

# Will size in Arctic benthic communities respond to climate warming? Variability in biomass size spectra along latitudinal gradient (60-80°N)

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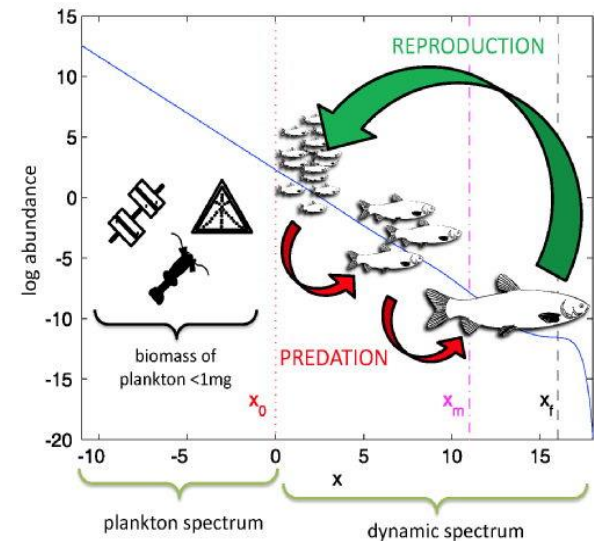
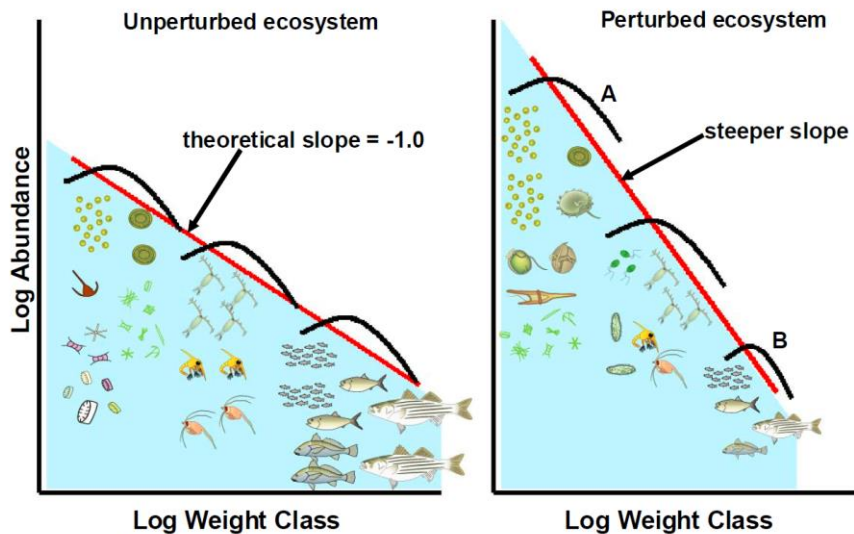
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# Size spectra

- Widely used to assess state of various aquatic communities
- Provide information about energy flow within the system
- Sensitive to some disturbances – eg. overfishing, fluvial discharge
- Mostly explored in pelagic communities



