Spatial and temporal variation of meroplankton as an indication of Atlantification in the European Arctic

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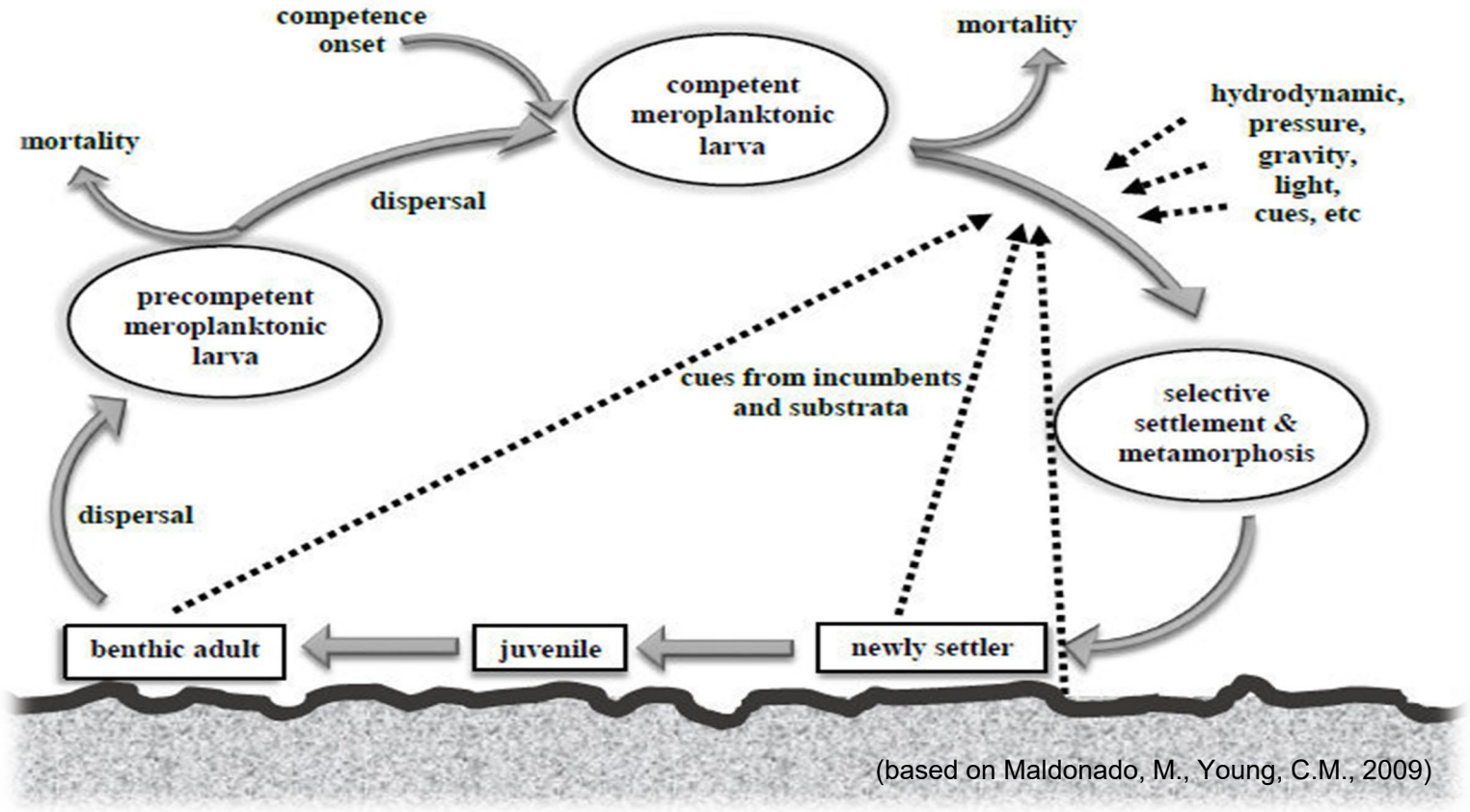
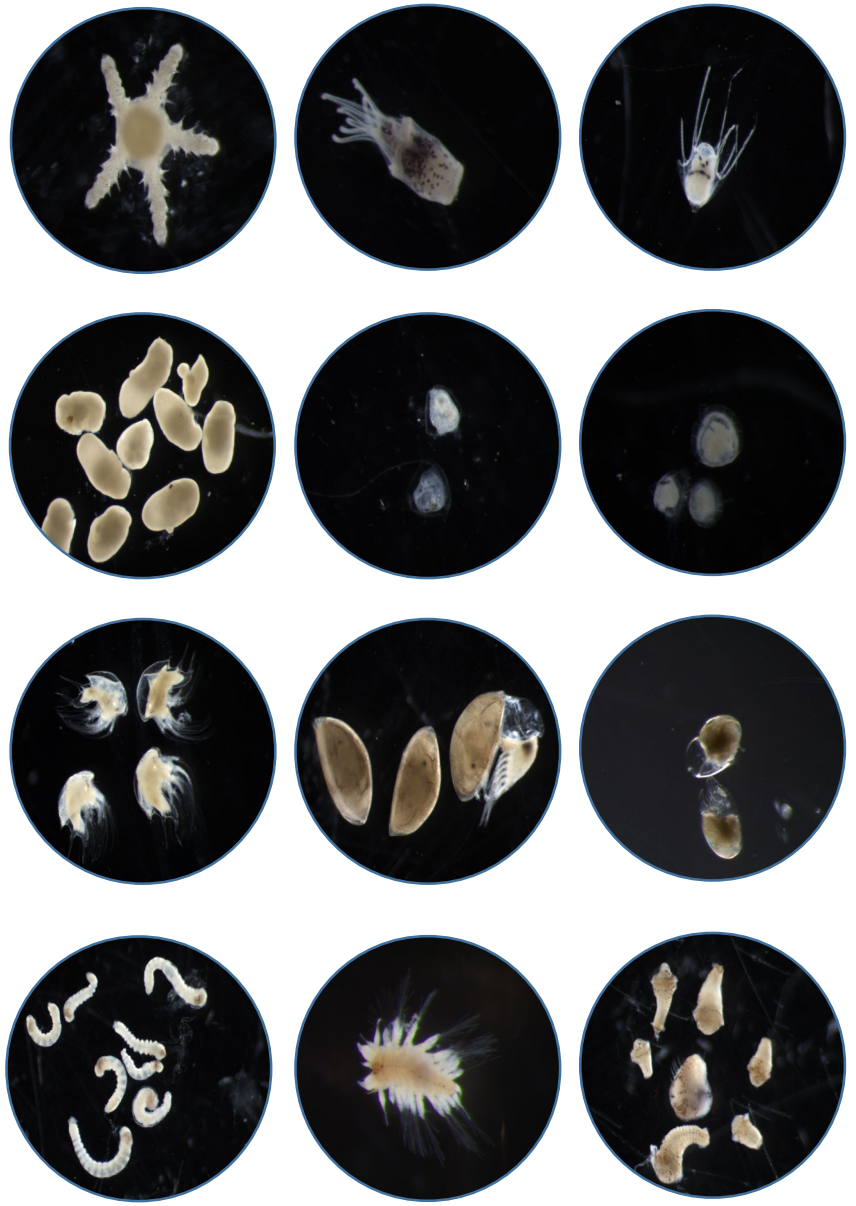
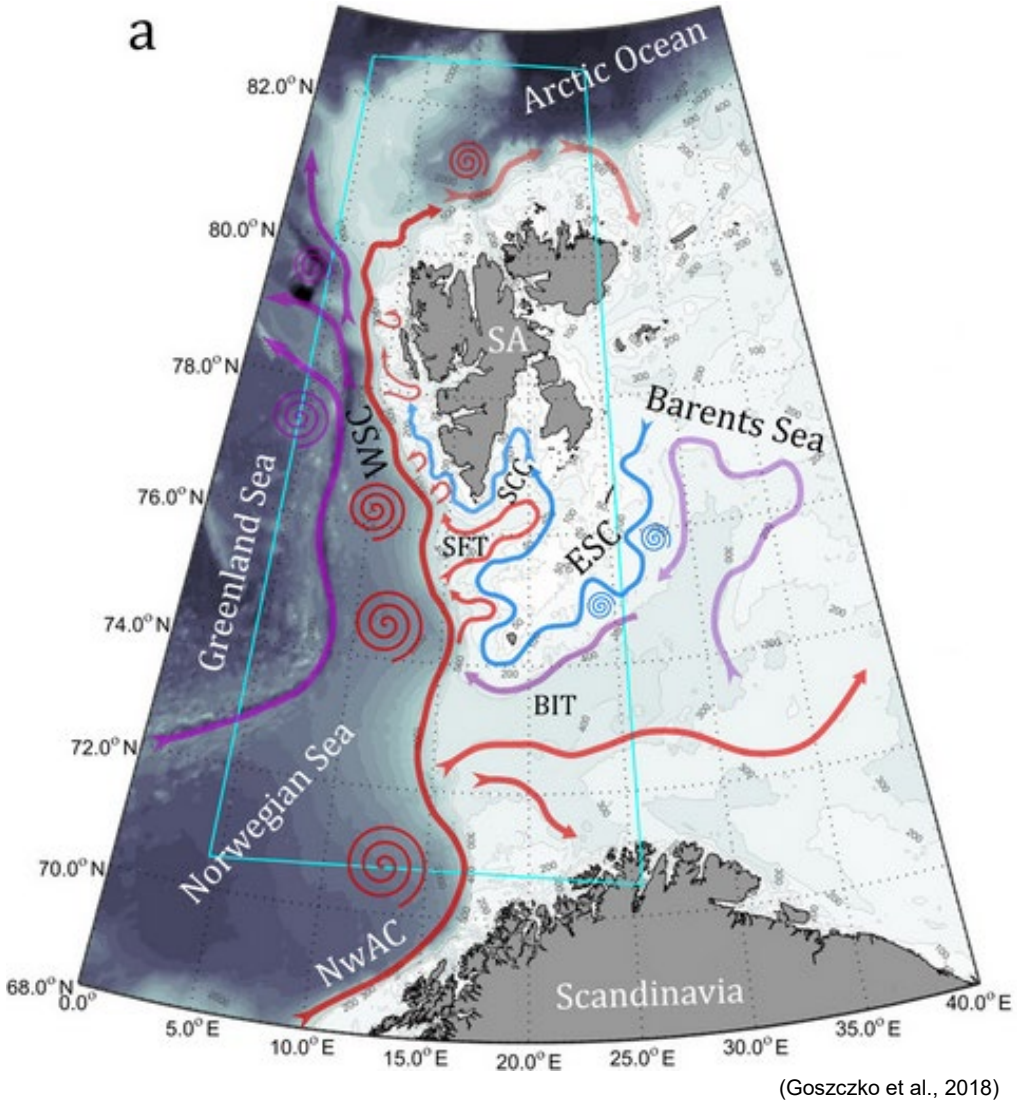


