

## GLAERE Benthos study interests:

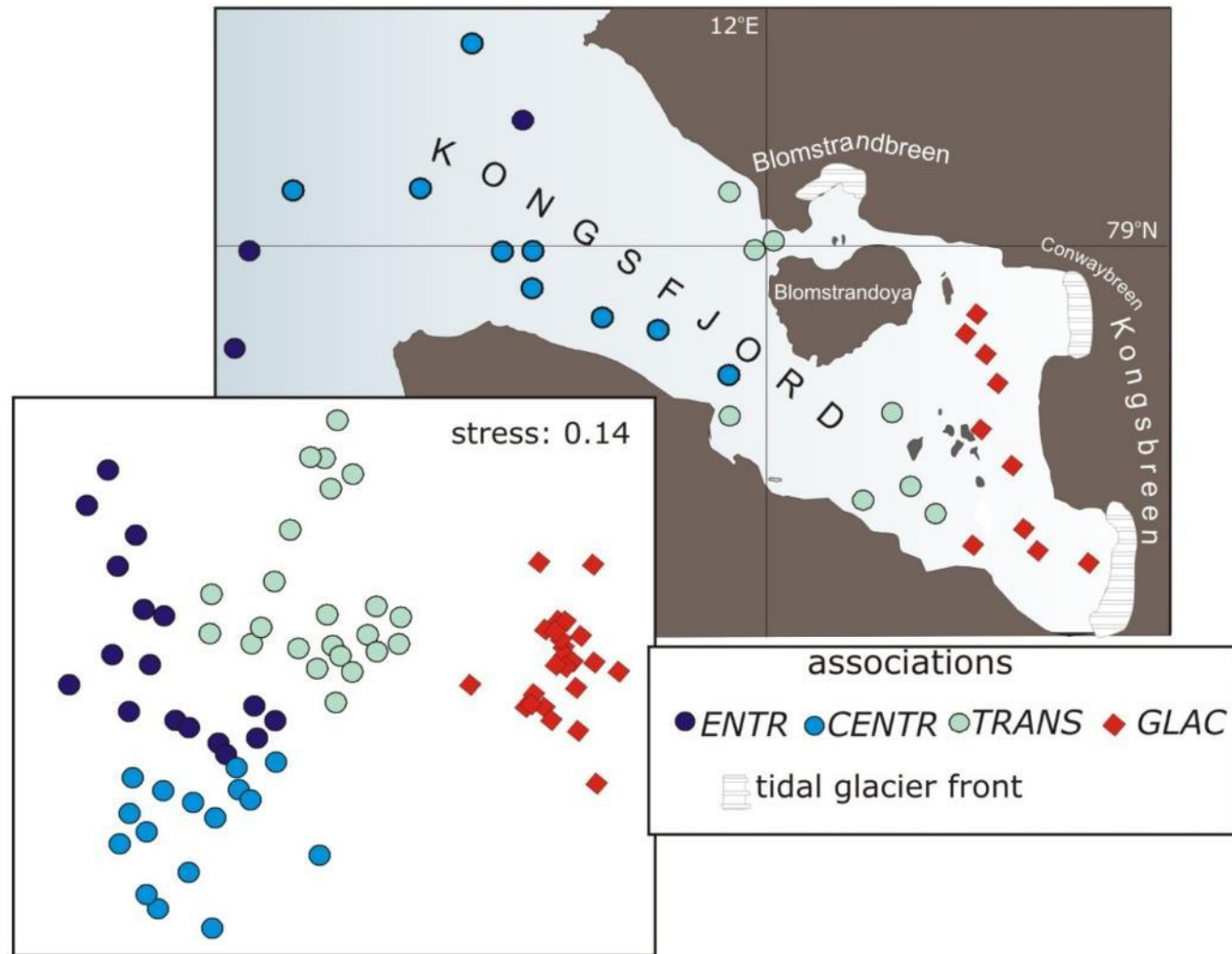
1. Composition of macrozoobenthos in glacial bays as opposed to central/outer fjordic basins

**Special point:** potential importance of glacial bays as refugia for cold water species

1. Trophic structure of pelagic and benthic invertebrate communities, including the primary food sources utilized by the key species

**Special point:** potential importance of ,dead zooplankters' as food source to benthic consumers

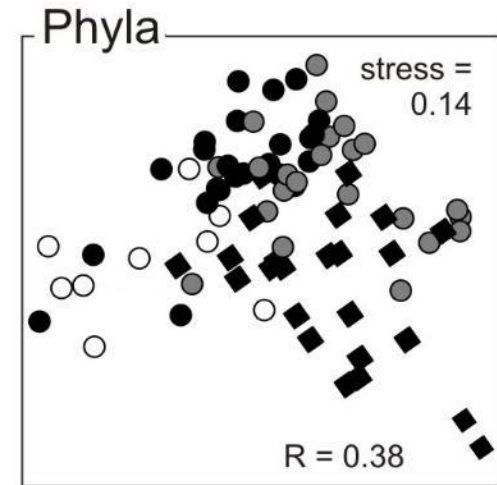
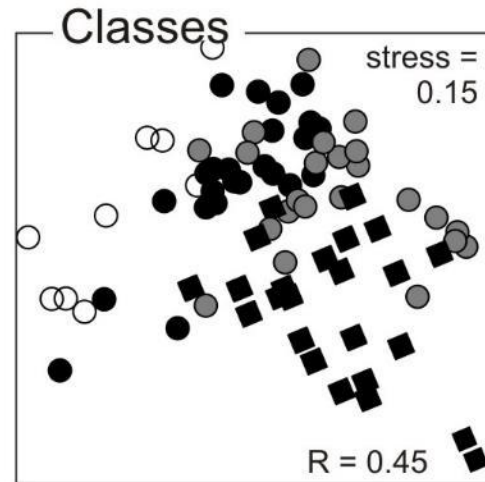
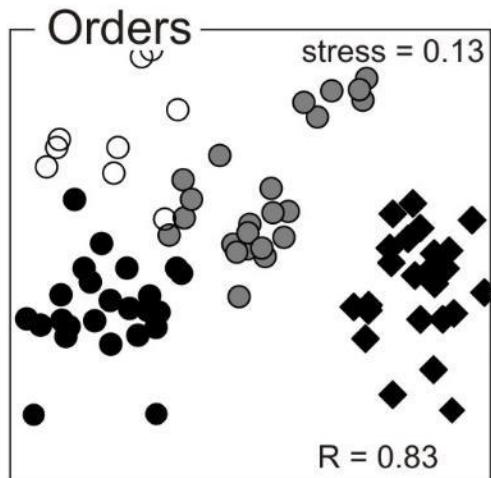
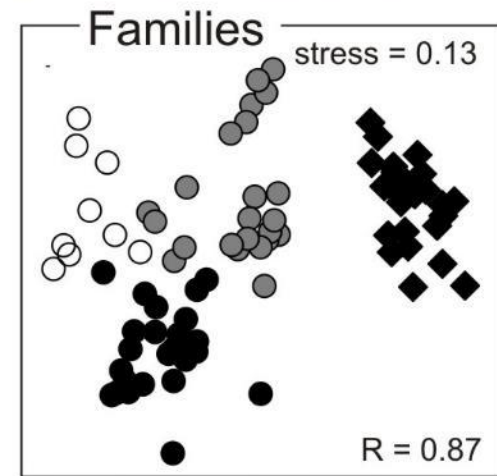
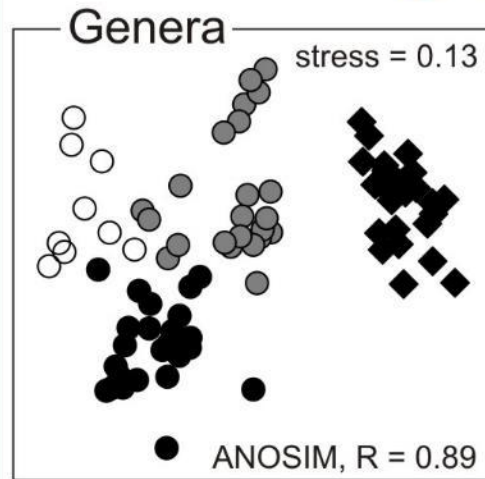
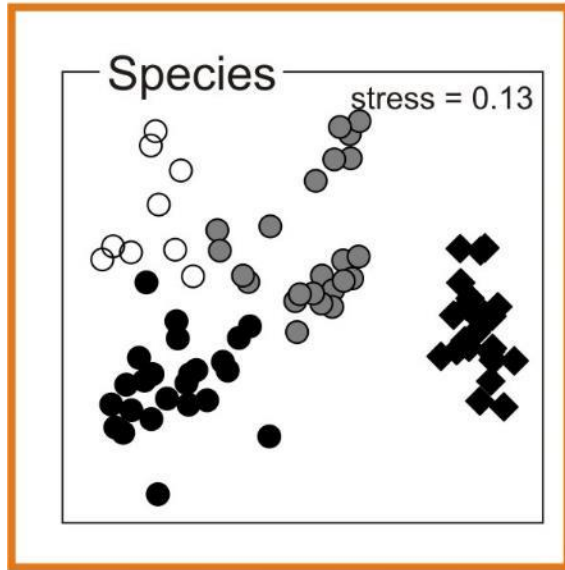
# patterns of macrobenthos distribution in a glacial fjord