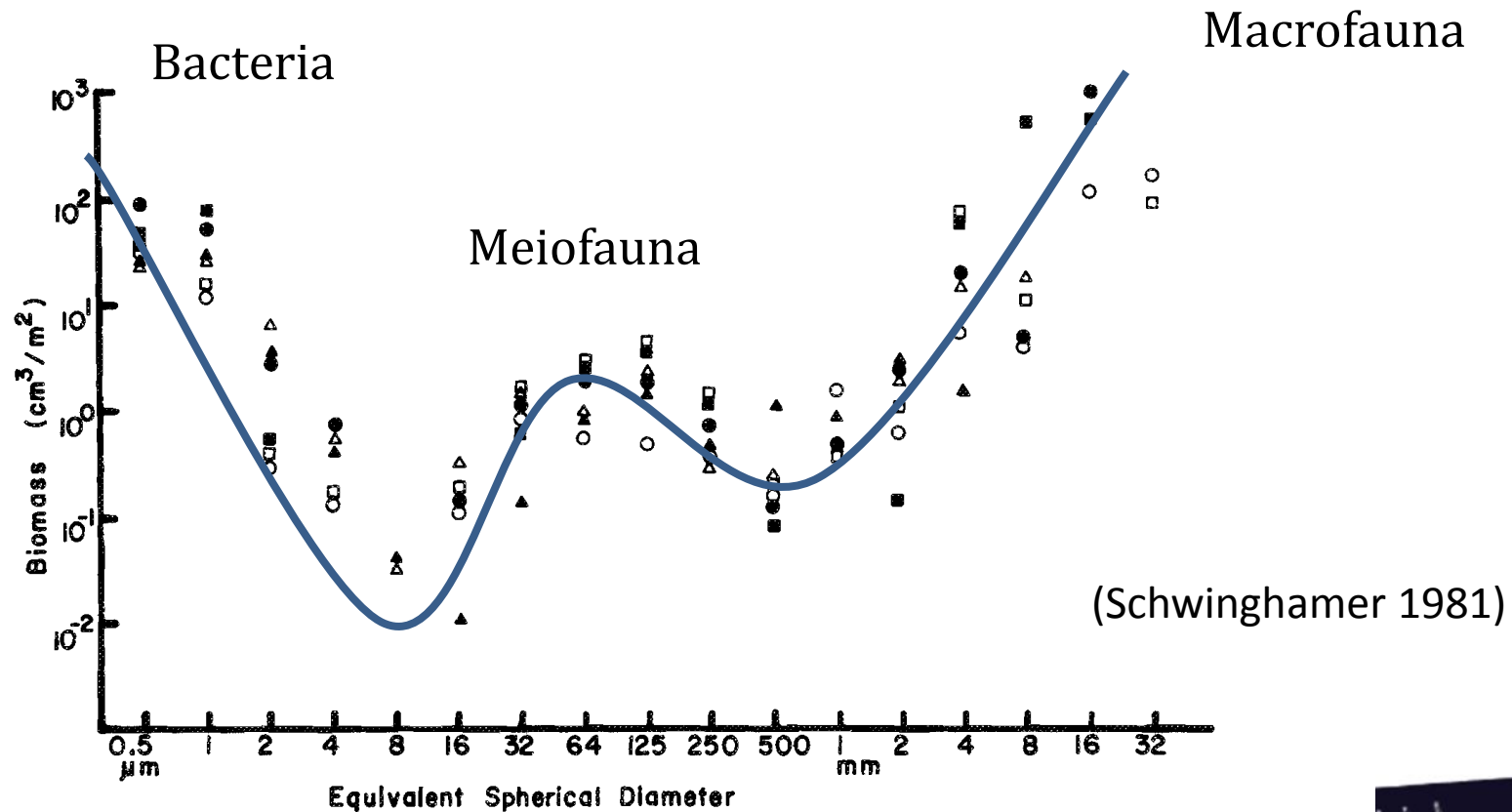
Conelly, 2011

Datta 2011



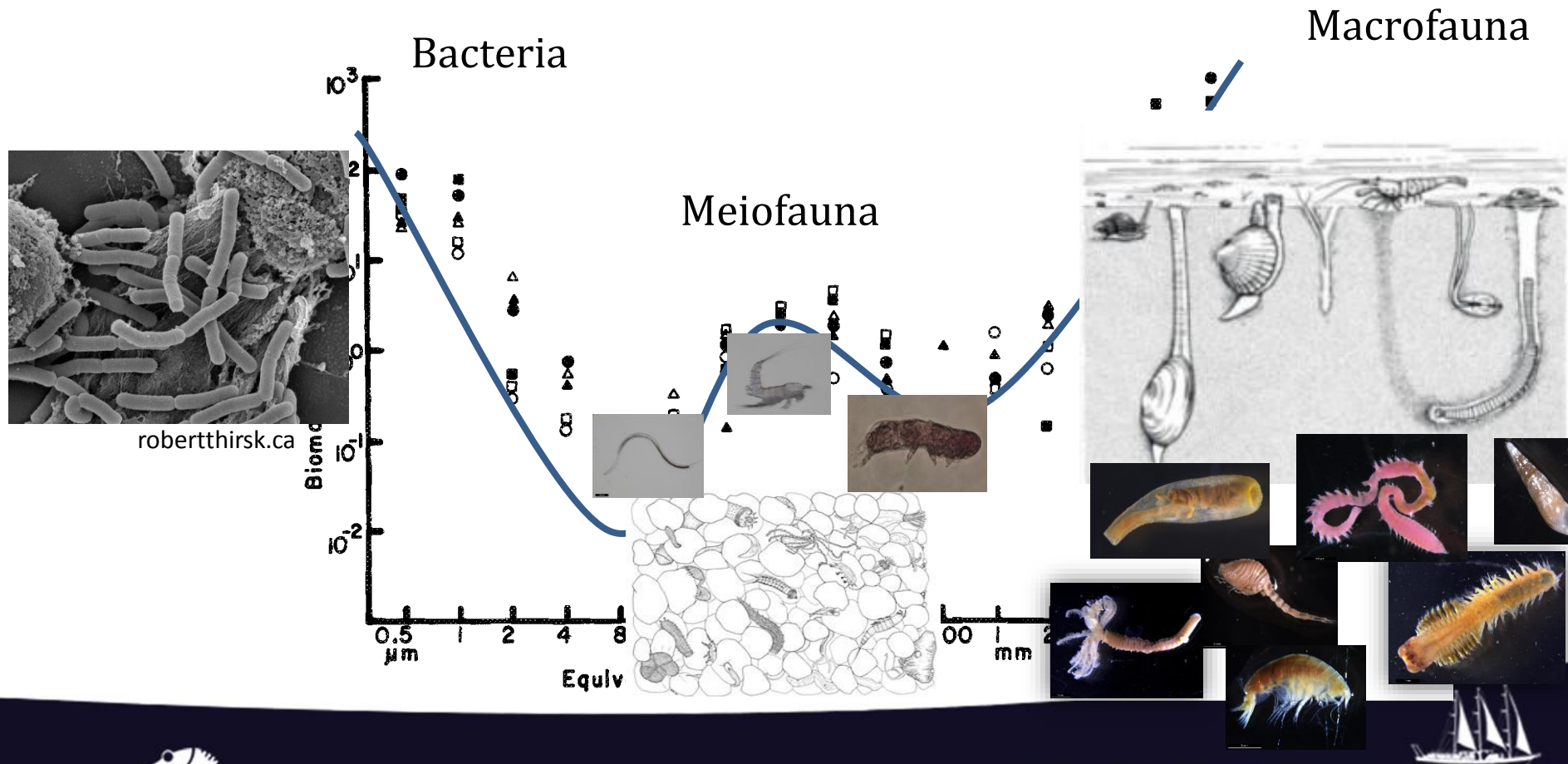
# Benthic Size Spectra

- Different groups are well separated by troughs due to niche change
- Resilient to the total biomass changes



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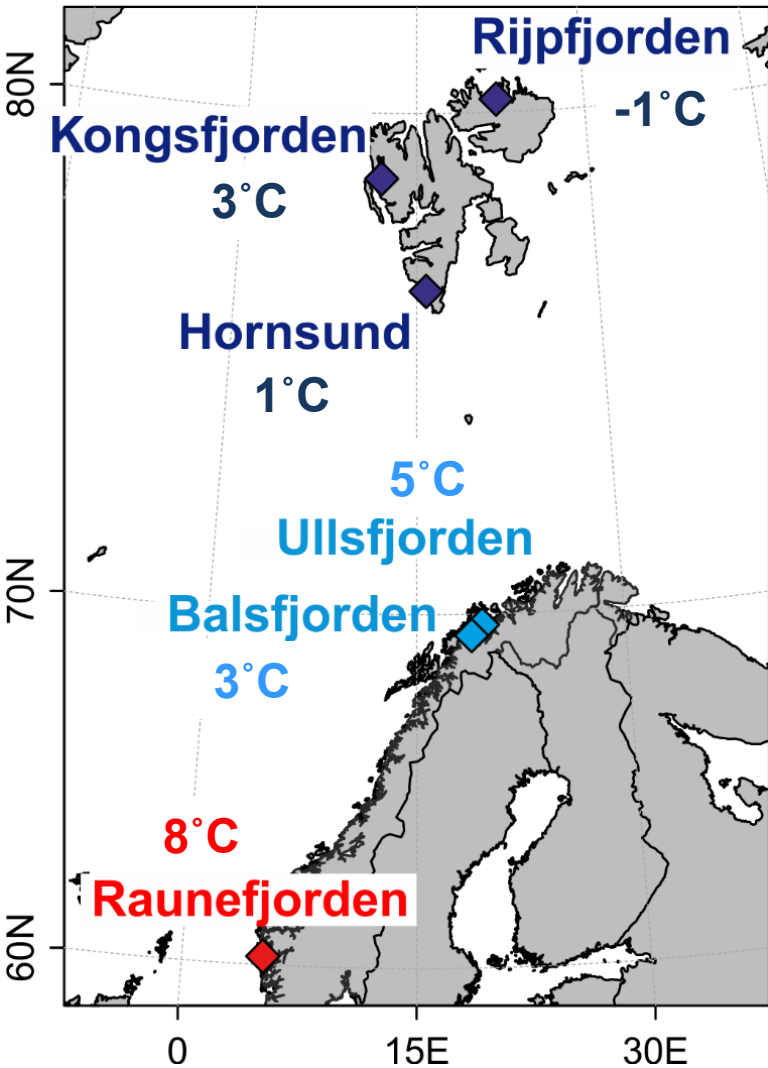


# Benthic Size Spectra

- Seasonality – no clear patterns (*Quiroga et al. 2016, Mazurkiewicz in prep.*)
- Grain size independent (*Duplisea and Drgas 1999, Duplisea 2000*)