Diagram of a generalized life cycle of benthic invertebrates with a meroplanktonic larval stage





(Goszczko et al., 2018)

Ilustrative map of the West Spitsbergen Current (WSC) root in the Arctic Region

- ✓ The warm and salty Atlantic Water inflow northward is an oceanic heat source to the Arctic Ocean.
- ✓ The fluctuations of environmental factors caused by global warming will cause greater sensitivity to changes in native species

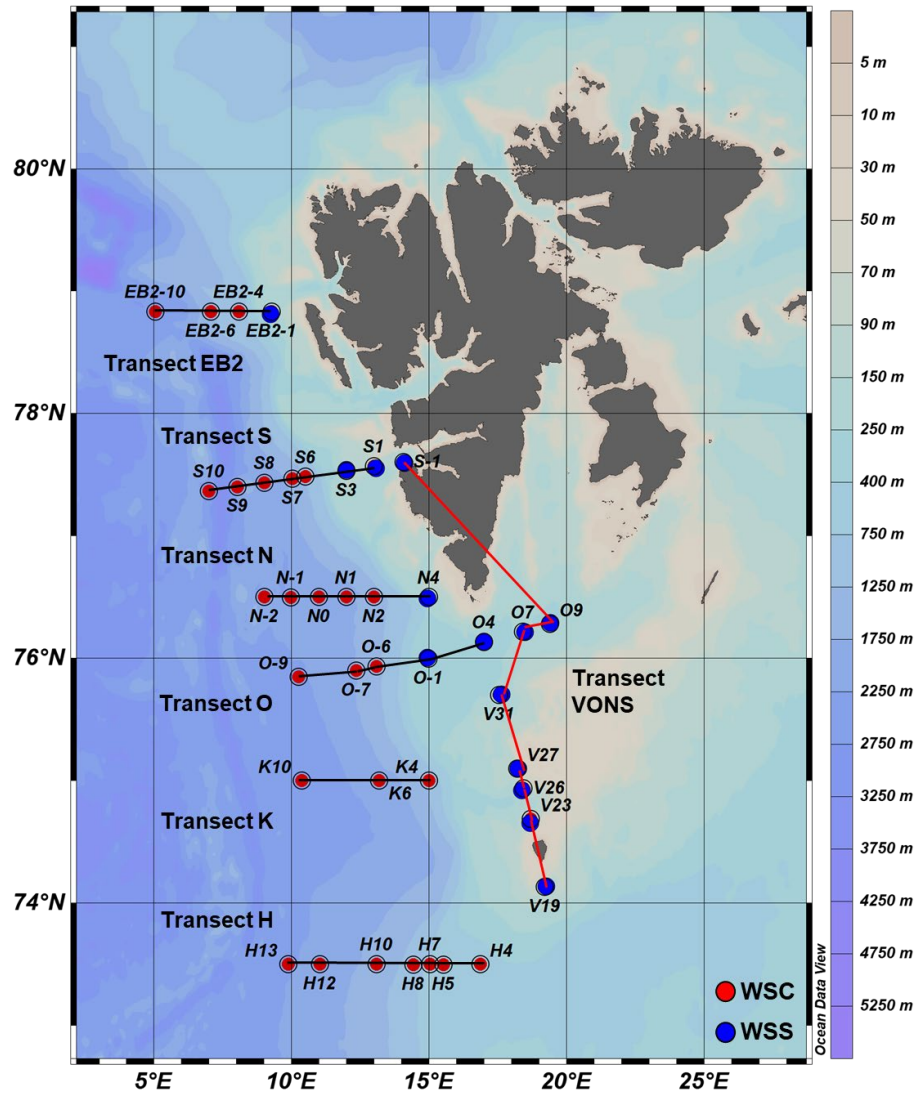
The aim

To investigate the temporal and spatial variability of meroplankton and their distribution along transects from south to north along the West Spitsbergen Current (WSC) and West Spitsbergen Shelf (WSS)

Research questions

- ✓ *Were there changes in the spatial and temporal distribution of meroplankton during the observation period?*
- ✓ *Were there changes in the composition and abundance of meroplankton along the WSC and WSS from south to north?*
- ✓ *Were there any impact of environmental conditions on the meroplankton community?*

