"This project is funded from Norway Grants in the Polish-Norwegian Research Programme operated by the National Centre for Research and Development"

Arctic benthic biomass size spectra in response to climate changes

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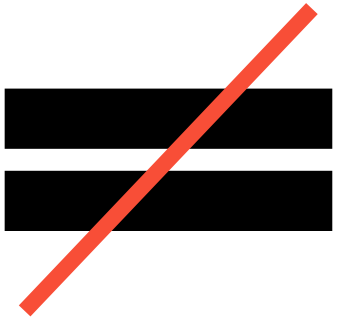
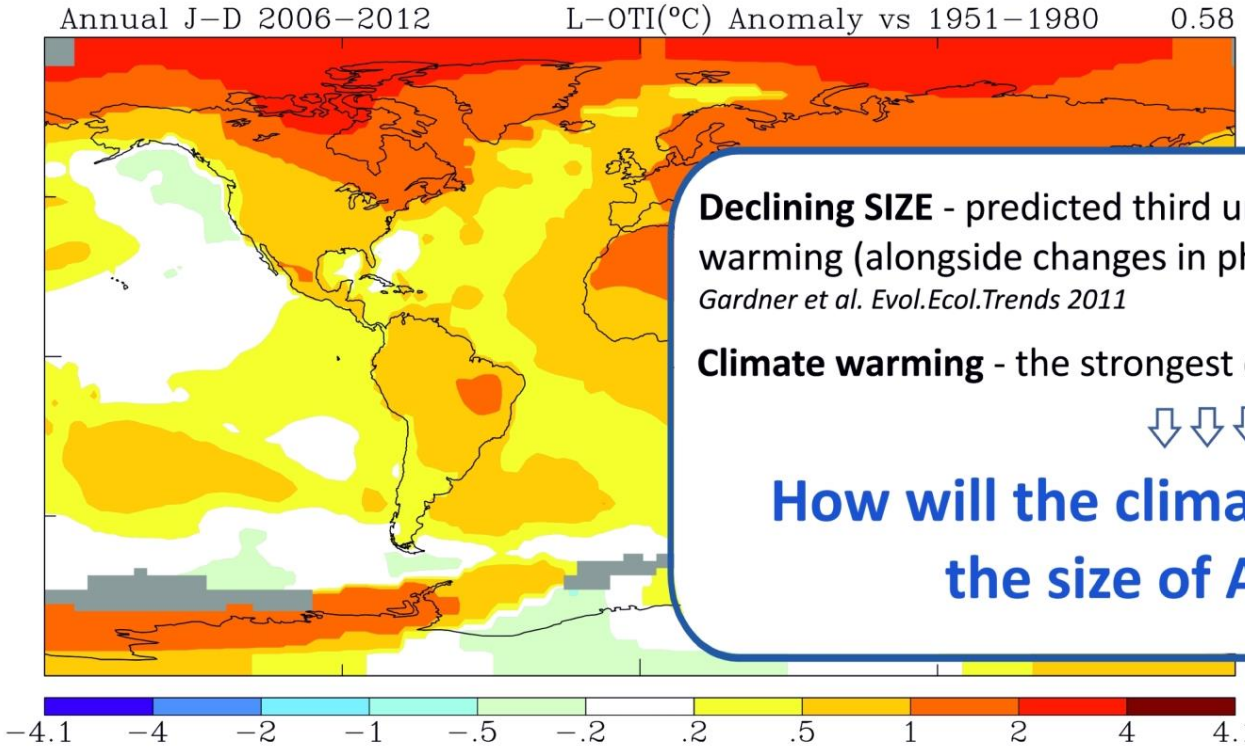
SIZE matters!



SIZE matters!

Same mass but different properties (eg. metabolism, bioturbation rate, production)



Average surface temperatures from 2006-2012 compared to a base period of 1951-1980.
*courtesy of **NASA Goddard Institute for Space Studies***

Declining SIZE - predicted third universal response to climate warming (alongside changes in phenology and species distributions)
Gardner et al. Evol.Ecol.Trends 2011