- Oxygen conditions – influence on the size structure (*Quiroga et al. 2005*)
- Sensitive descriptor of trophic conditions in deltaic environment (*Akumaniaki et al. 2006*)
- Depth (food) dependent (*Saiz-Salinas et al. 1999*)
- Independent to organic enrichment (*Duplisea & Hargrave 1996*)
- Can be used as indicators of anthropogenic stressors (*Quiroga 2011*)



# Sampling



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



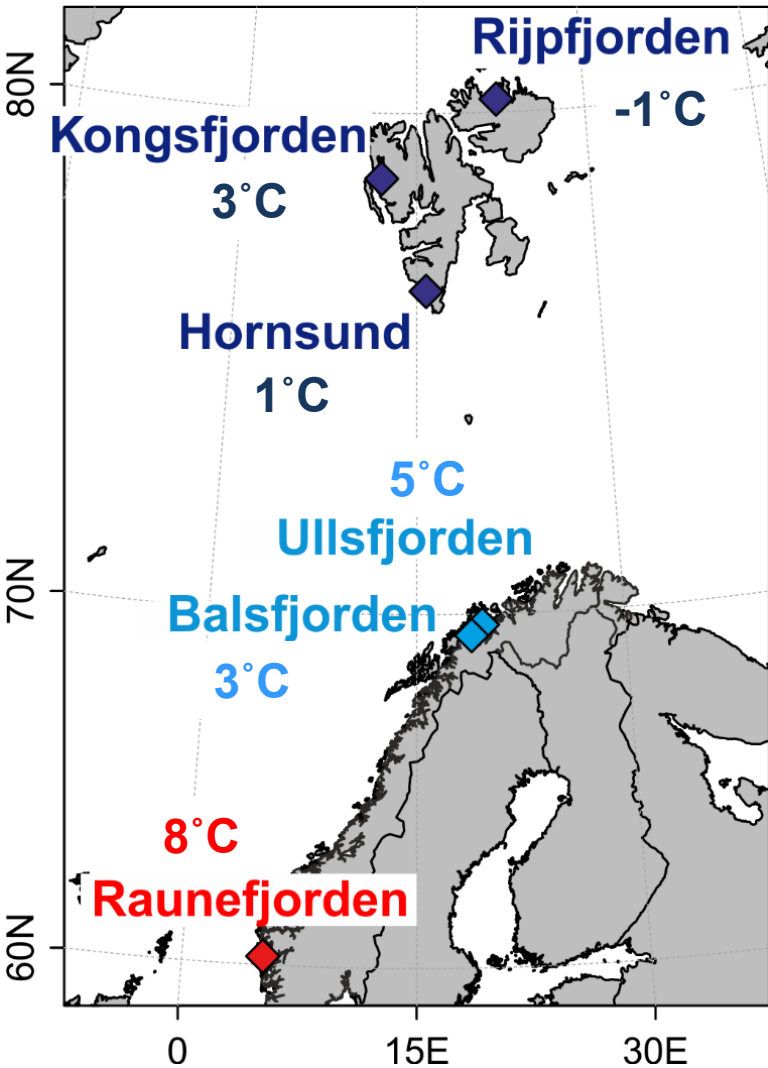
R/V Oceania



R/V Helmer Hanssen



# Sampling



3 stations in each fjord:

□ Macro- and meiofauna

□ Sediment samples:

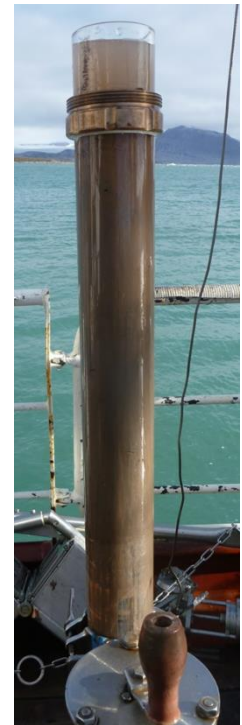
□ POC,  $\delta^{13}\text{C}$

□ Photosynthetic pigments

□ Grain Size

□  $^{210}\text{Pb}$ ,  $^{234}\text{Th}$

□ CTD



## Meiofauna

Sieving on 32  $\mu\text{m}$   
and centrifuge in  
Ludox

Identification to  
higher taxa



## Sample processing

Measurements of  
individual size

Biovolume  
calculations

Biomass of each  
specimen

Secondary production  
estimations

## Macrofauna

Sieving on 500  $\mu\text{m}$   
and sorting

Identification to  
species level

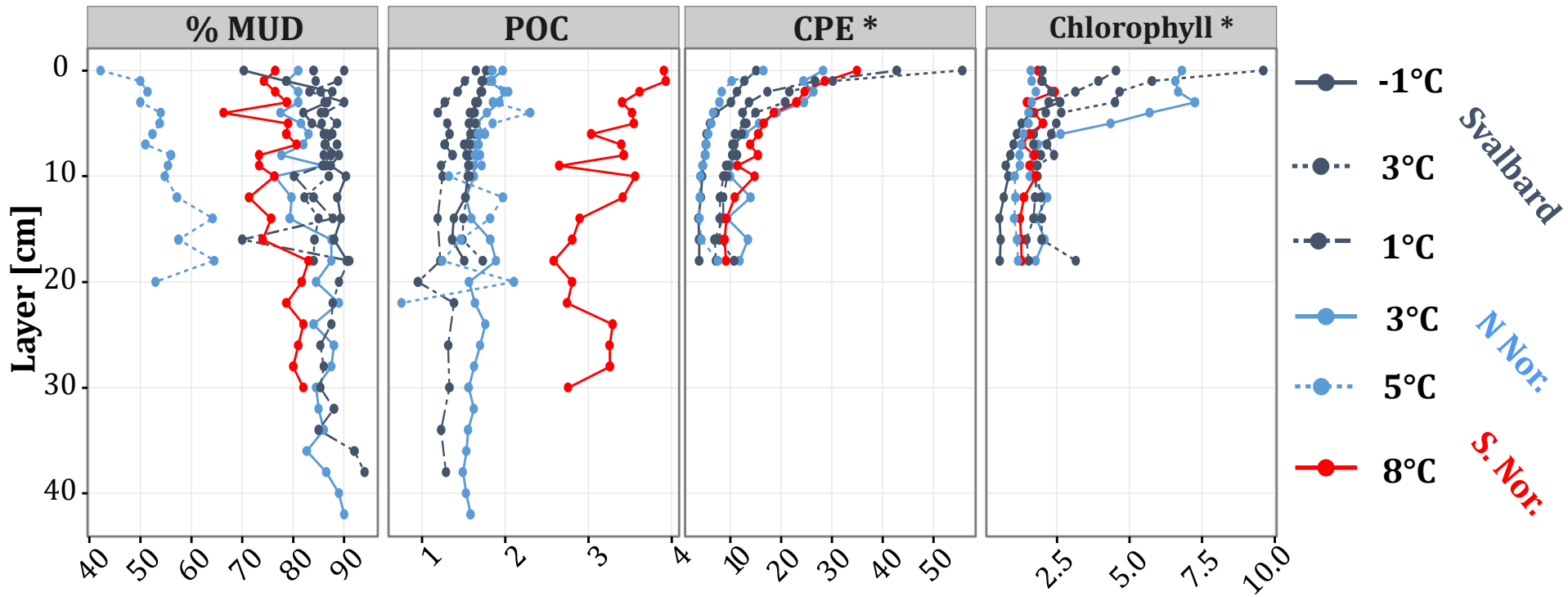


Benthic Biomass Size  
Spectra





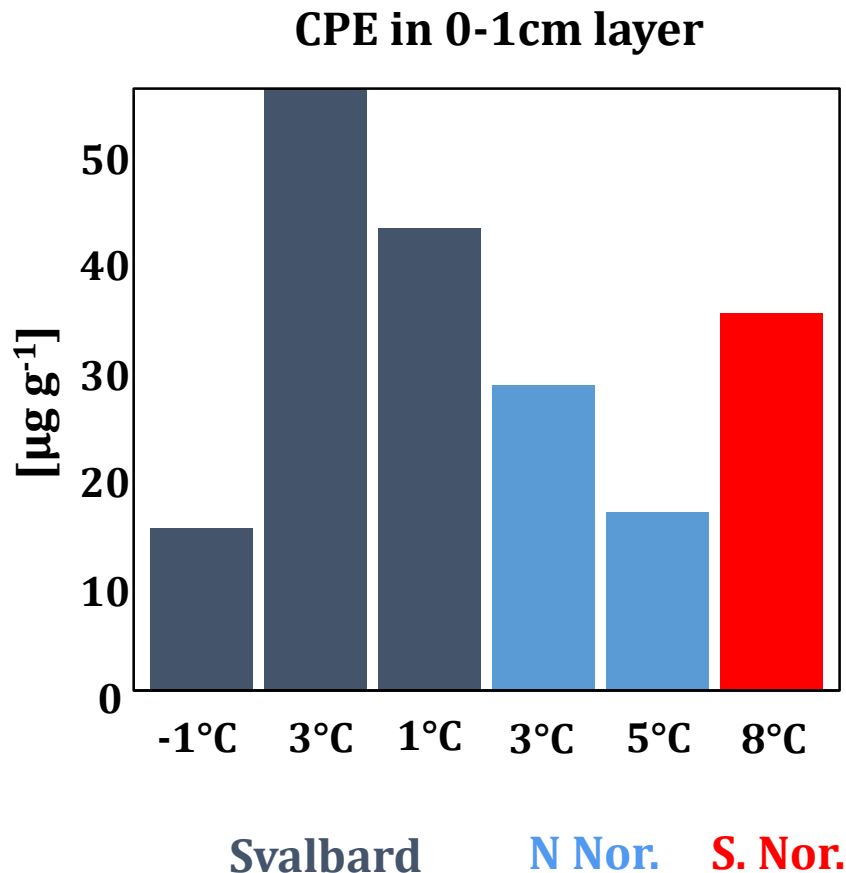
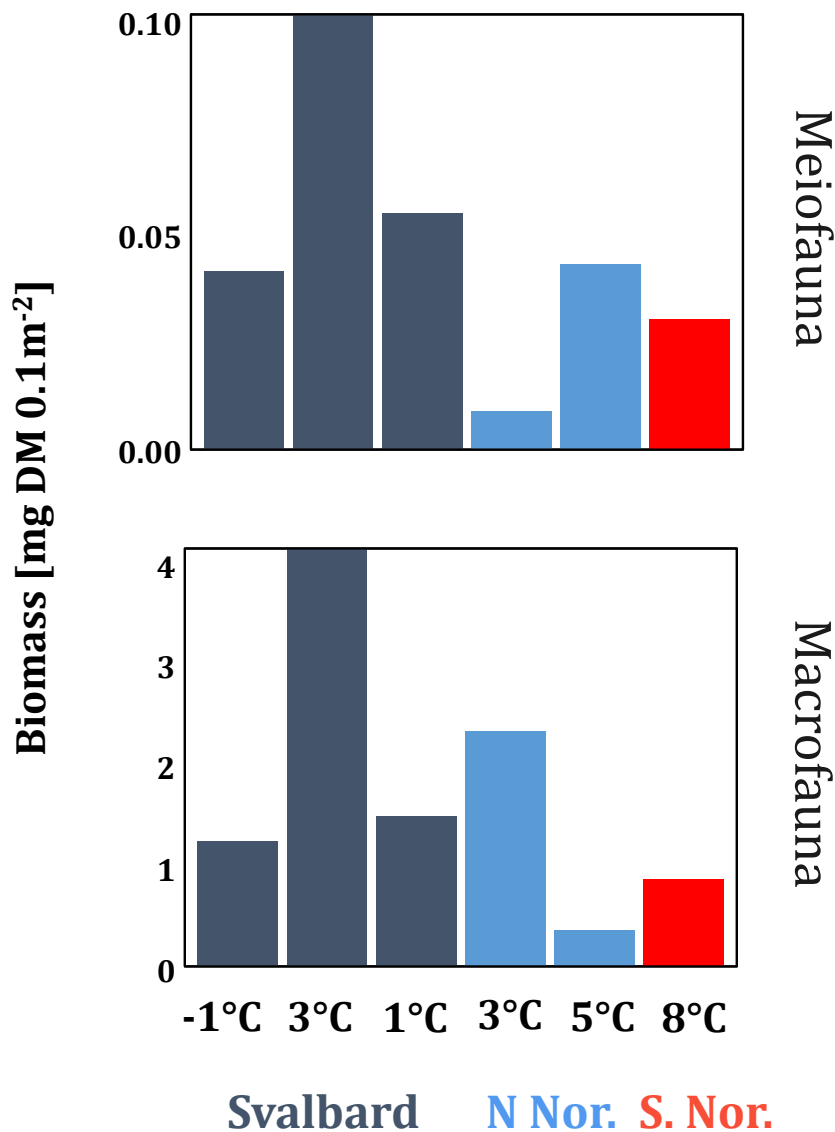
# Characteristics of sediments