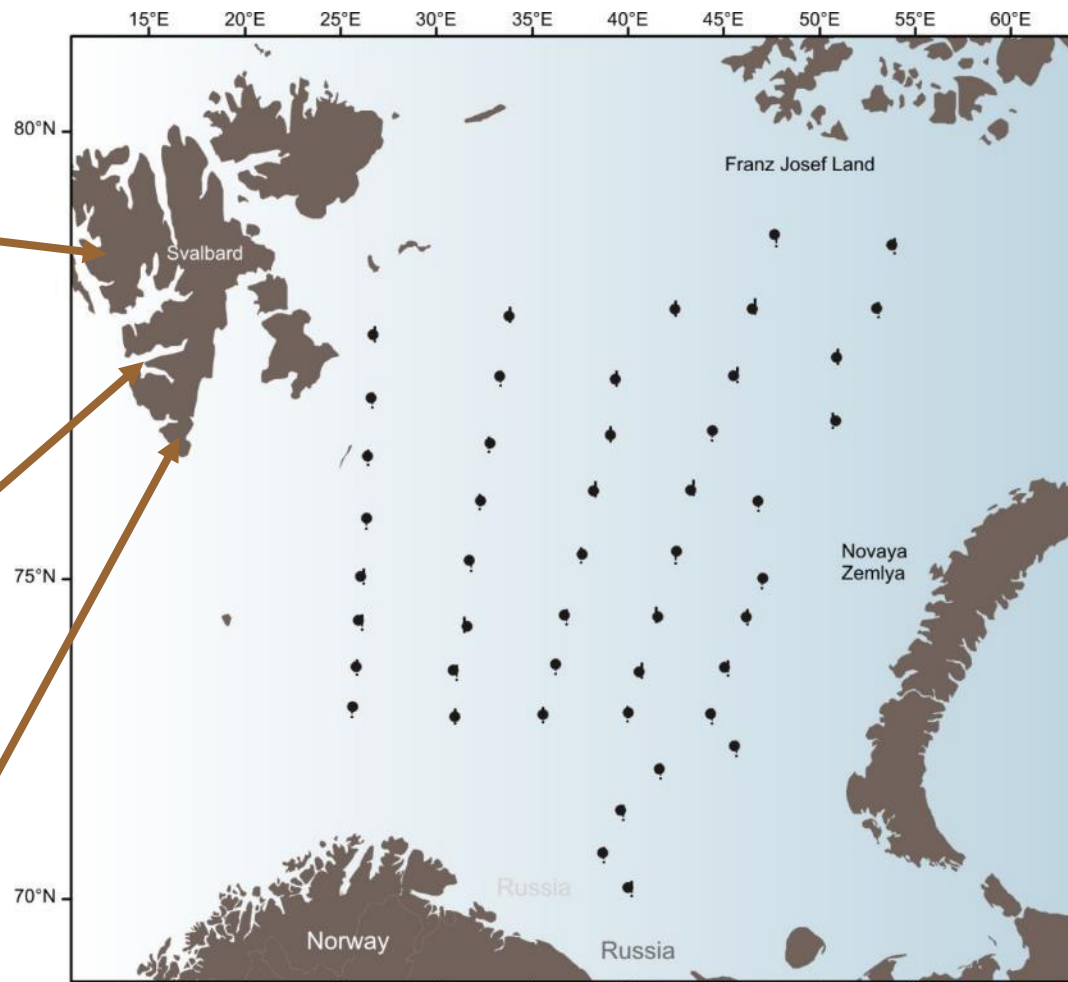
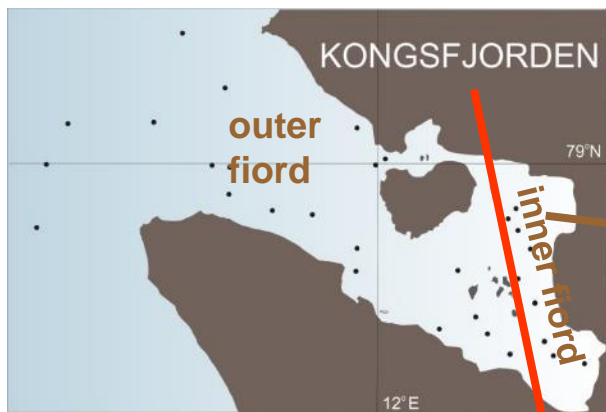
nMDS of species abundances in samples  
(Bray-Curtis similarity, double-root transformed data)