Svalbard Archipelago



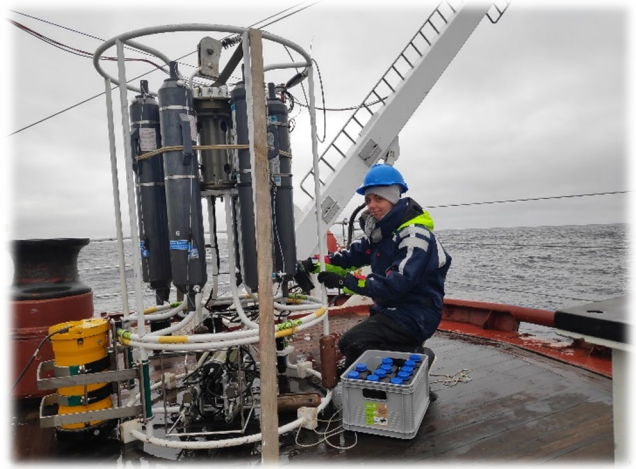
Sampling stations

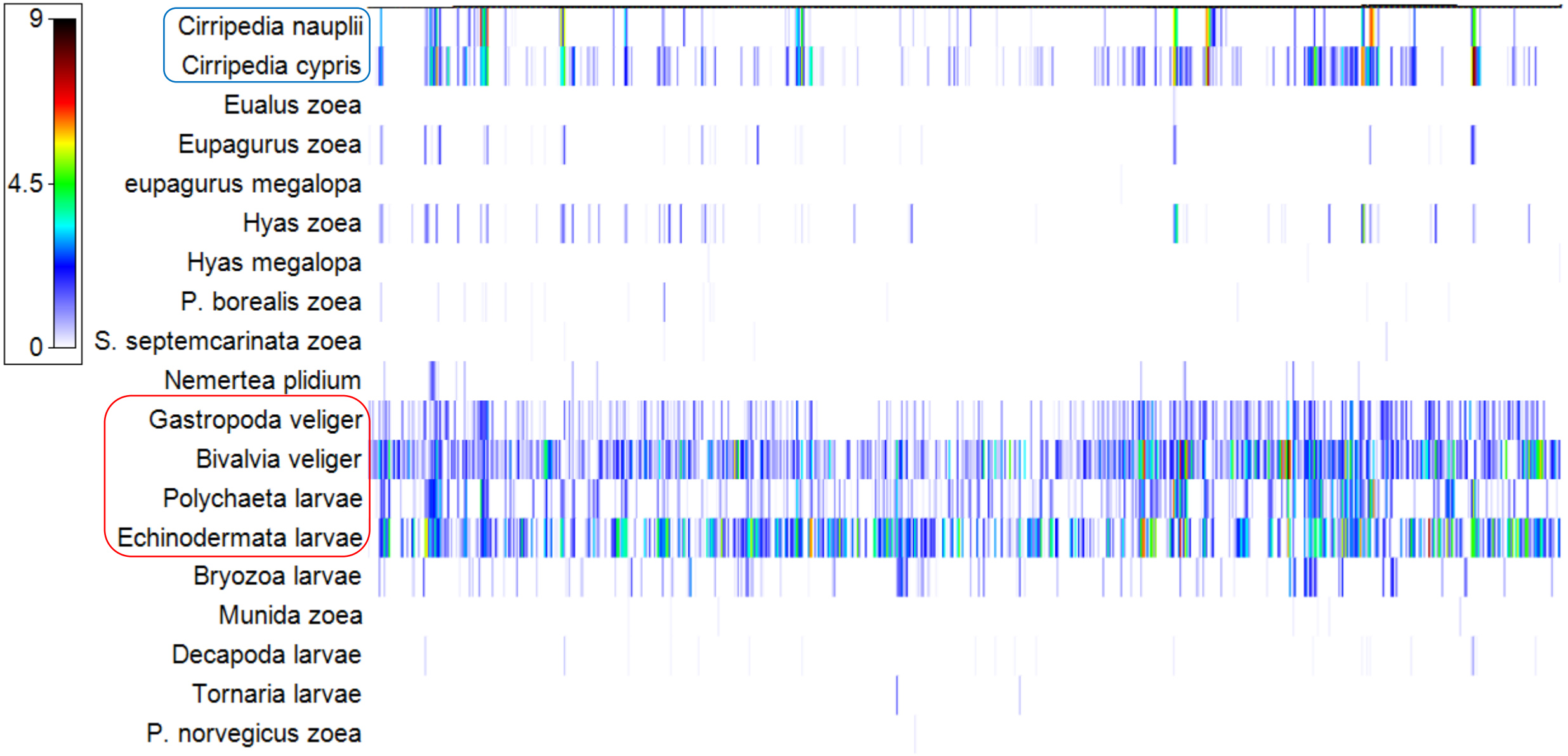
Environmental variables

- temperature and salinity