\*  $\mu\text{g g sediment}^{-1}$

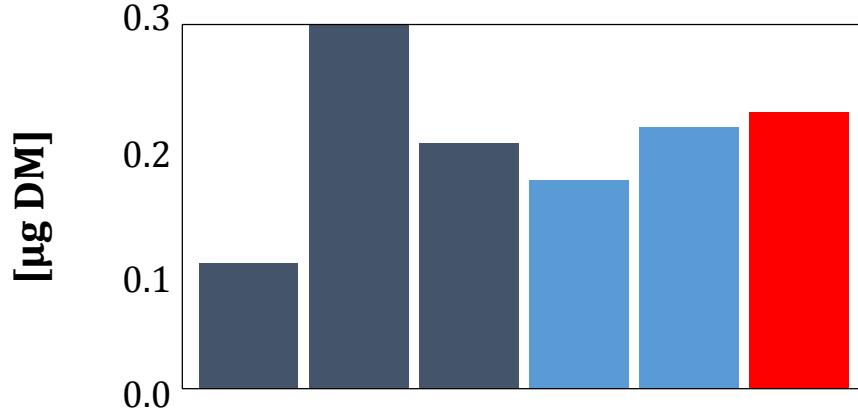


# Total Biomass

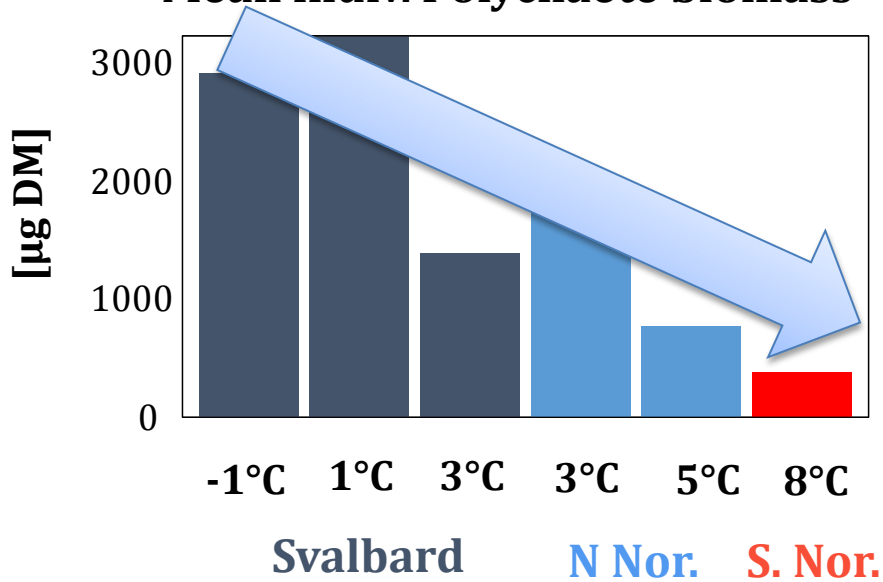


# Total Biomass

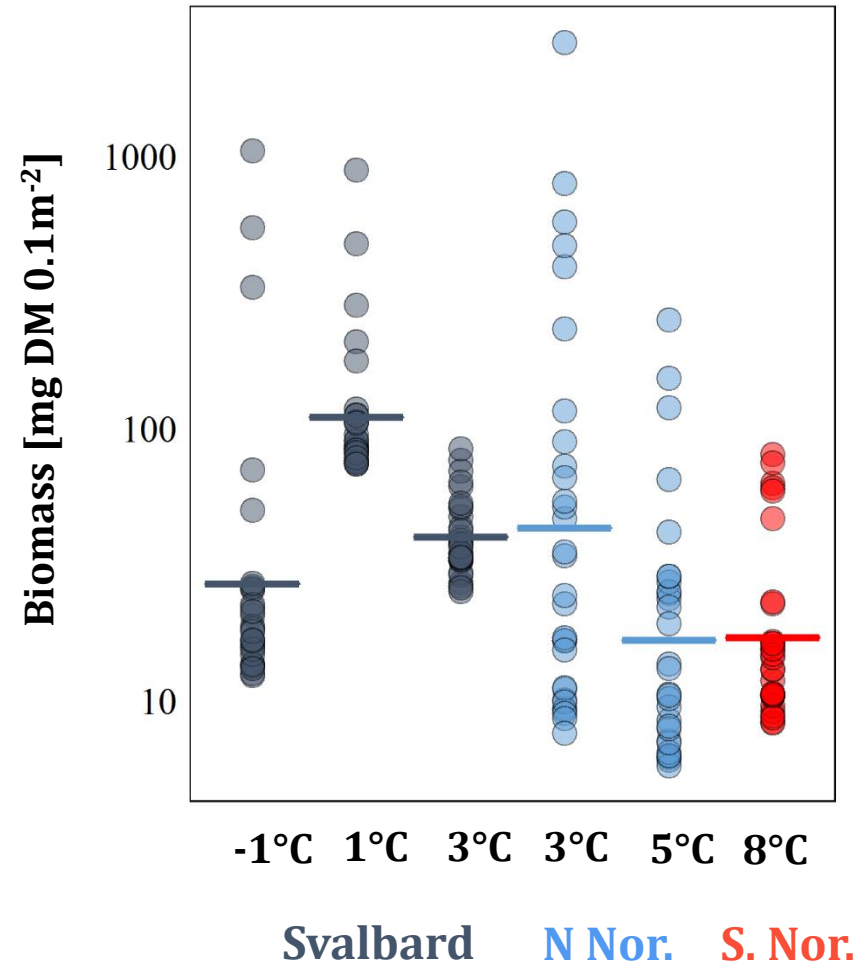