# patterns consistent also for higher taxa

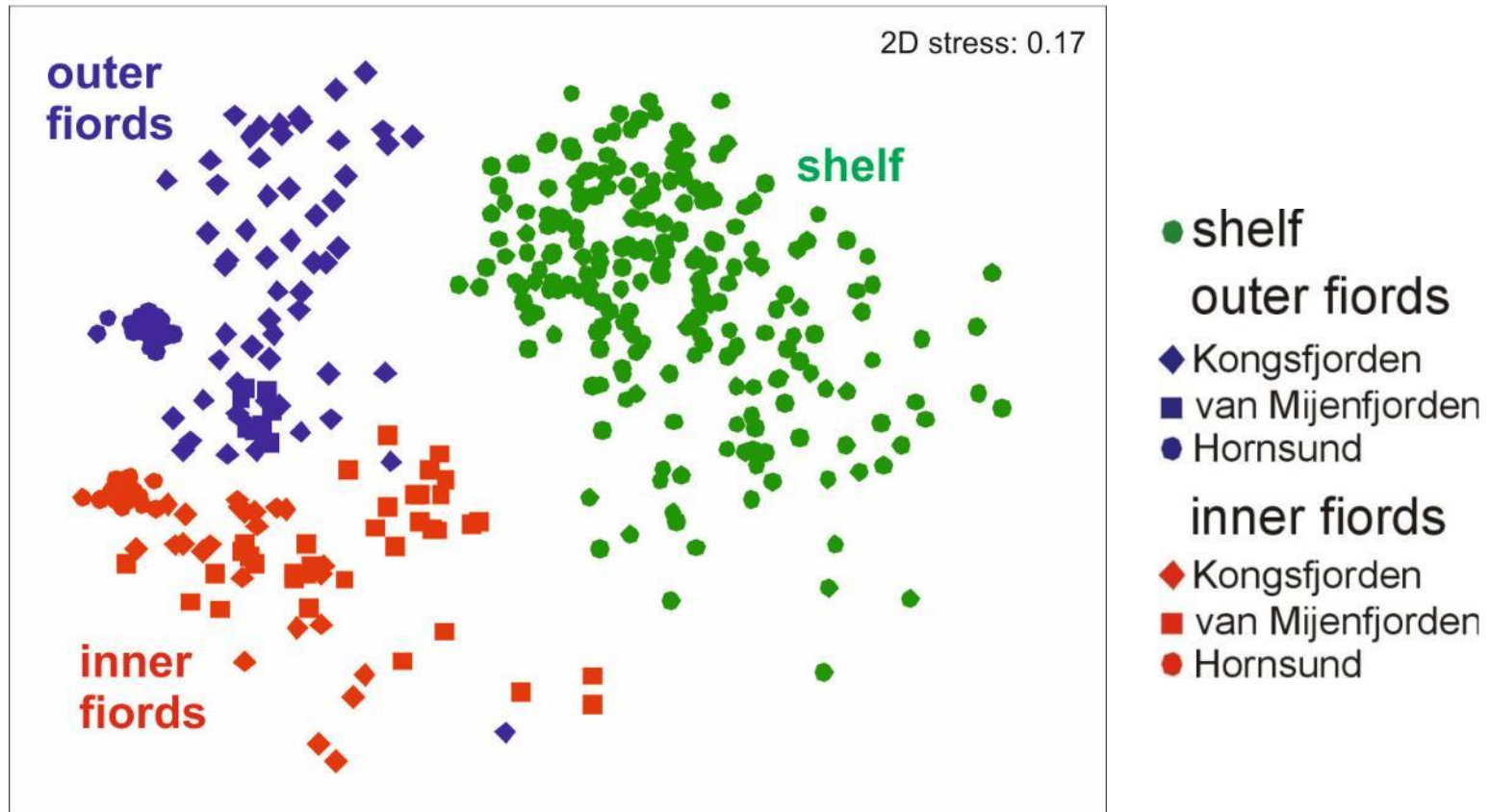
lowering taxonomic resolution



# West Spitsbergen fjords and Barents Sea



# West Spitsbergen fjords and Barents Sea

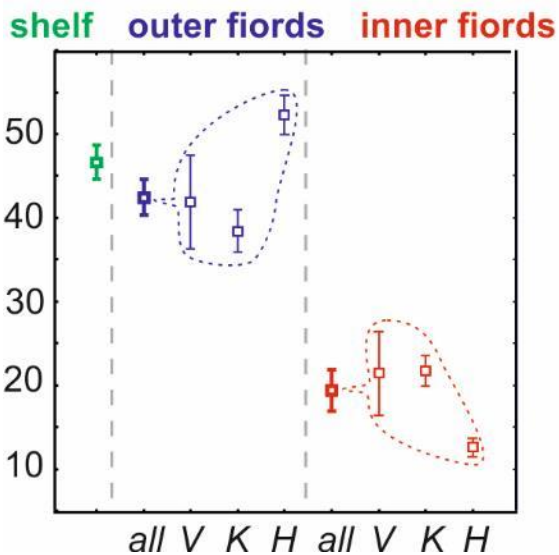


# West Spitsbergen fjords and Barents Sea



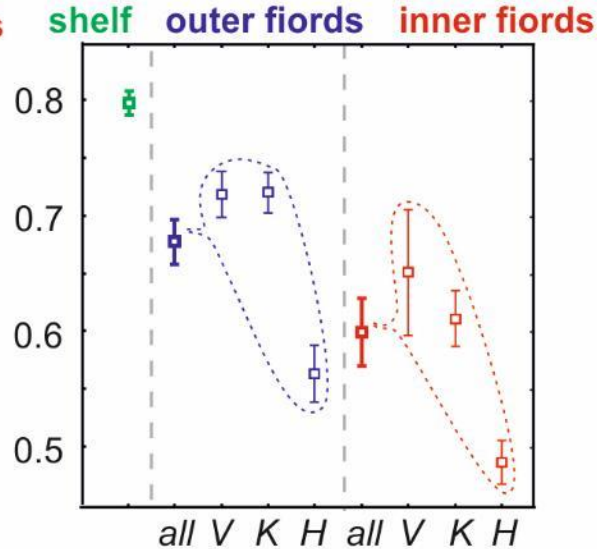
## species richness

number of species per sample



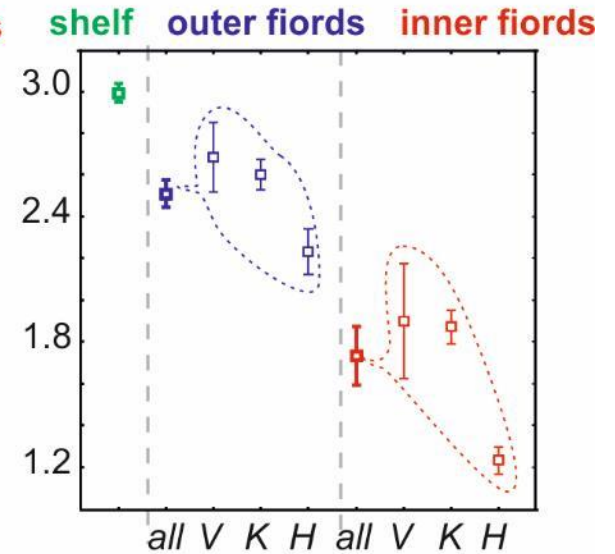
## evenness

Pielou index



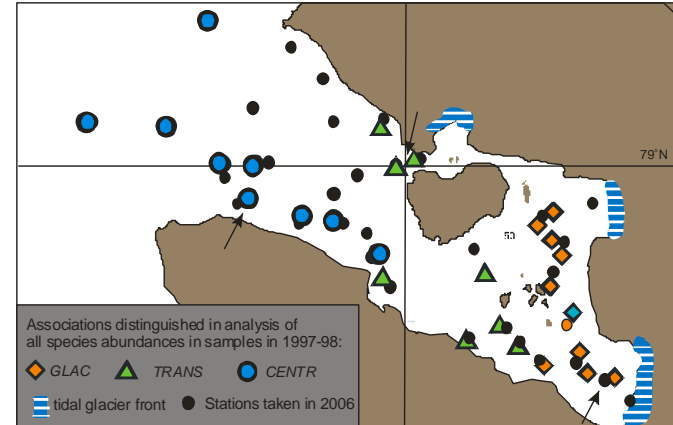
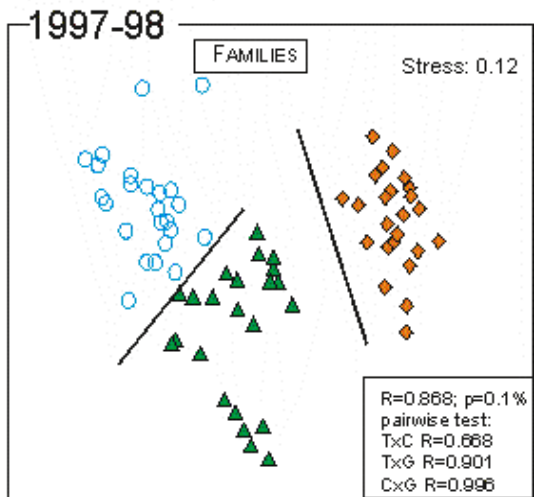
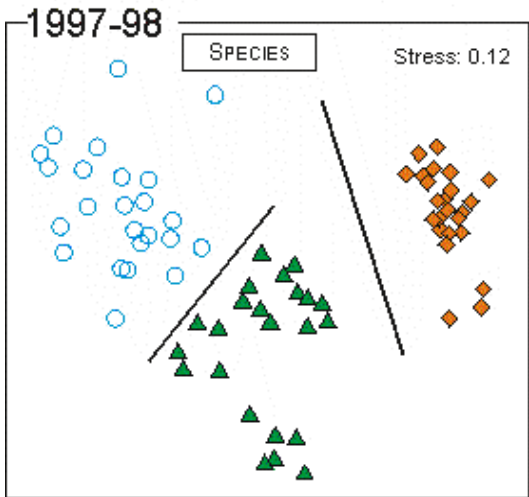