Climate warming - the strongest effects in **Arctic regions**

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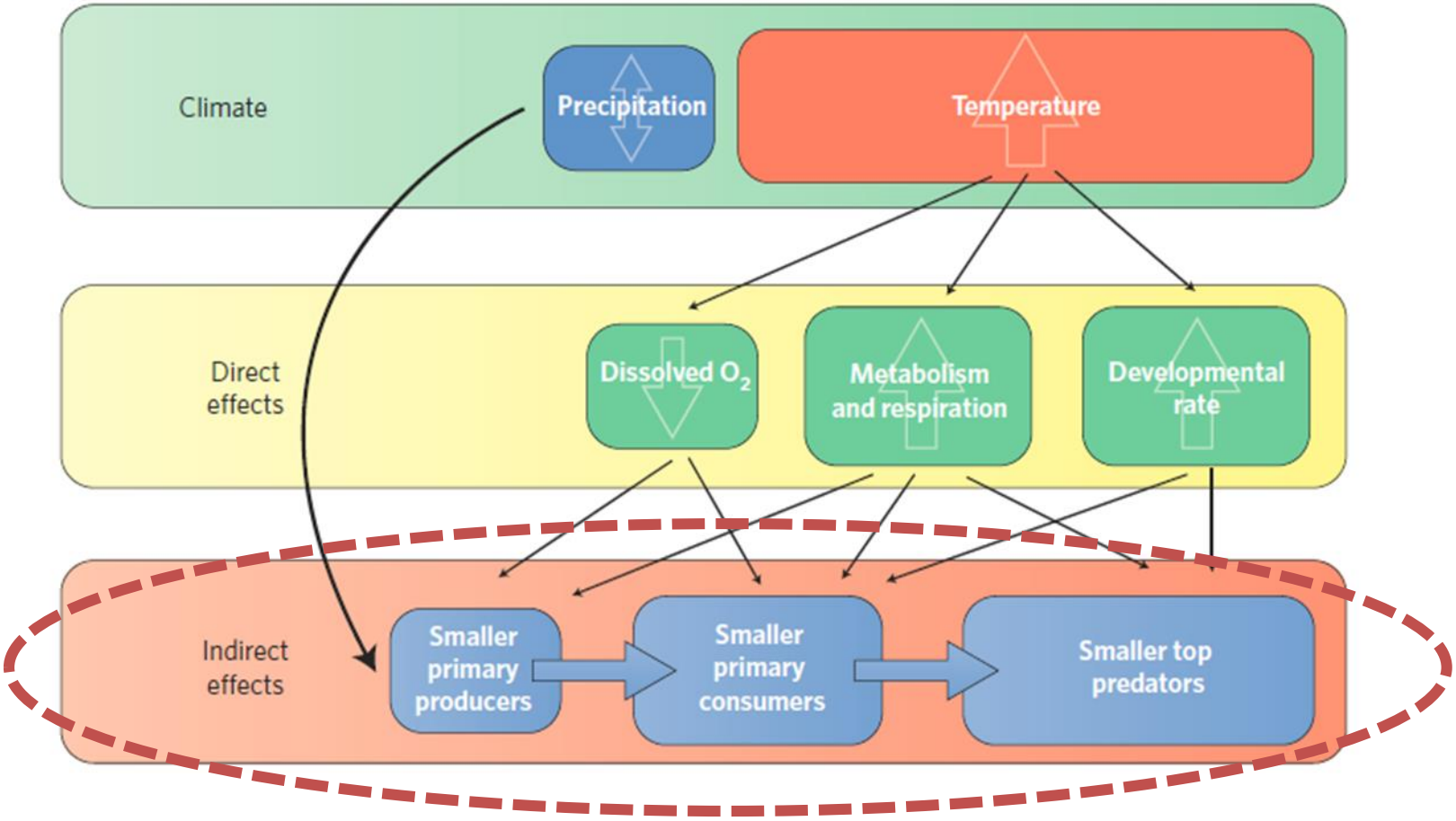
How will the climate warming affect the size of Arctic biota?

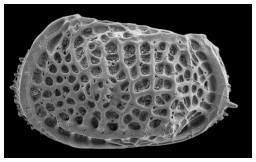
DWARF

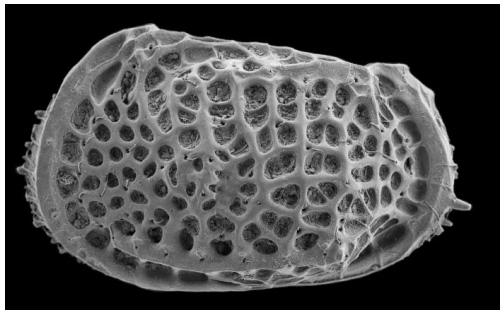
Direct and indirect effects of temperature