## Mean indiv. Nematoda biomass



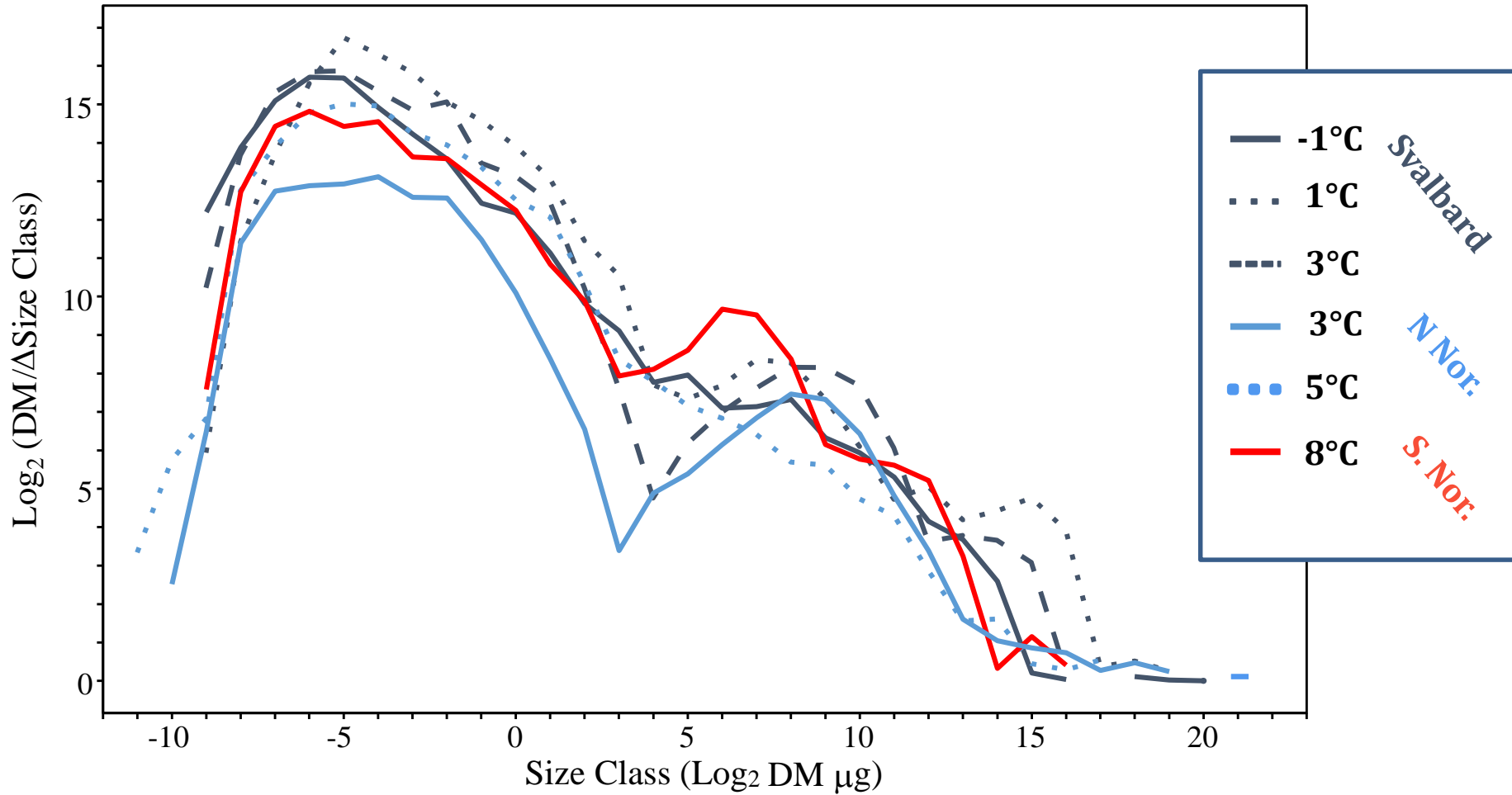
## Mean indiv. Polychaete biomass



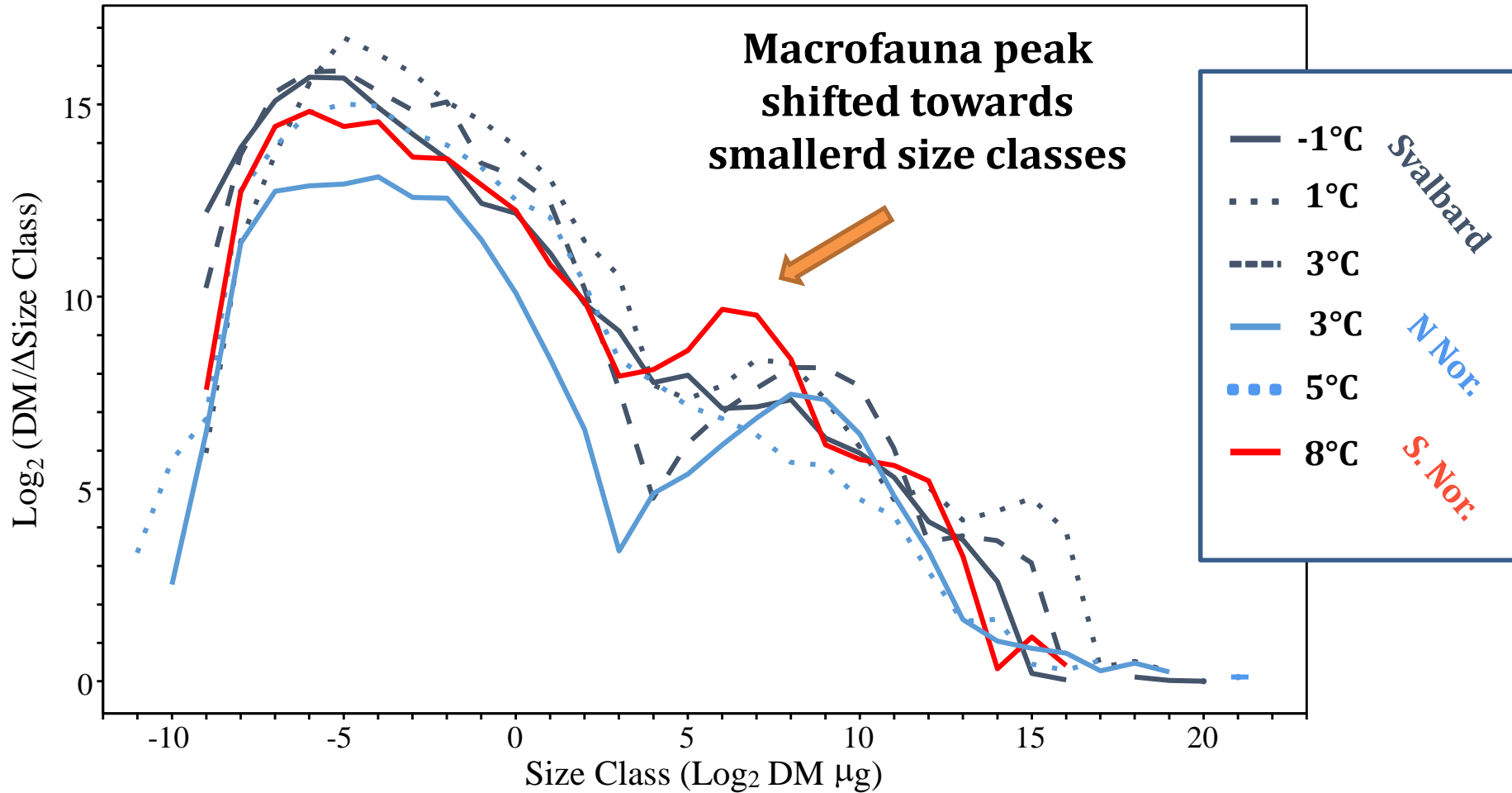
## Top 30 largest specimens



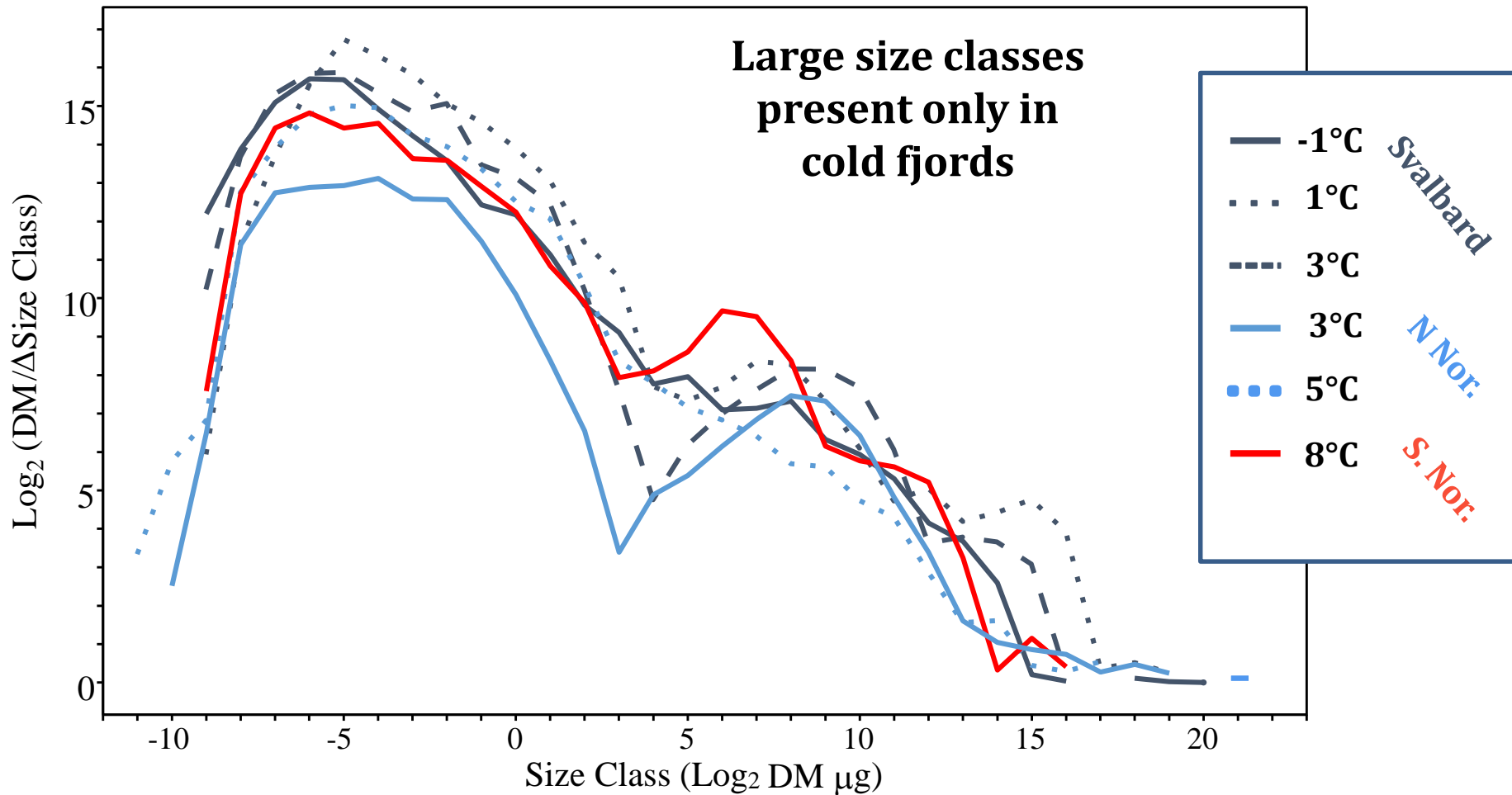