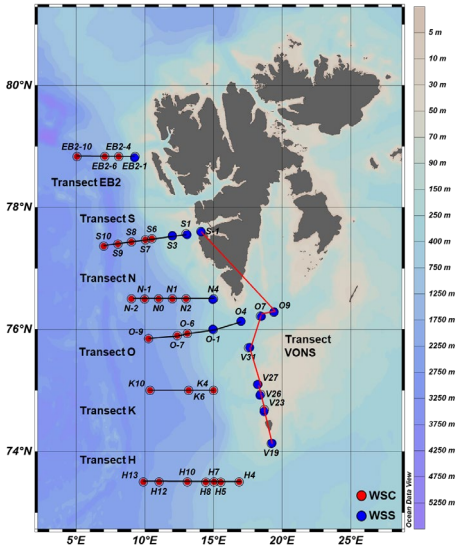
Fauna sampling

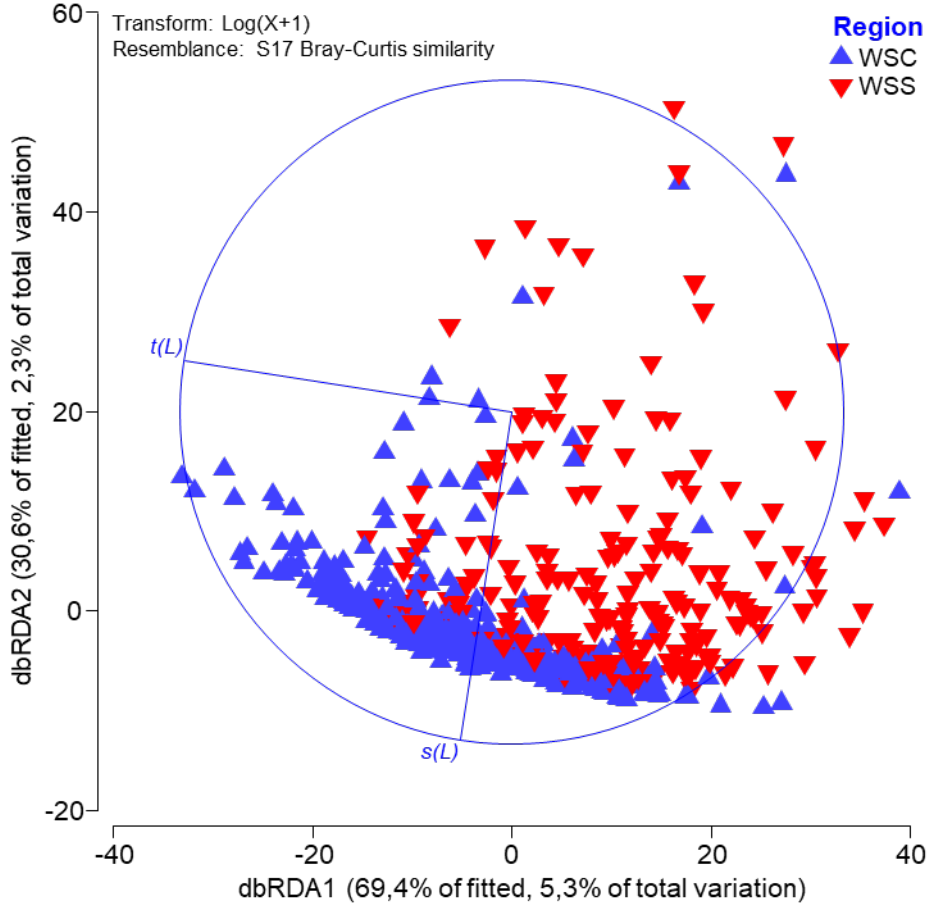
- Summer 2001 - 2016
- WP2 plankton net, 180 µm
- From 200-0 m, several depth layers
- Preservation 4% formaldehyde