## species diversity

Shannon-Wiener index



*all* – all samples  
*V* – van Mijenfjorden  
*K* – Kongsfjorden  
*H* – Hornsund

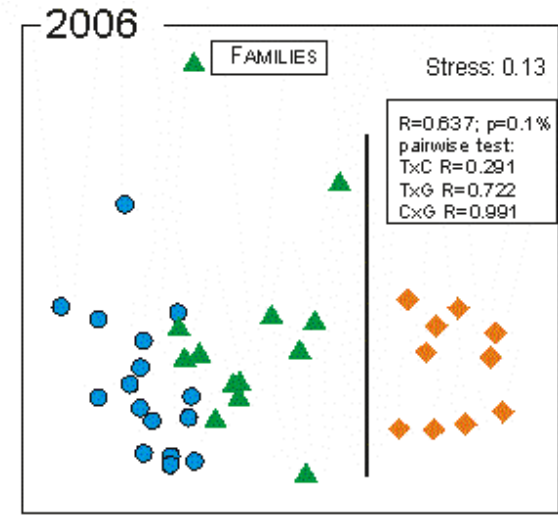
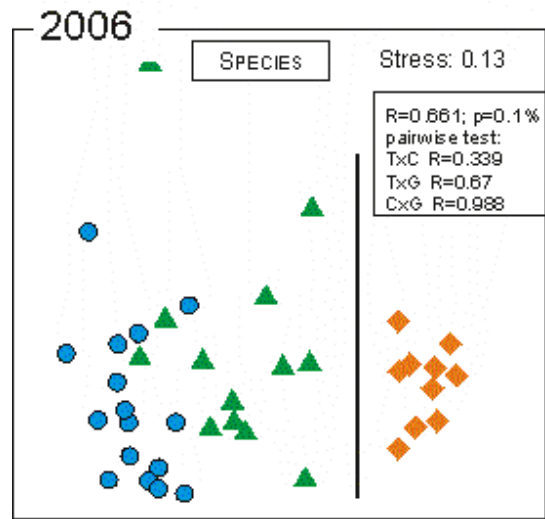
# Benthic communities distribution patterns: resampling



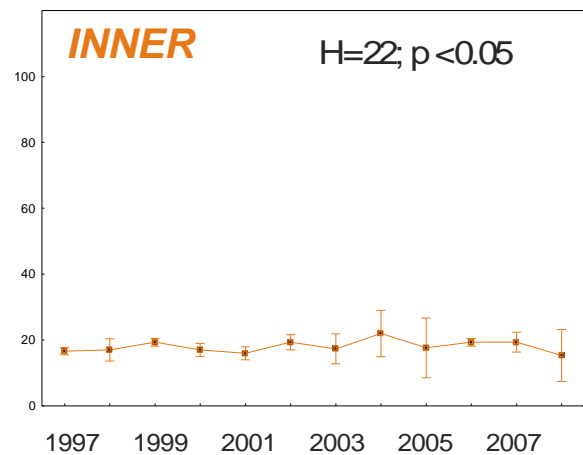
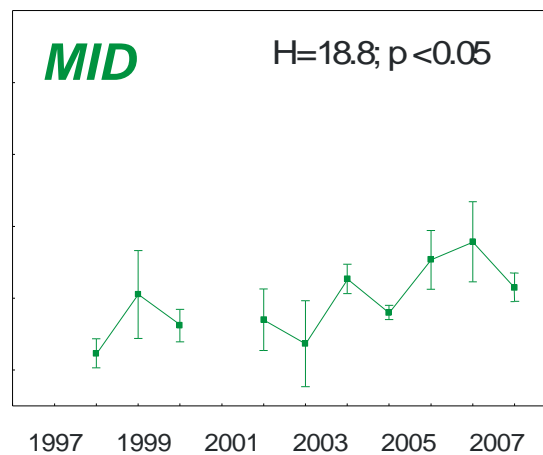
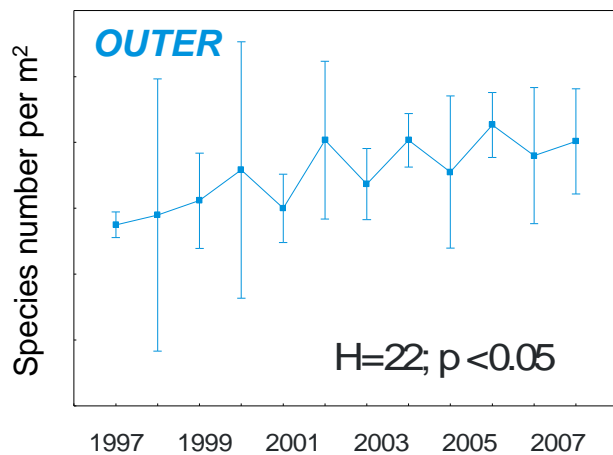
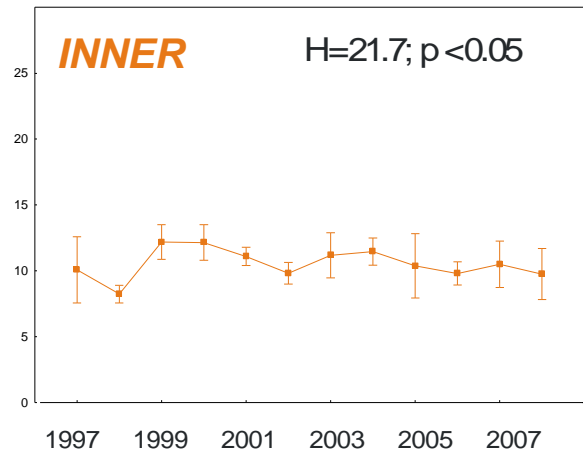
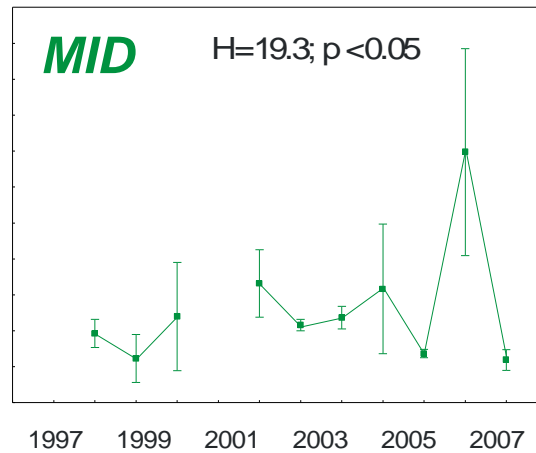
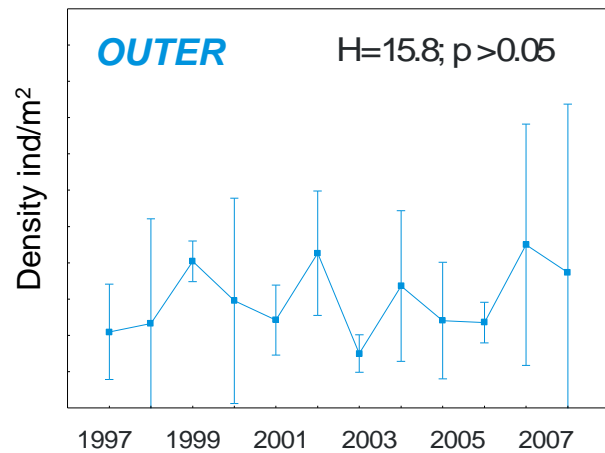
Włodarska-Kowalczyk & Pearson, 2004  
Włodarska-Kowalczyk et al., 2005