# Normalised Biomass Size Spectra



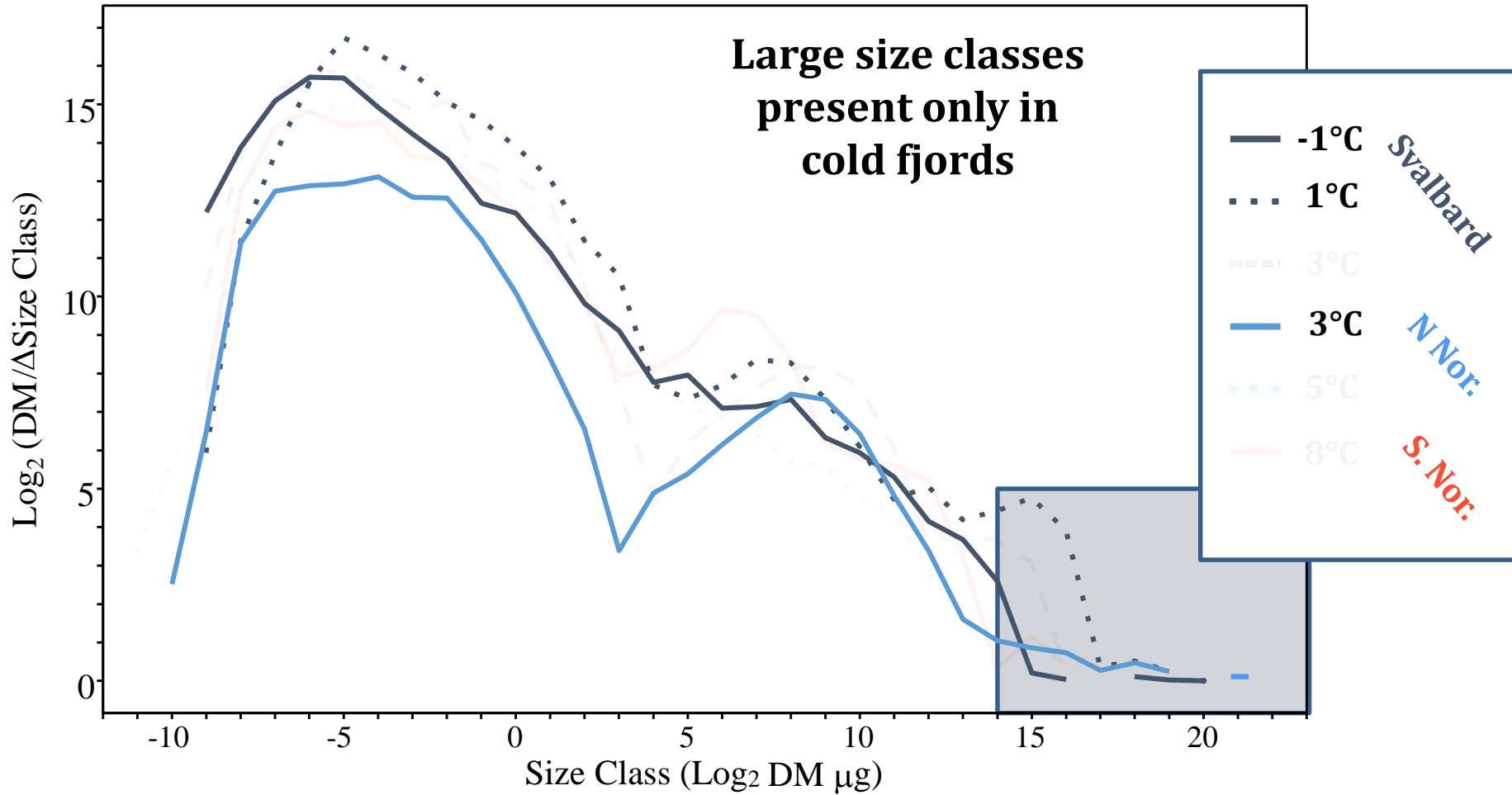
# Normalised Biomass Size Spectra



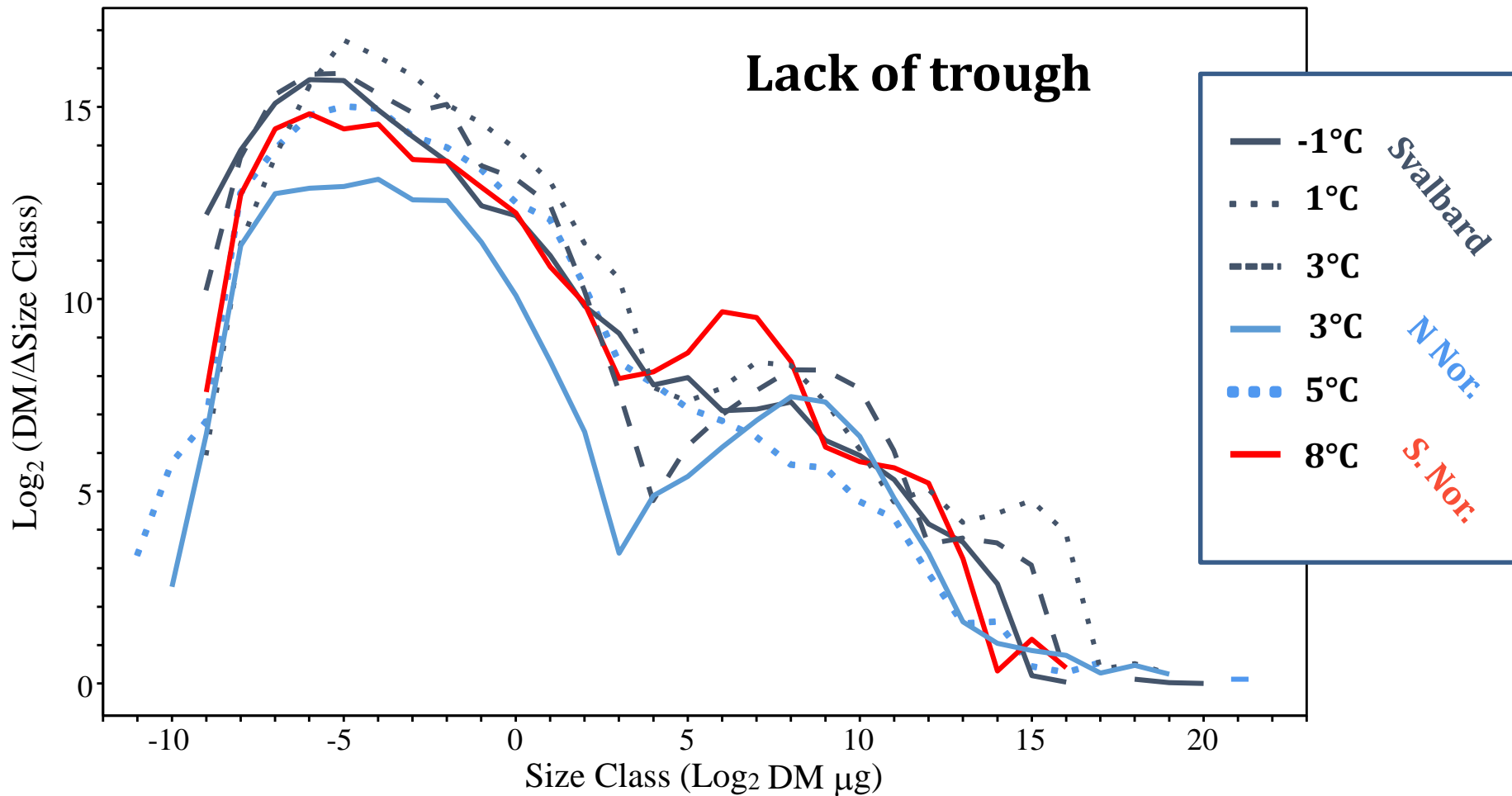
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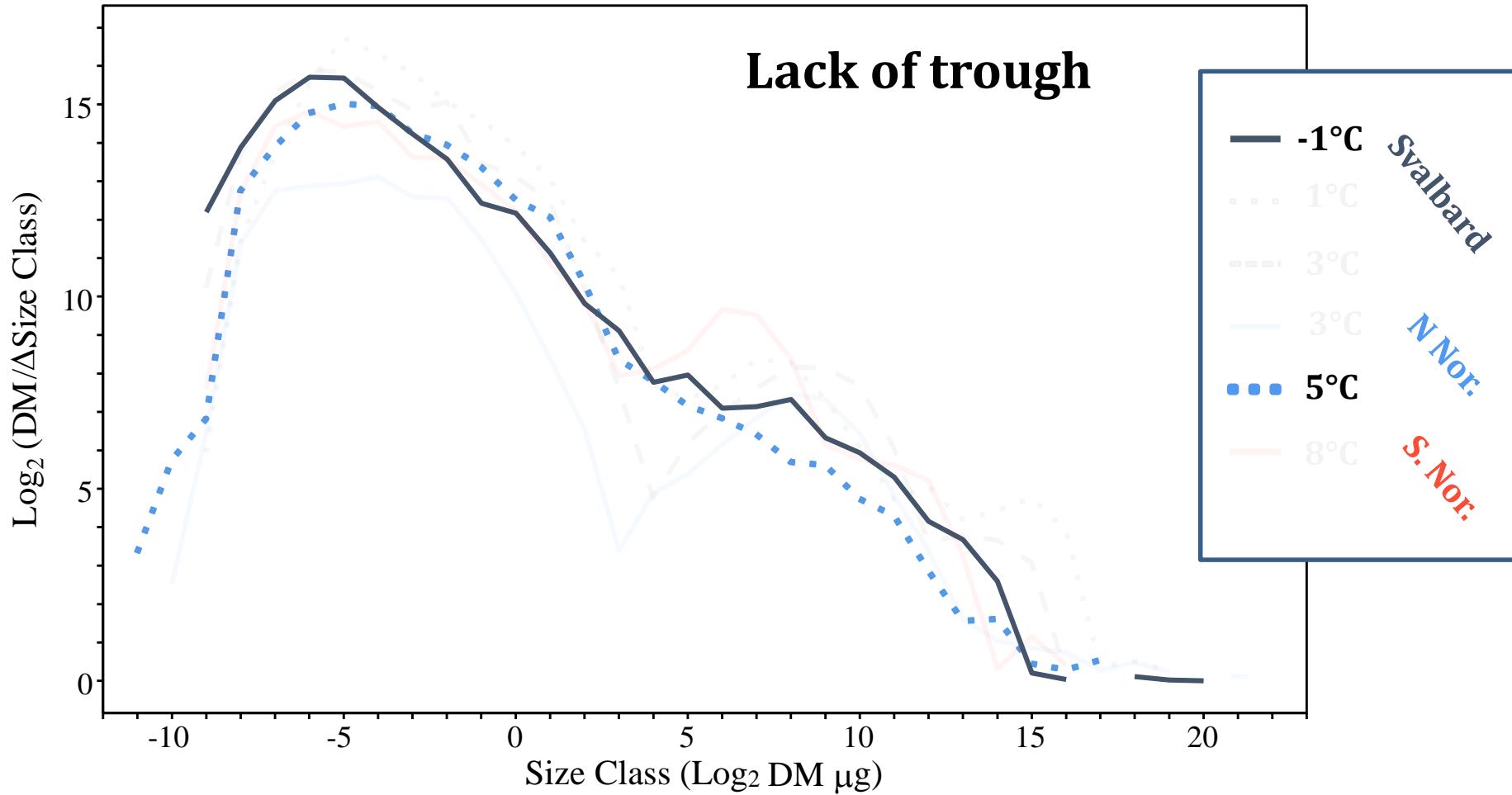