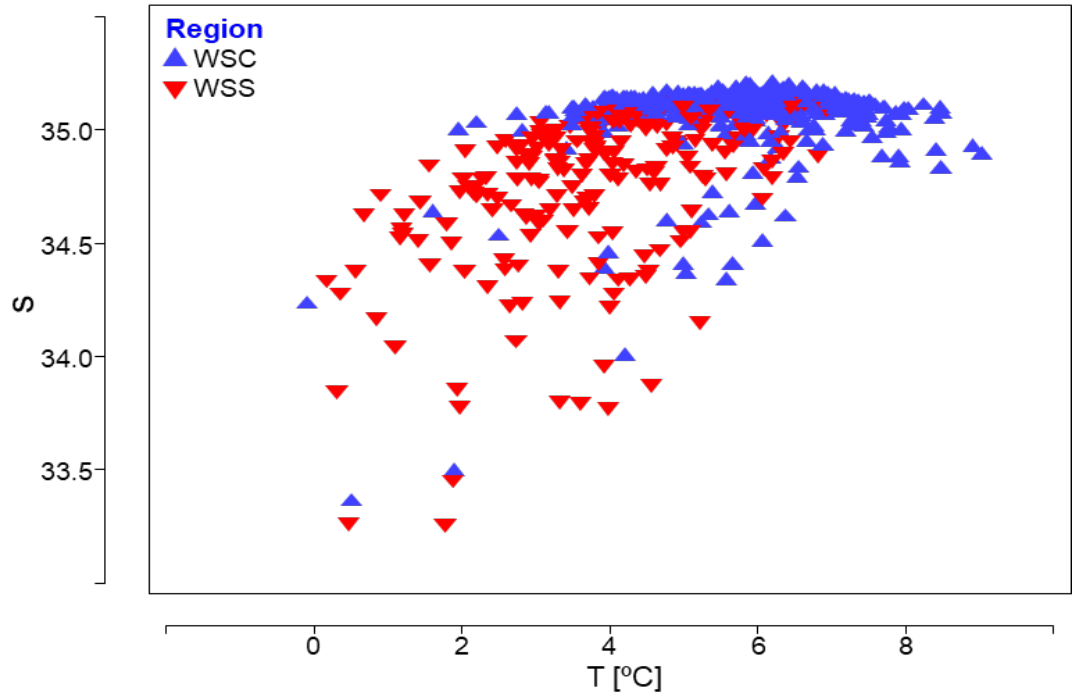




Shade plot of meroplankton community structure based od log-transformed abundance dataset





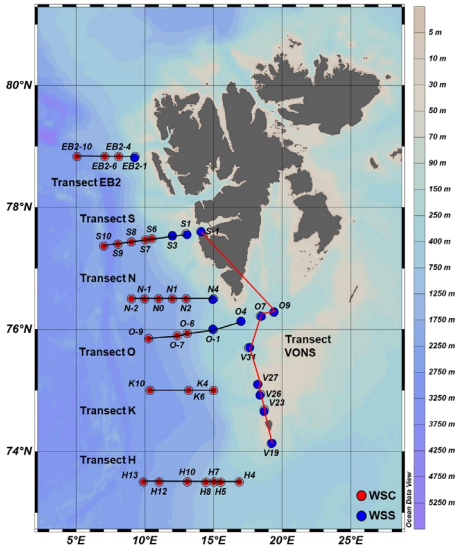


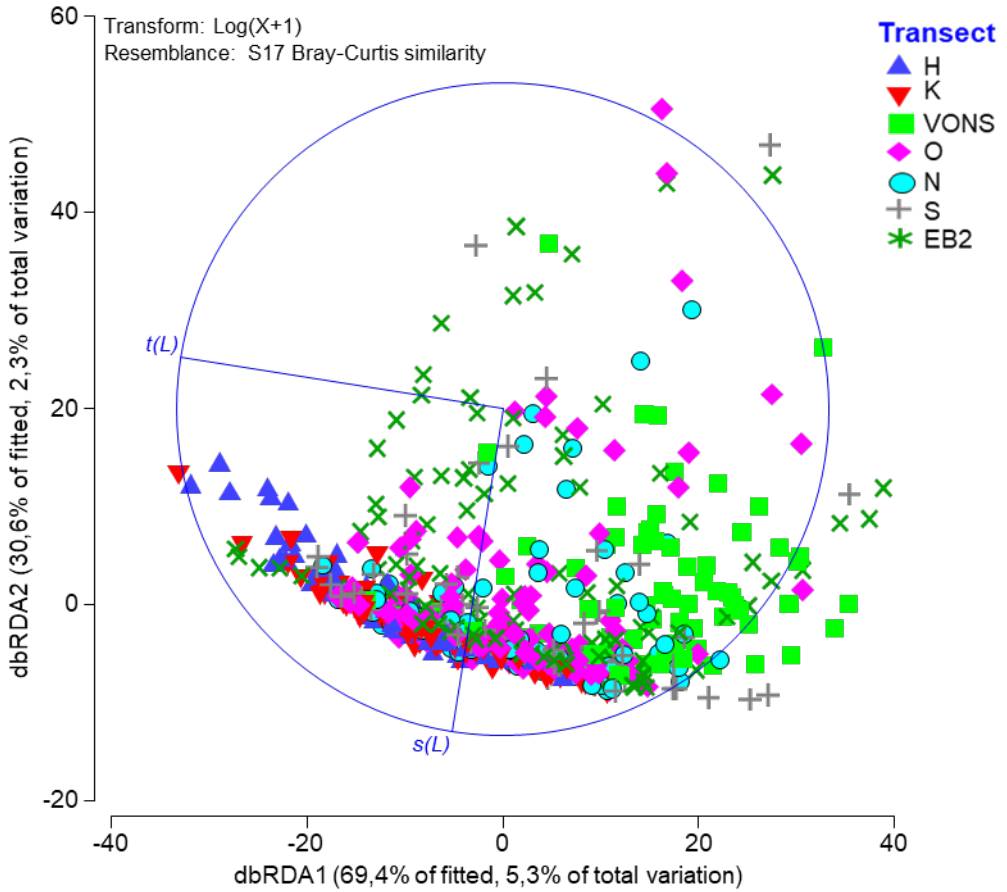
dbRDA analysis (left);
Draftsman plot of environmental variables (right)