Spatial patterns in community structure and species diversity are significantly different in the central basin of Kongsfjorden after a decade while there is no change in the inner part of the fjord.

*Kedra et al., 2010*



# Benthic monitoring: 1997-2008

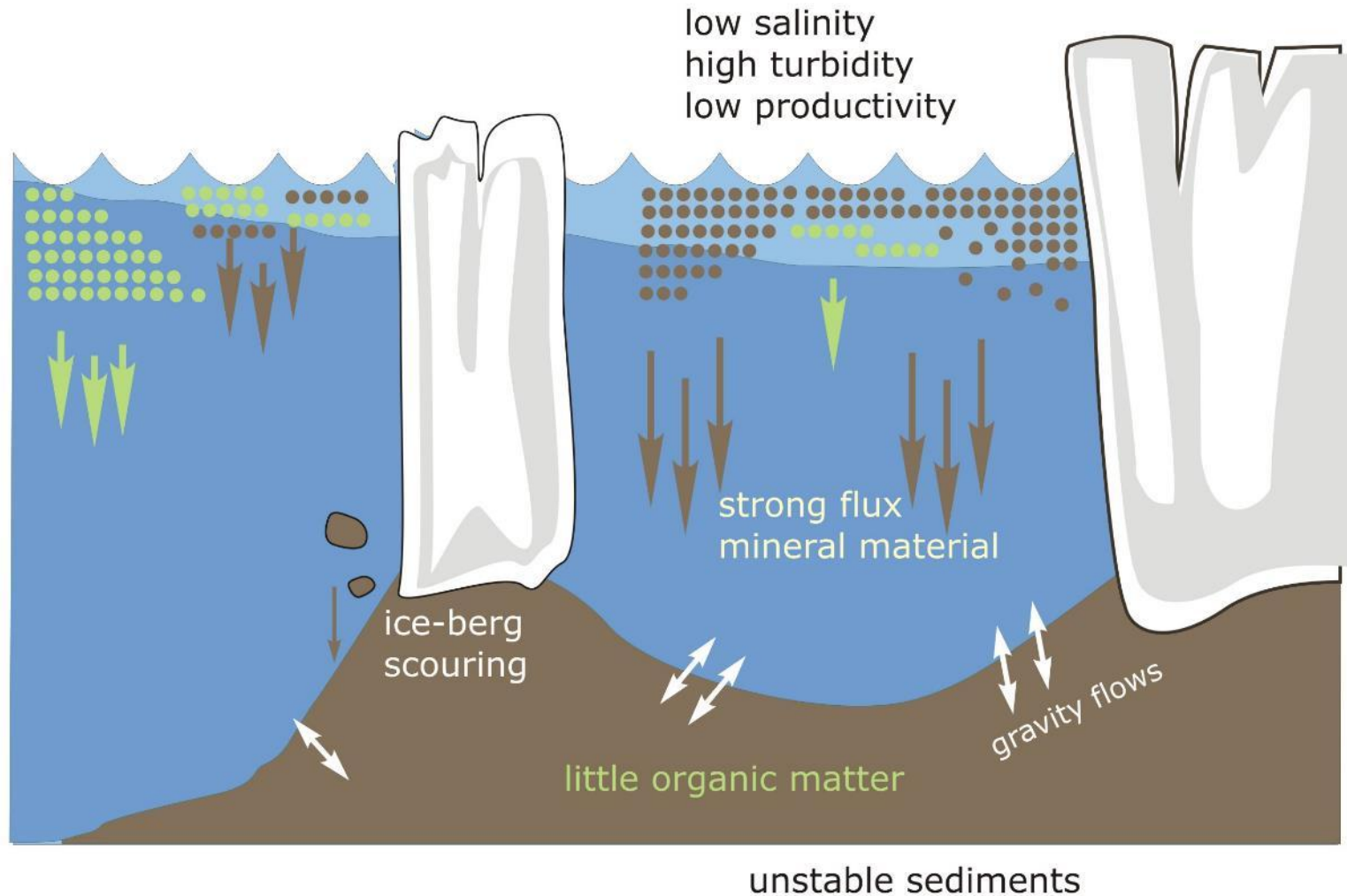


Kruskal-Wallis test

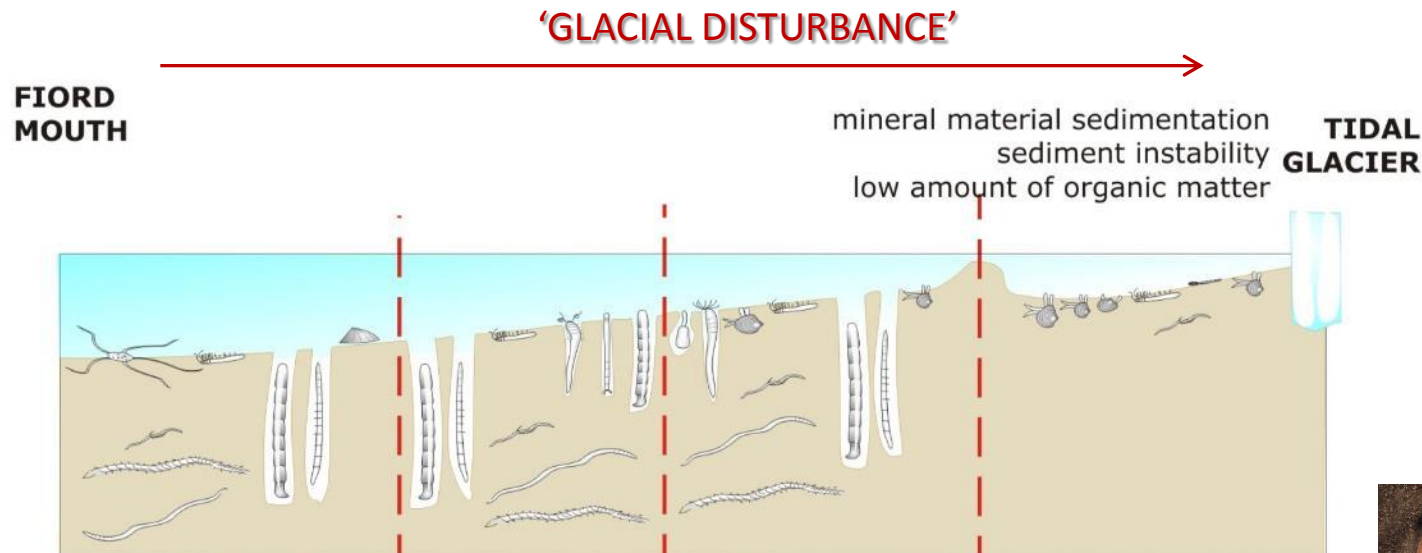
Kedra & Węślawski, unpublished data



# Environmental constraints for benthic fauna in glacial bay



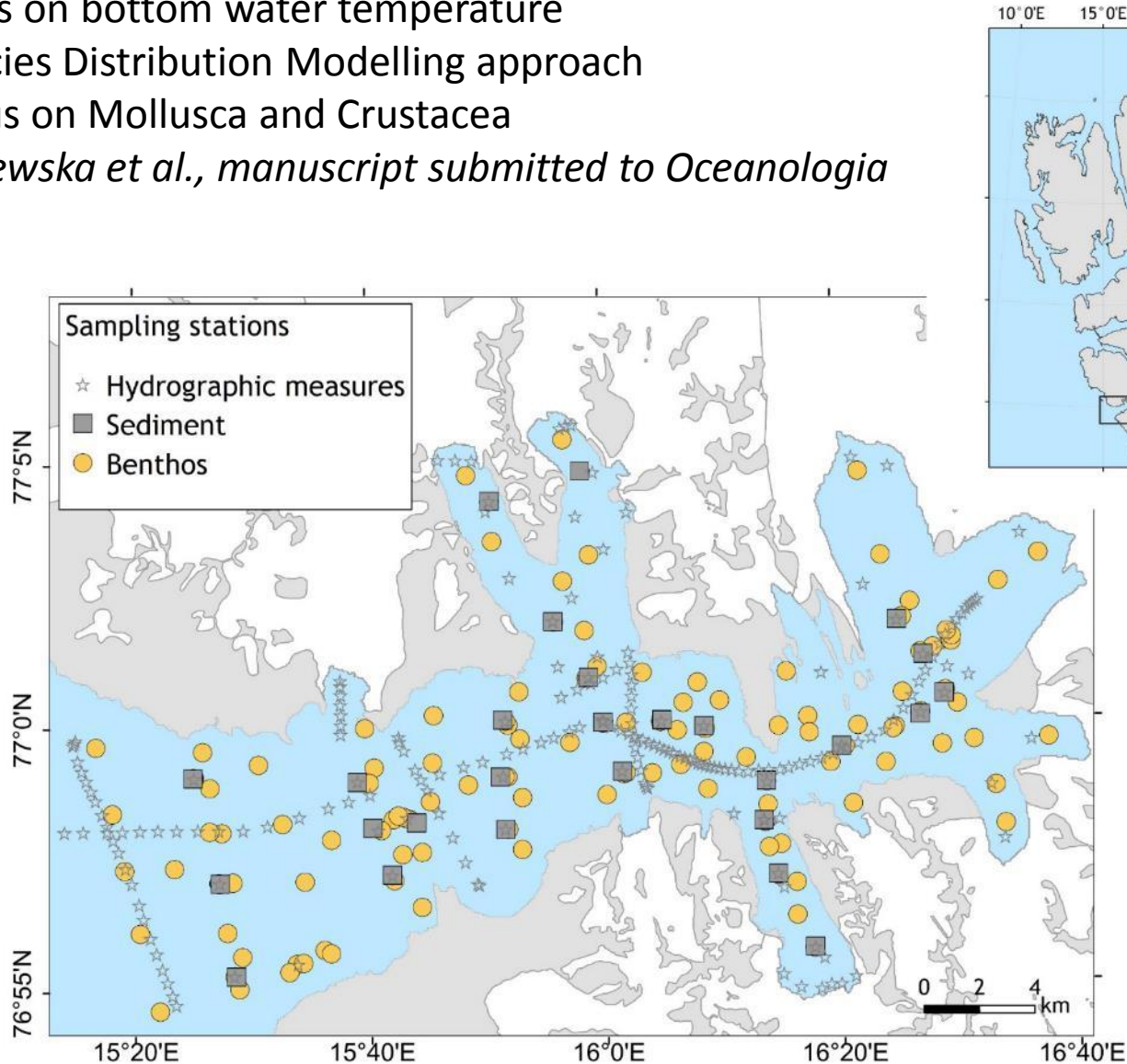
# Patterns in macrofauna along the fiord axis/glacial disturbance gradient



- change in species composition