# Normalised Biomass Size Spectra





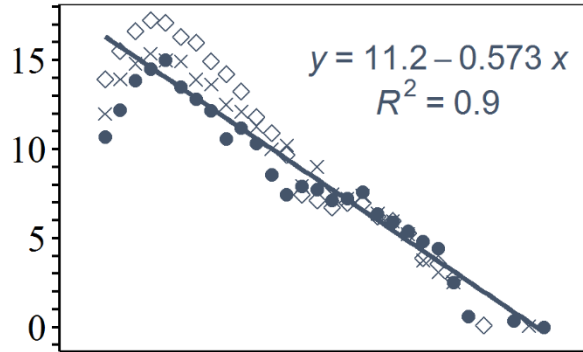
# Normalised Biomass Size Spectra



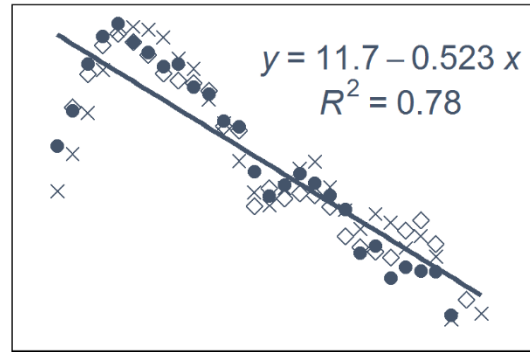
# Normalised Biomass Size Spectra

## Svalbard

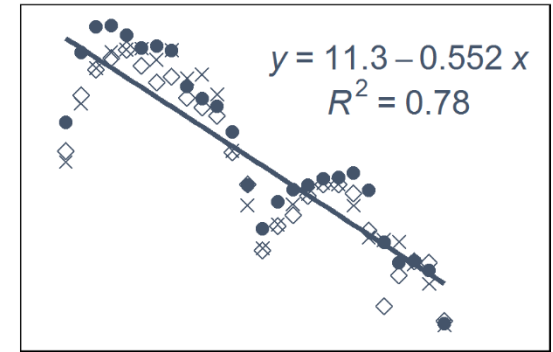
RIJP -1°C



HSD 1°C



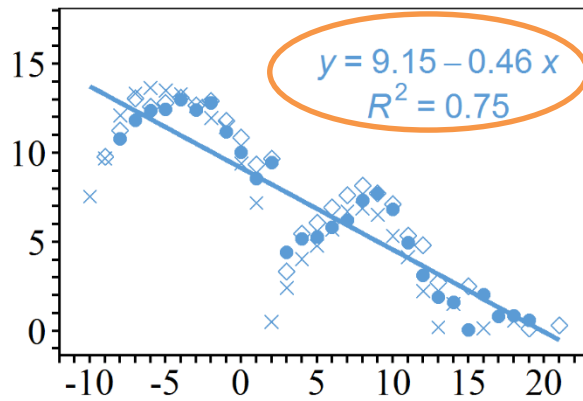
KGF 3°C



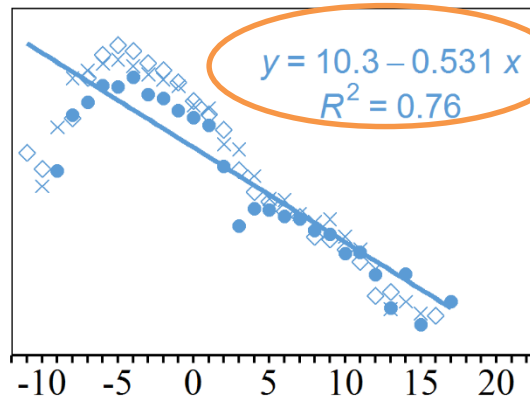
BSF 3°C

N Norway

Log<sub>2</sub> (DM/ΔSize Class)

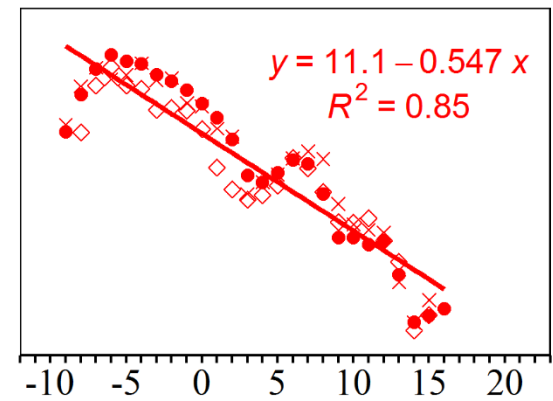


ULS 5°C



S. Norway

RAU 8°C

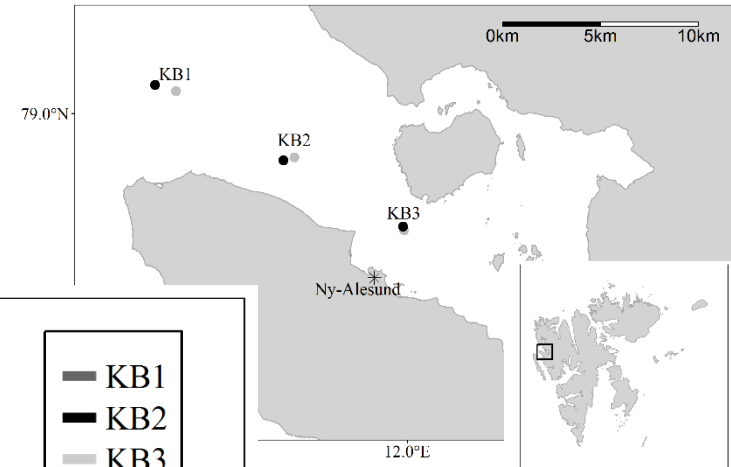
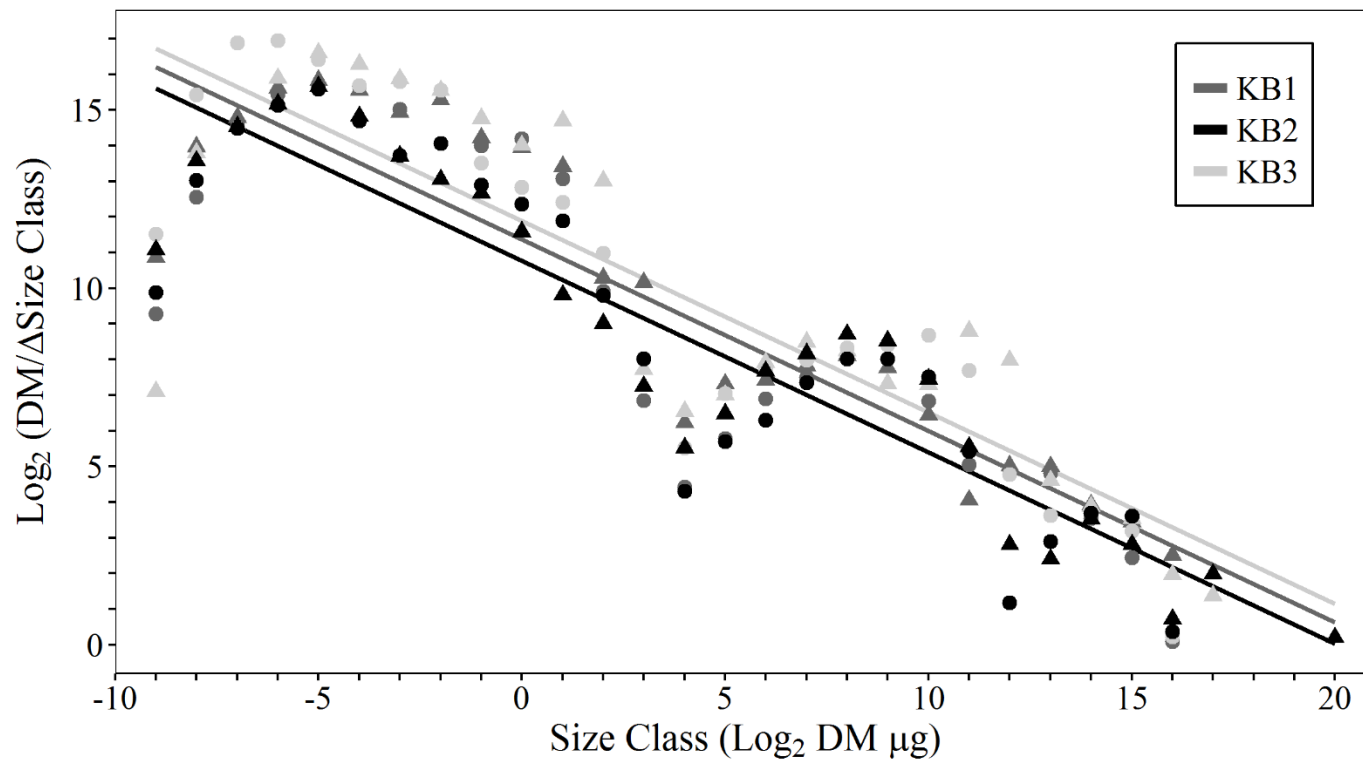


Size Class (Log<sub>2</sub> DM μg)



# Normalised Biomass Size Spectra

No summer - winter differences in normalized size spectra



## Conclusions

- The size structure seems to be very conservative along the whole temperature gradient
  - The most pronounced difference is the loss of higher size classes in warmer fiords
- The total biomass seems to reflect the CPE in surface layers of sediments
- The size structure does not vary seasonally



Thank you



**DWARF**

Declining size - a general response to climate warming in Arctic fauna?