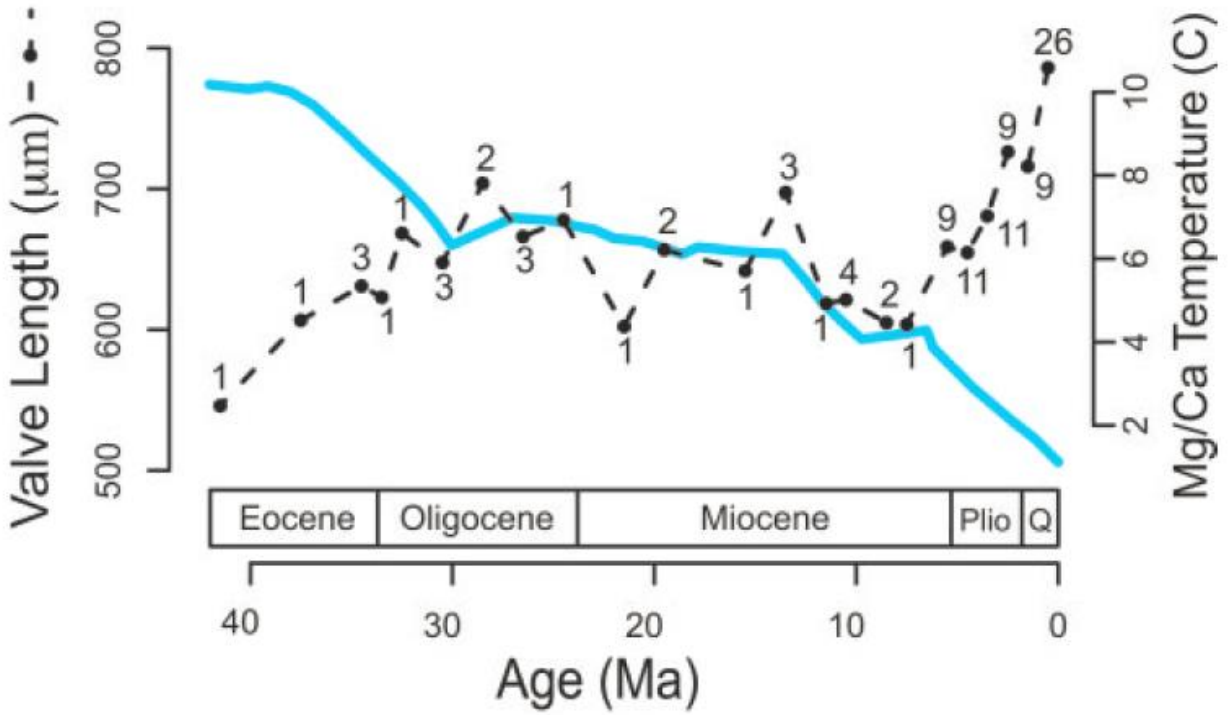


(Sheridan & Bickford 2011)

Effect of the past climate change on the size of *Poseidonamicus* ostracods – Cope's rule