- decrease in biomass, average animal size, density
- decrease in species richness and evenness
- simplification of community 'physical structure' - smaller animals, keeping close to sediment surface, no tube-dwellers in glacial bays
- simplification of functional diversity - suspension feeding and sedentary fauna depressed, fauna dominated by one functional guild (mobile surface deposit feeders) in glacial bays

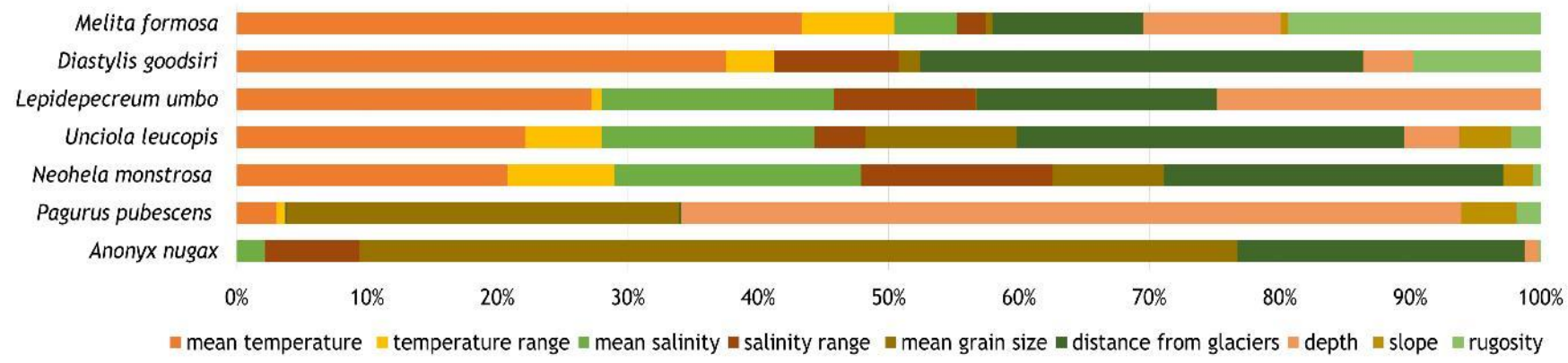
## GLAERE Benthos *glacial bays - refugia for cold water species?*