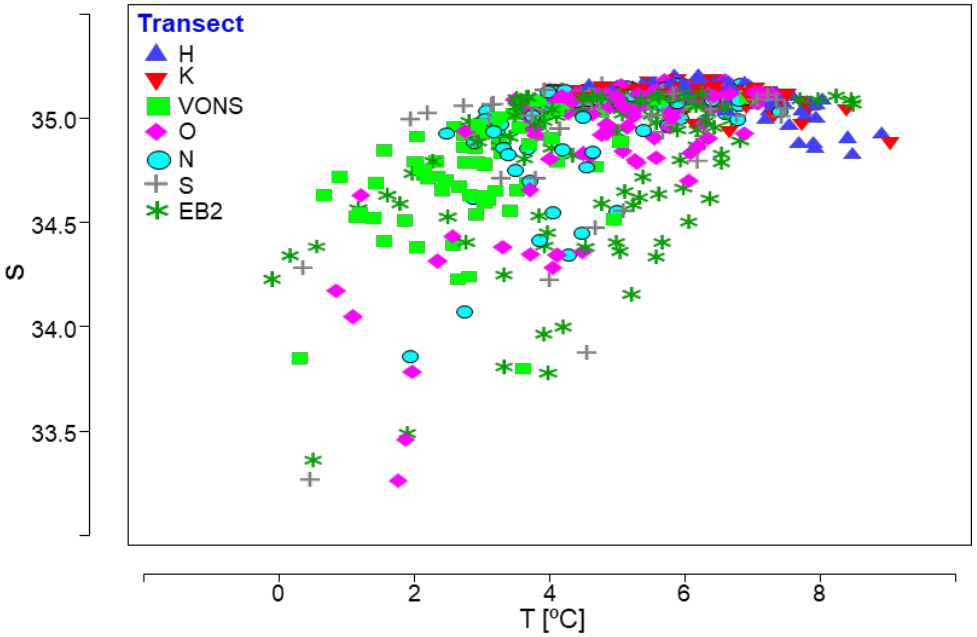
SIMPER analysis
Average dissimilarity = 75,12
Echinodermata larvae
Bivalvia veliger
Cirripedia cypris
Polychaeta larvae
Cum. Contribution: 78.39%

DistLM analysis
Mean T [°C]; p < 0.001
Mean S; p < 0.001

ANOSIM test
Sample statistic (R): **0.156**
p < 0.001







dbRDA analysis (left);
Draftsman plot of environmental variables (right)

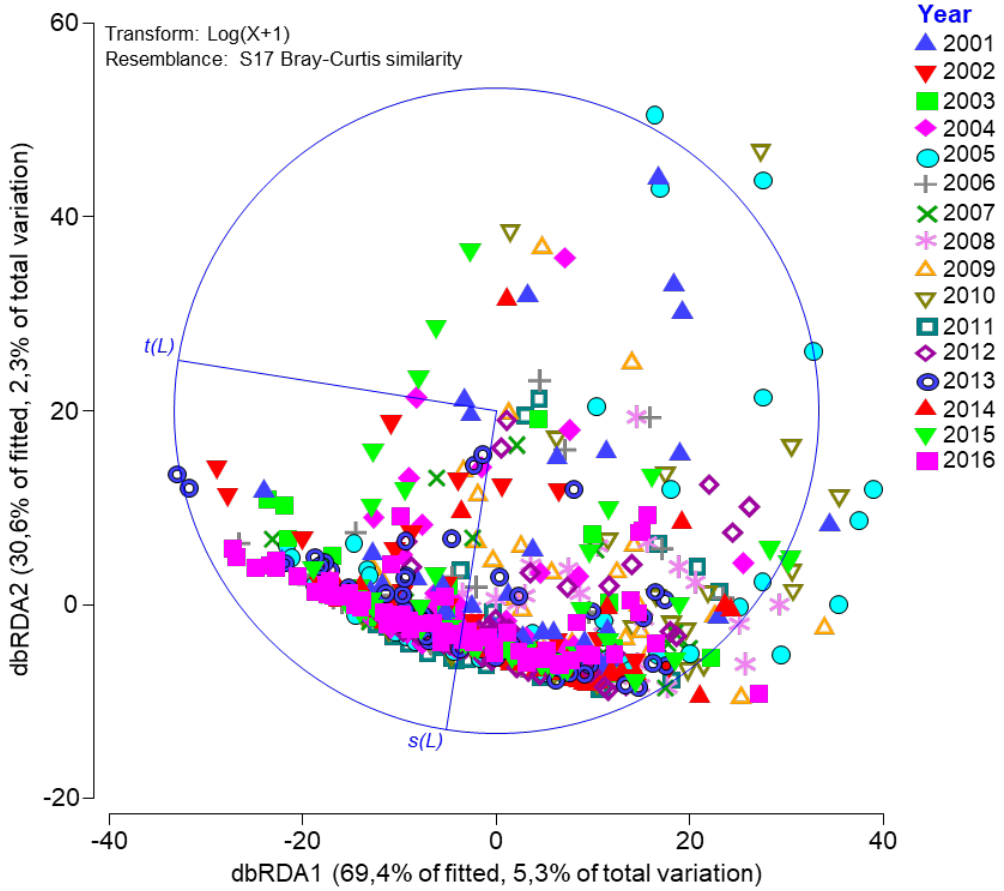
Echinodermata larvae
Bivalvia larvae
Gastropoda veliger
Cirripedia nauplii
Cirripedia cypris
Polychaeta larvae