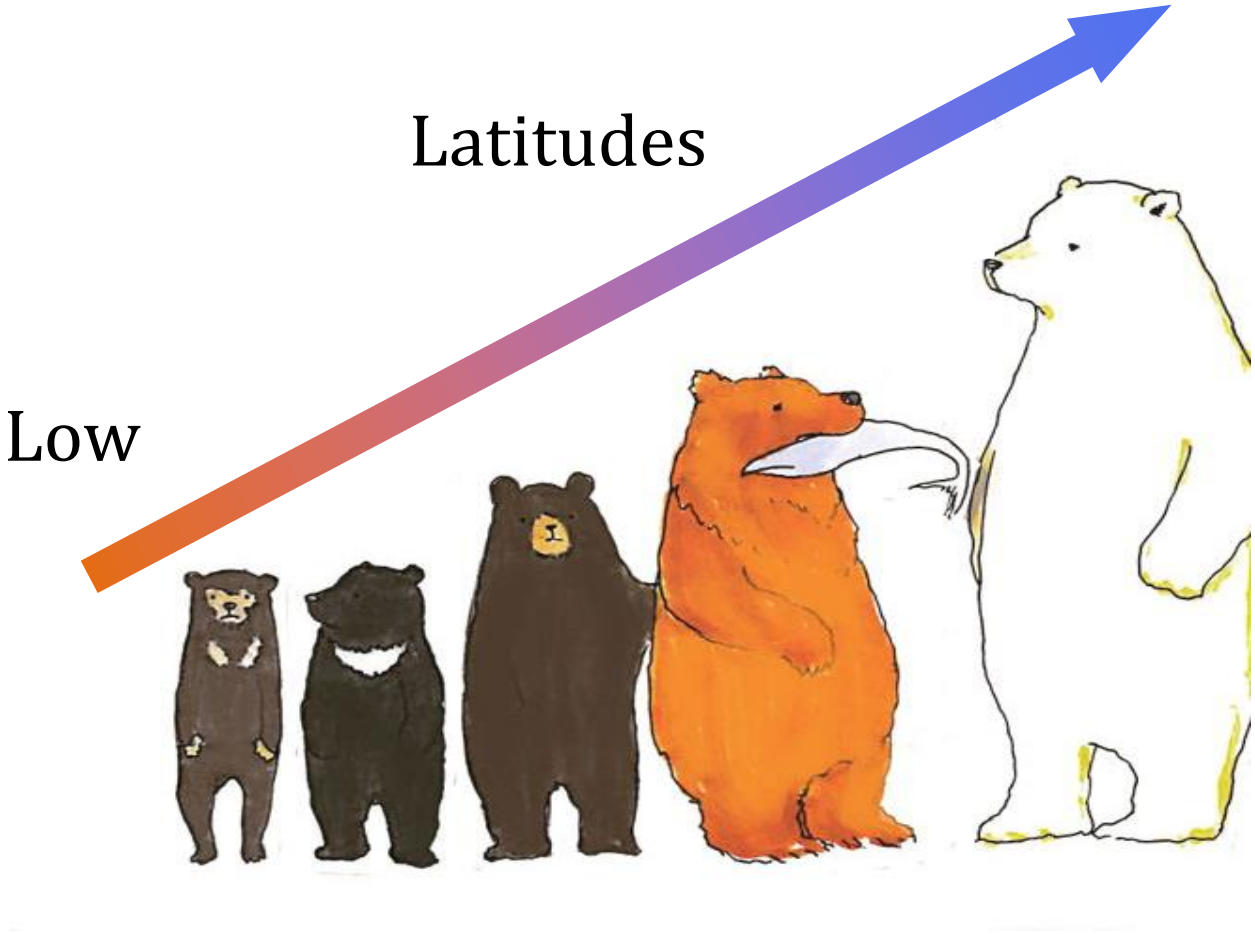




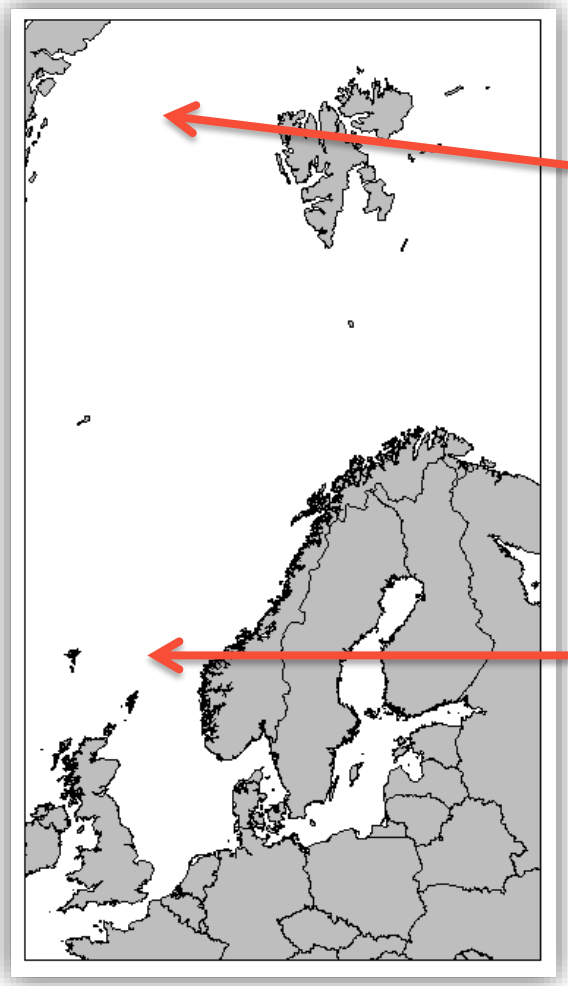


(Hunt & Roy, 2006)

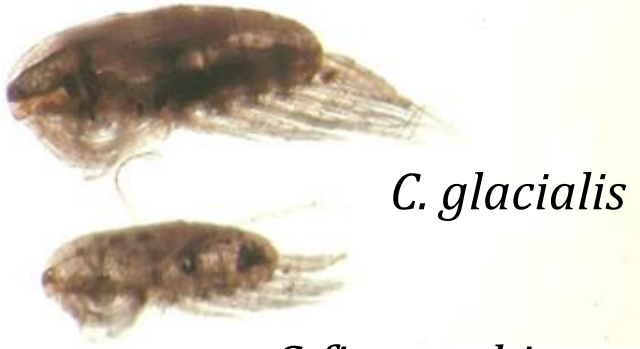
Bergmann's rule:



Bergmann's rule:



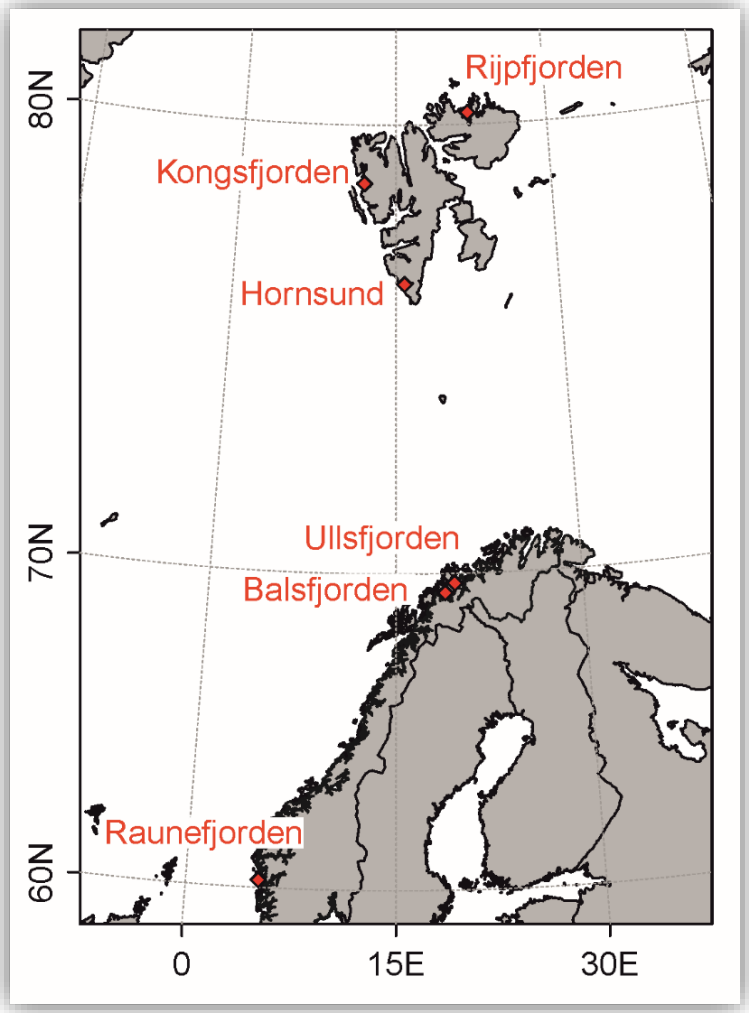
Calanus hyperboreus



C. glacialis

C. finmarchicus

Sampling

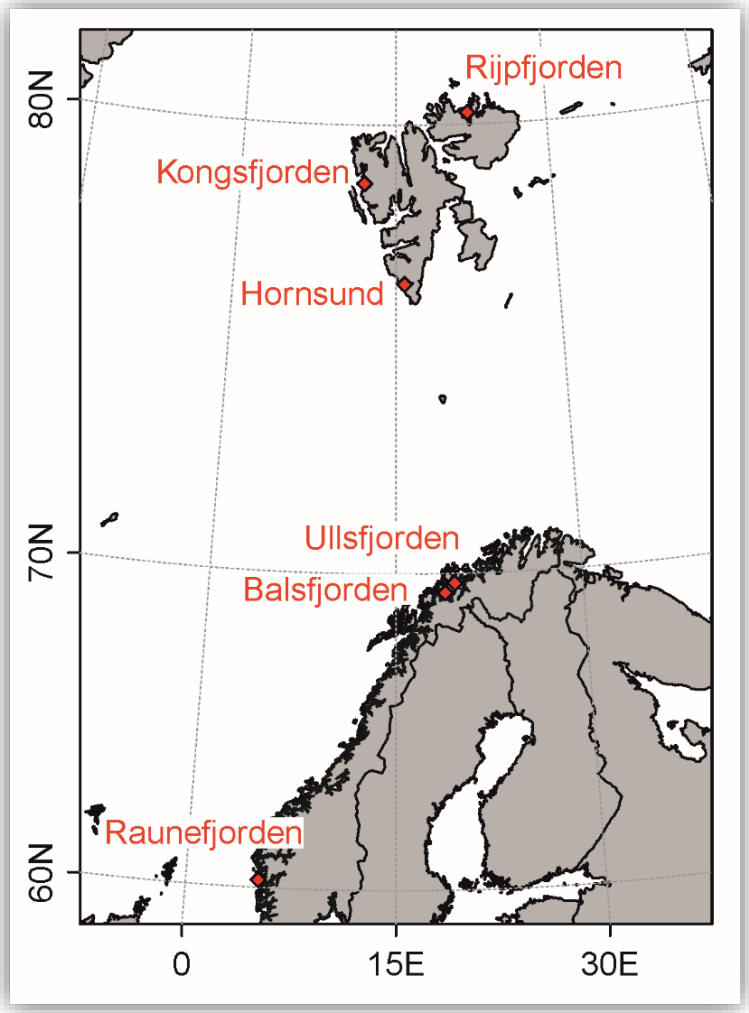


- Summer 2014: Ullsfjorden, Hornsund, Kongsfjorden, Rijpfjorden
- Winter 2015: Kongsfjorden
- Summer 2015: Raunefjorden, Balsfjorden