- macrobenthic samples collected in Hornsund in 2003, 2007, 2012, 2014
- focus on bottom water temperature
- Species Distribution Modelling approach
- Focus on Mollusca and Crustacea
- *Piszewska et al., manuscript submitted to Oceanologia*

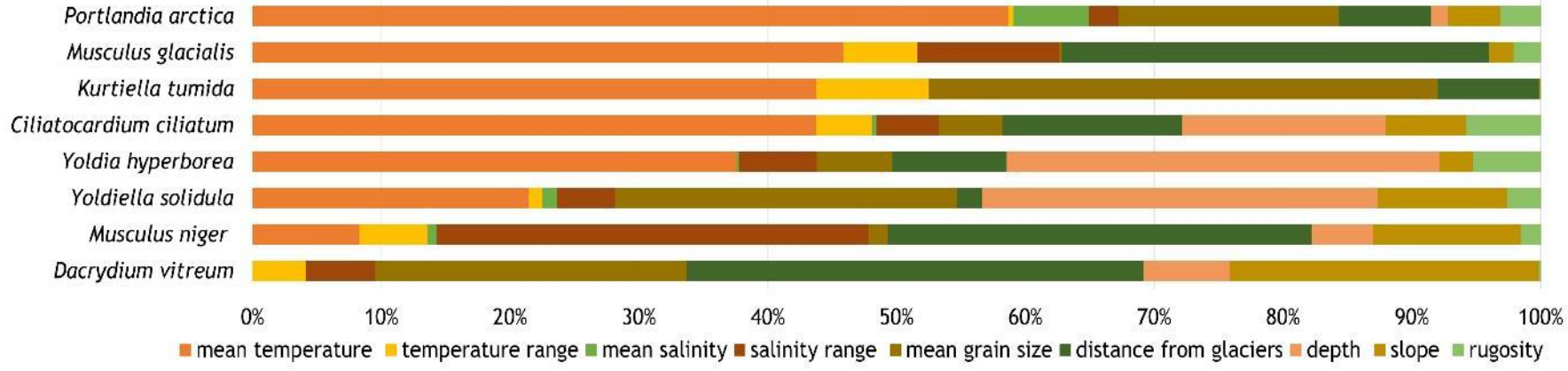


**GLAERE Benthos** *glacial bays - refugia for cold water species?*

*Arthropoda*



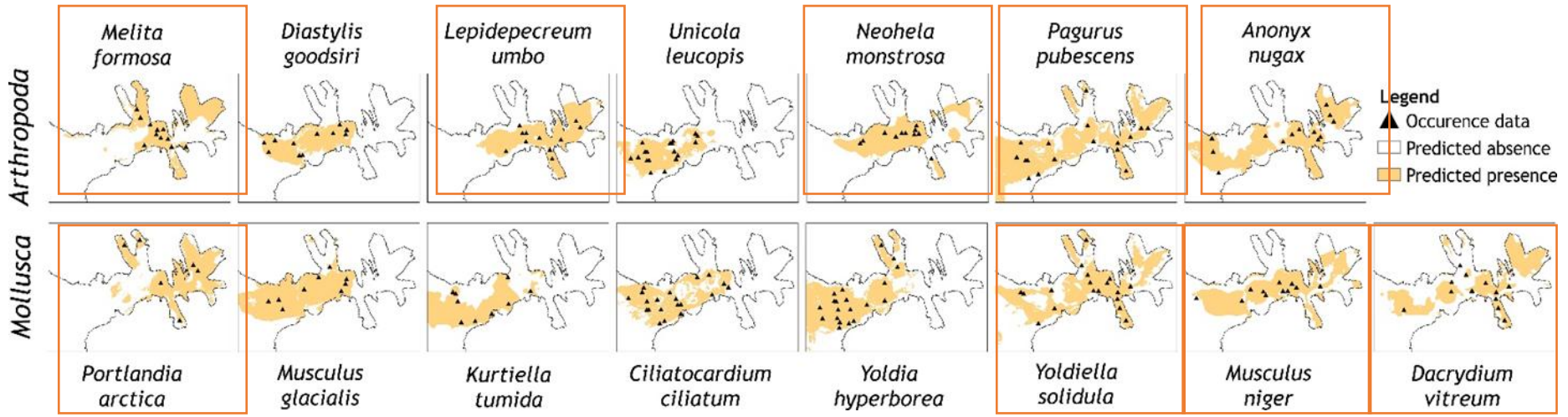
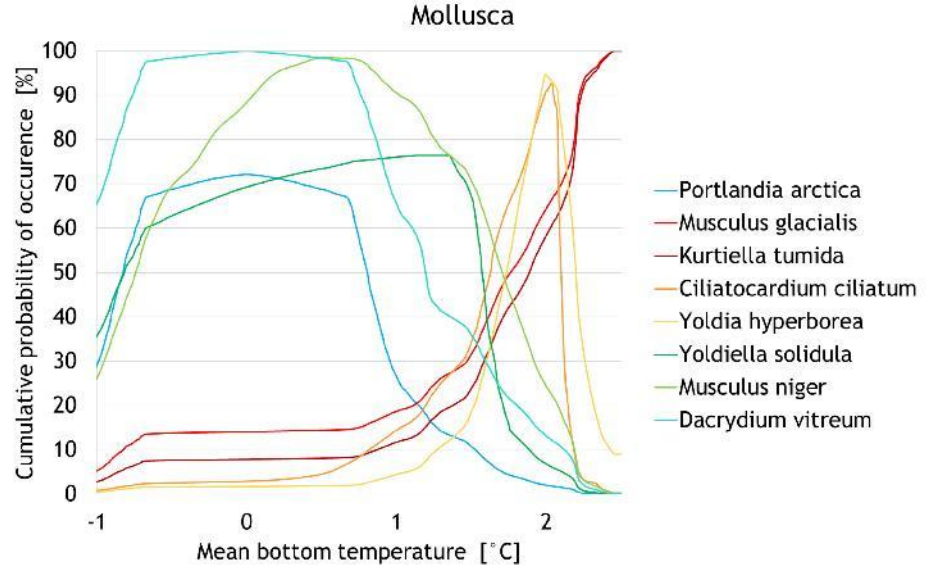
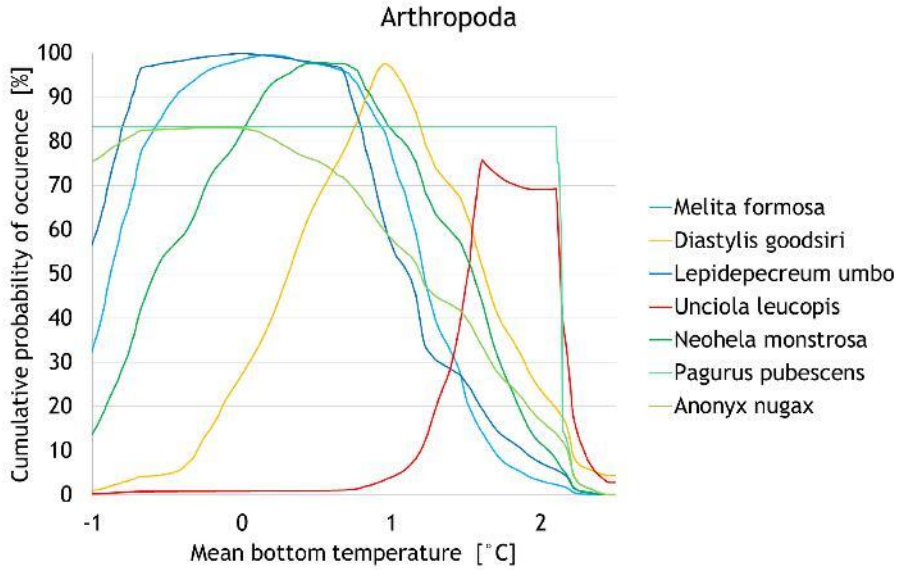
*Mollusca*



