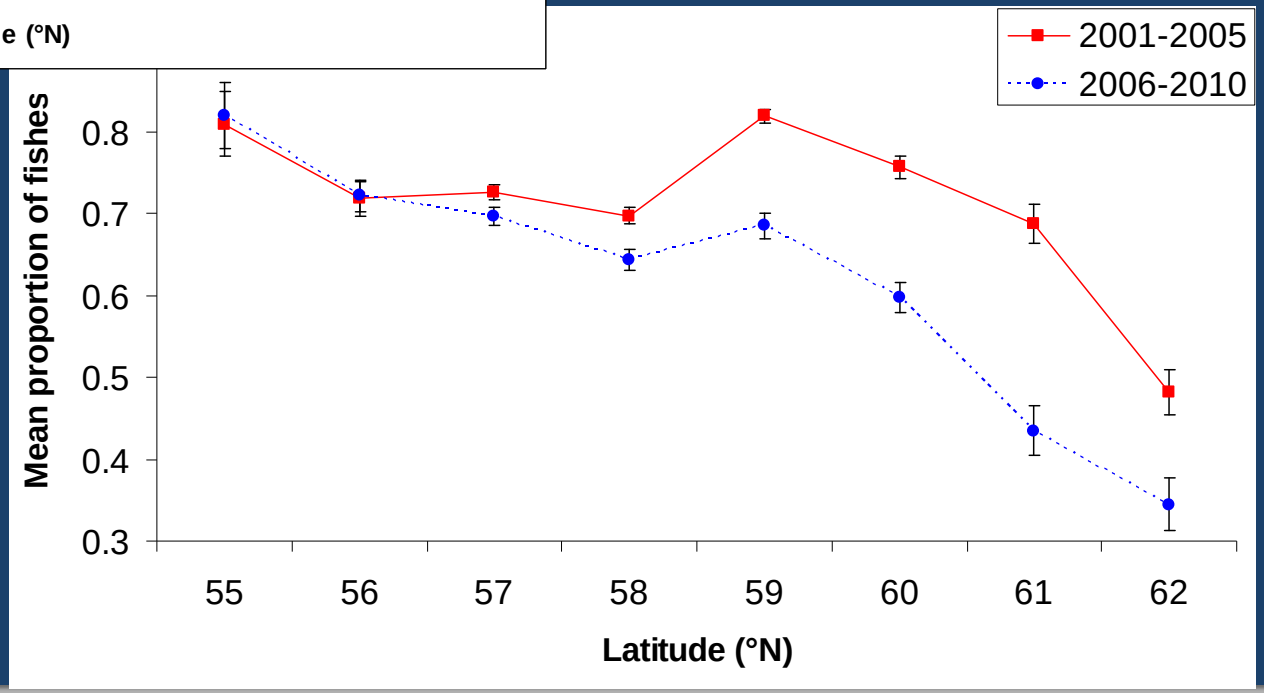






Temporal Trends – warm vs. cold





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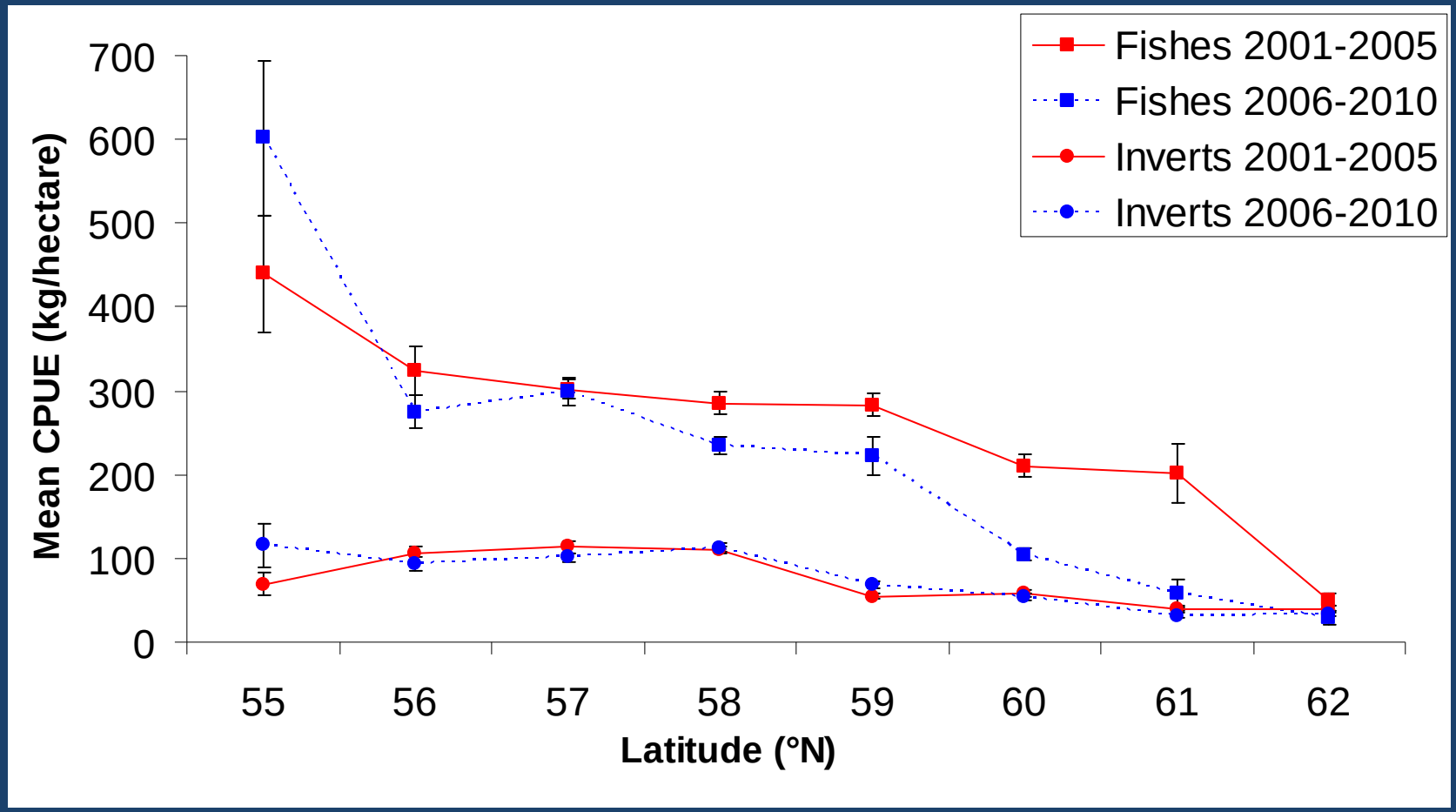

Conclusions

- The biomass of the epibenthic community declines with increasing latitude in the eastern Bering Sea

- The ratio of fish to invertebrate biomass declines with increasing latitude in the Bering Sea

- The ichthyofauna in the southern BS is dominated by flatfishes, while gadids and sculpins become more dominant the northern BS

- The invertebrate epifauna in the BS is dominated by *Asterias amurensis*, but oregoniid crabs are very abundant at some latitudes

Conclusions

- Mean fish size declines with increasing latitude, primarily due to species turnover

- The early part of the past decade was a warm period in the EBS, while the last 5 years were cold

- During the cold period, fish CPUE and catch proportion were significantly lower in the EBS, particularly at 58-61°N

Acknowledgments

We thank the multitude of field scientists involved in NMFS bottom-trawl surveys in the eastern Bering Sea and southeastern Chukchi Sea over the past 30 years, as well as the captains and crews of the charter vessels used for these surveys and the programmers and database managers responsible for maintenance of the RACE database.