R/V Oceania

R/V Helmer Hanssen

Sampling



3 stations at each fjord:

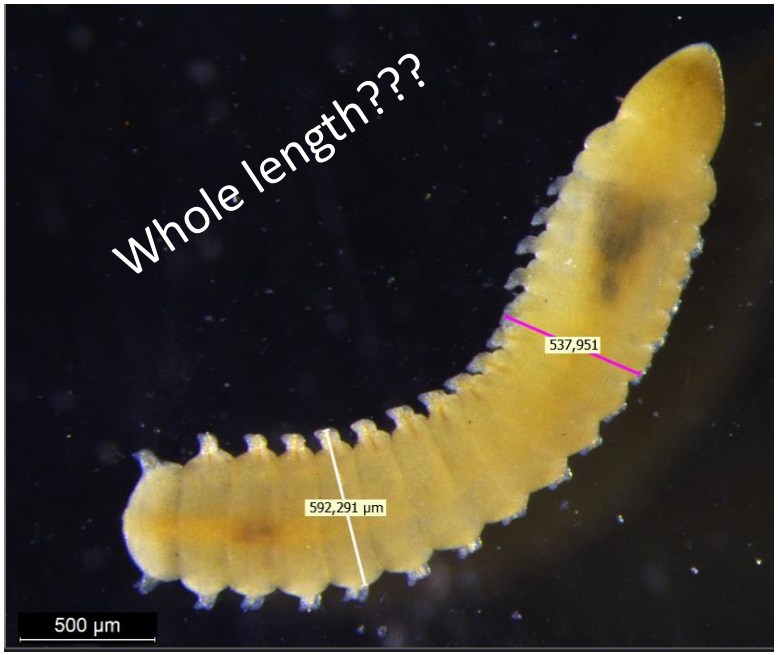
- Macrofauna (van Veen)
- Sediment samples:
  - POC, $\delta^{13}C$
  - Photosynthetic pigmnets
  - Grain Size
  - ^{210}Pb, ^{234}Th
- CTD