Percent contribution of environmental variables in explaining the species distribution (Maxent models)

*Piszewska et al., submitted*

Response curves for mean bottom temp. (derived with Maxent modeling)



## GLAERE Benthos – trophic structure

- Materials collected in Hornsund & Kongsfjorden glacial bays in 2014
- plankton and benthos (dredges, WP2 nets, Tucker Trawls)
- Stomach content, stable isotope & fatty acids analyses  
(in cooperation with University of Ghent and University of Liege, Belgium)
- Maria Włodarska-Kowalczyk, Marta Głuchowska, Emilia Jankowska, Joanna Legeżyńska



# GLAERE Benthos – trophic structure

Materials (Kongsfjorden and Hornsund glacial bays):

Zooplankton – Copepoda (*Calanus glacialis*,  
*Calanus finmarchicus*)



Euphausiacea (*Thysanoessa inermis*)



Amphipoda (*Themisto libellula*, *T. abyssorum*)



decapode larvae



# GLAERE Benthos – trophic structure

Materials (Kongsfjorden and Hornsund glacial bays):

Zoobenthos – Polychaeta (*Polycirrus arcticus*  
*Aglaophamus malmgreni*)



Decapoda  
(*Pandalus borealis*  
*Sabinea septemcarinata*  
*Eualus gaimardi*)



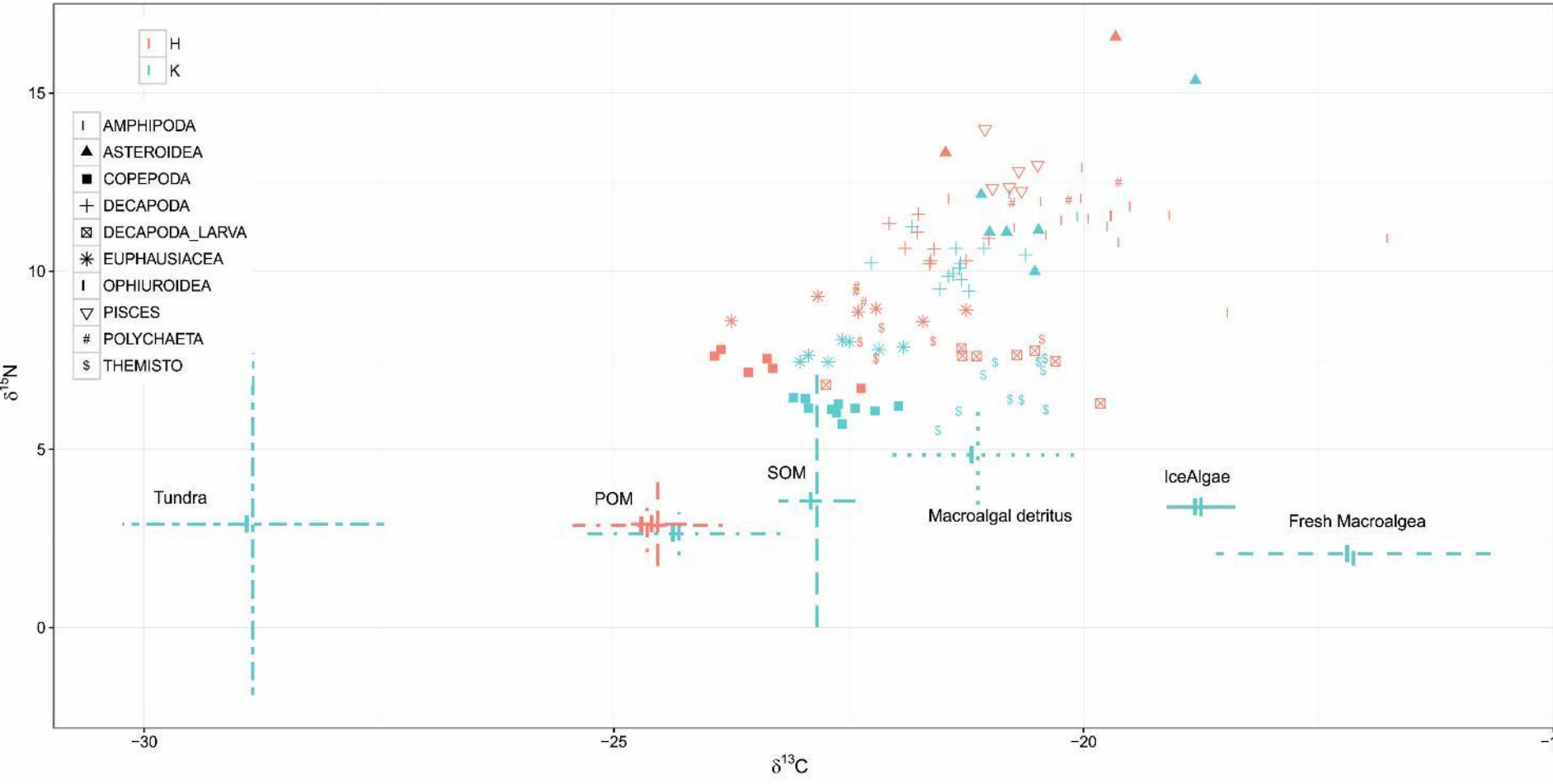
Amphipoda (*Anonyx nugax*, *Acanthostepheia malmgreni*)



Echinodermata (*Urasterias linckii*)



# GLAERE Benthos – trophic structure



## Fatty Acids - biomarkers

### Bacteria:

+18:1 (n-7)



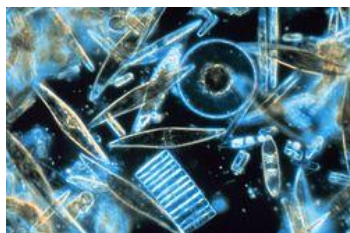
### diatoms:

16:1(n-7), 20:5(n-3)

16:1(n-7)/16:0,

16:1(n-7)+C16

PUFA+20:5(n-3)



### Ice alga- diatoms:

16:1(n-7)

16:4(n-1)

### Foraminifera:

20:4(n-6)



### Calanoida:

20:1(n-9) + 22:1(n-

11)



### flagellates:

22:6(n-3)

C18 PUFA+

22:6(n-3)



### Carnivorous diet:

18:1(n-9)

18:1(n-9)/18:7(n-7)





*Photography by Kajetan Dujak*

thank you