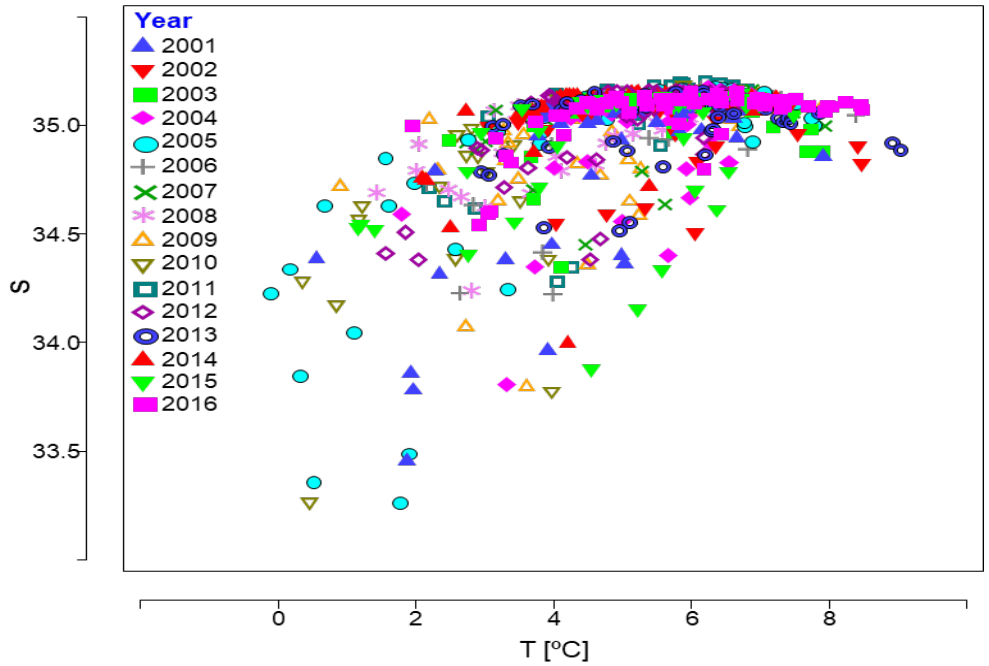
SIMPER analysis

Average dissimilarity from 67.75 to 81.22

Cum. Contribution: from 70.98 to 82.30%

ANOSIM test
VONS vs all other transects
Sample statistic (R): **>0.264**
EB2 vs K
Sample statistic (R): **0.127**
p < 0.001





dbRDA analysis (left);
Draftsman plot of environmental variables (right)

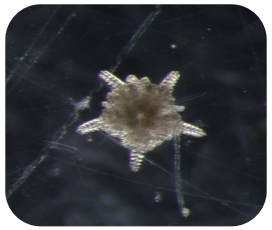
ANOSIM test
2015 vs 2002 or 2004
Sample statistic (R): **>0.100**
2005 vs 2011 or 2013
Sample statistic (R): **0.110**
p < 0.001

Echinodermata larvae
Bivalvia larvae
Gastropoda veliger
Cirripedia nauplii
Cirripedia cypris
Polychaeta larvae

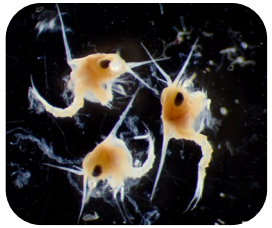
SIMPER analysis
Average dissimilarity from 64.85 to 78.22
Cum. Contribution: from 70.03 to 82.73%

Over the 16 years of research, both spatial and temporal variation of meroplankton along the WSC and WSS was observed.

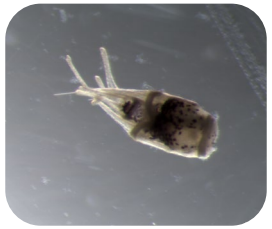
Echinodermata larvae, Bivalvia veliger, Cirripedia larvae and Polychaeta larvae are the most influential taxa which differentiate the meroplankton community both in spatial and temporal terms.



Highly abundant and occuring at most of the stations in the water column, over the 16 years of research, Bivalvia veliger, Echinodermata larvae seem to be the most resistant to changes in temperature and salinity.



The statistically significant influence of changes in salinity and temperature on the abundance and taxonomic structure of meroplankton was confirmed.



Further, more advanced statistical and ecological analysis will be performed.

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Acknowledgements

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  - ➢ HIMERO; Spatial and temporal variability of the hidden Arctic meroplankton diversity as a key for understanding rapidly progressing environmental changes; No. 2021/41/N/NZ8/02735; Preludium20 from the National Science Centre
  - ➢ ASCOMEA; "Influence of Atlantification on succession and biotic components in the shallow hard-bottom ecosystem in the Arctic 2019/33/B/NZ8/02154 2020-2023 - NCN OPUS
  - ➢ 2020/37/B/ST10/02905

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