Methodology

Measurements of individual size

DWARF

Methodology



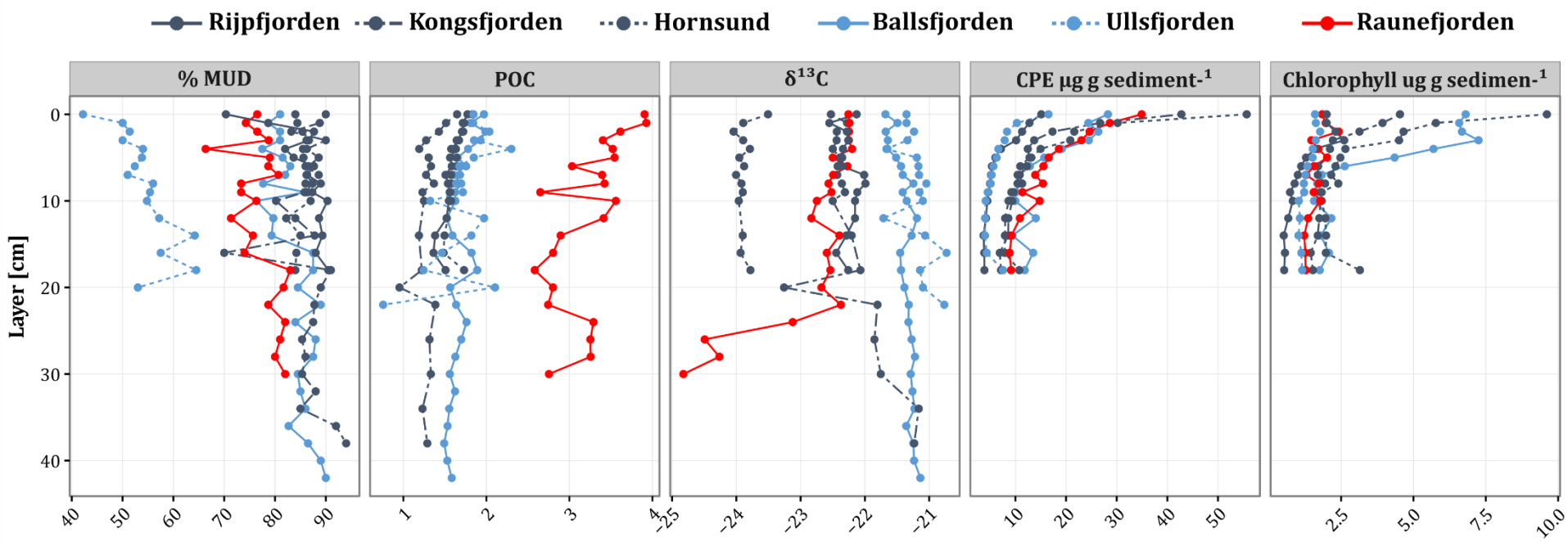
Measurements of individual size

Biovolume calculations

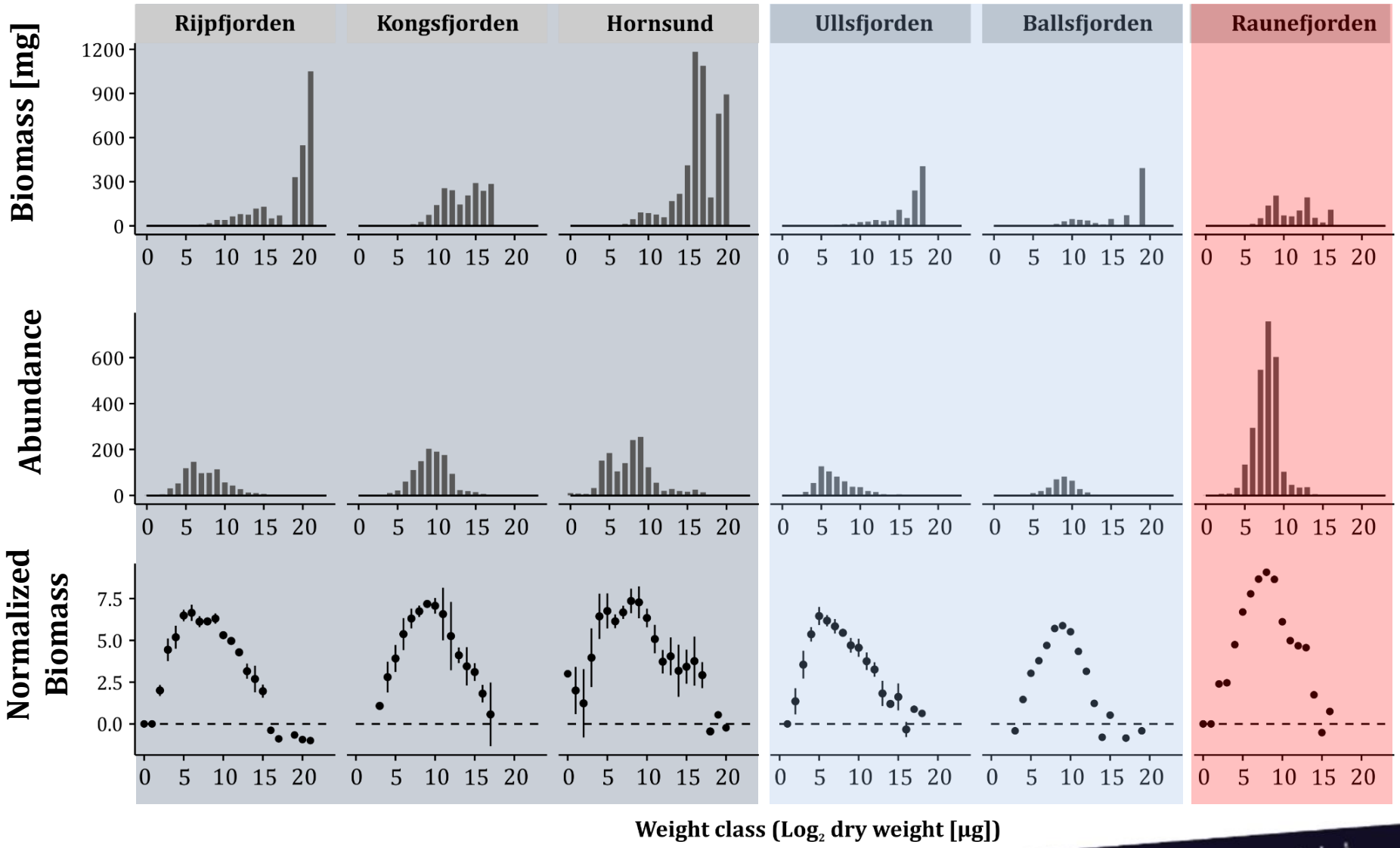
Biomass of each specimen

Family	equation	chetiger	r	p	r^2	N
Capitellidae	L = 4985.757 + 13.640*chet	chet 1	0.697	<0.001	0.486	23
	L = 6571.730 + 9.336*chet	chet 2	0.594	0.004	0.352	22
	L = 6626.593 + 8.962*chet	chet 3	0.609	0.003	0.371	22
	L = 6644.671 + 8.961*chet	chet 4	0.607	0.005	0.369	20
	L = 6680.113 + 8.936*chet	chet 5	0.609	0.004	0.371	20
	L = 6509.111 + 9.530*chet	chet 6	0.651	0.002	0.424	20
	L = 6143.365 + 10.735*chet	chet 7	0.661	0.003	0.437	18

Characteristics of sediments



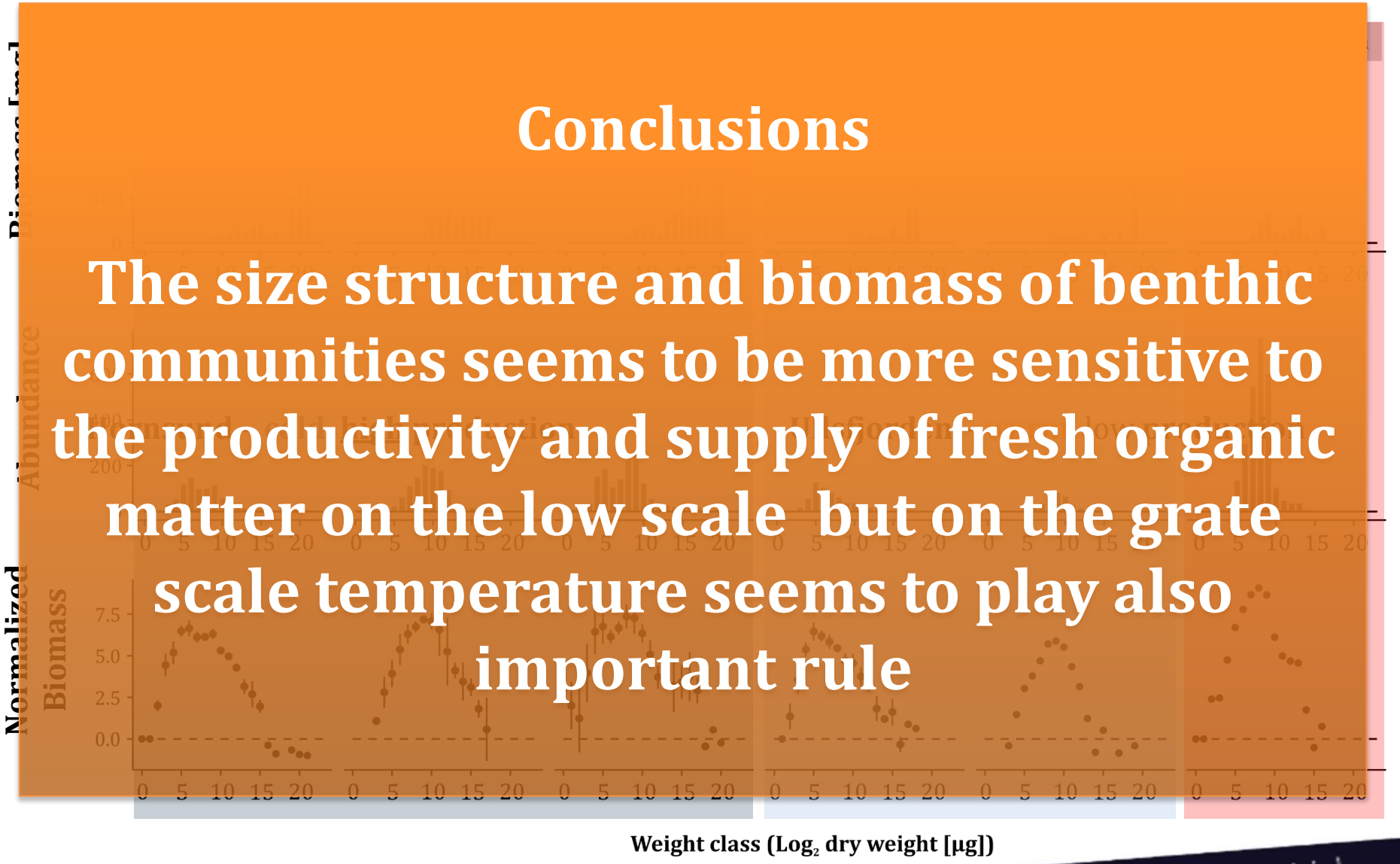
Size spectra



Size spectra

Conclusions

The size structure and biomass of benthic communities seems to be more sensitive to the productivity and supply of fresh organic matter on the low scale but on the grate scale temperature seems to play also important rule



Thank you