Will Arctic Ocean zooplankton DWARF as water temperature increases?

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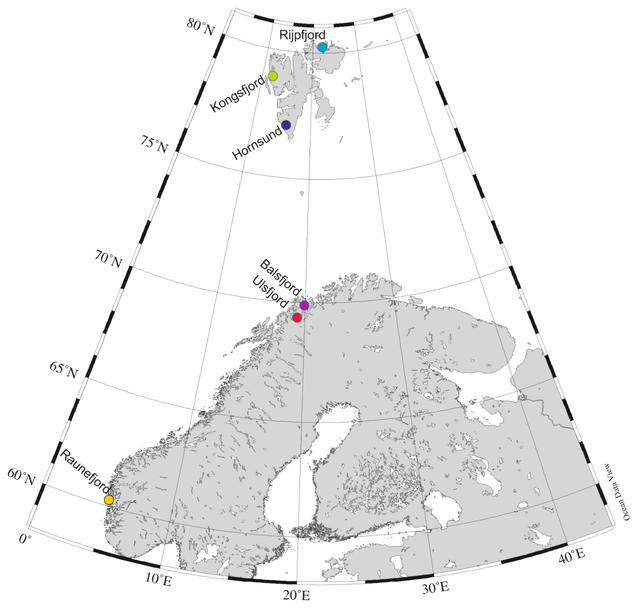
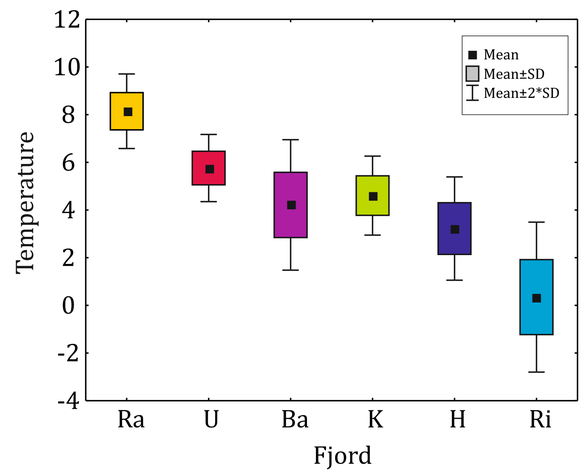
Introduction

Temperature is one of the main environmental factors influencing life at different organization levels. At present, global surface temperature increases at fastest rate in the records of climate change, with the temperature in the Arctic growing three times faster than elsewhere. We aimed at discovering relationships between size related characteristics of marine zooplankton and ambient temperature. We conducted our investigations at locations representing natural temperature gradient. We expected that comparison of the characteristics of zooplankton from the study locations, including zooplankton Normalized Biomass Size Spectra, taxonomic composition or size distribution of key zooplankters, supported by data on environmental factors, would allow us to verify the hypothesis that zooplankton becomes smaller with temperature increase. If this hypothesis was confirmed, one could envisage dwarfing of zooplankton community in the Arctic Ocean with progressing global warming.

Sampling sites



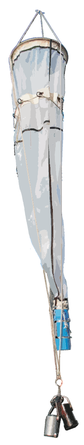
Temperature regimes



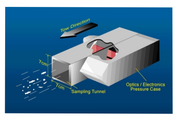
Methods

Multi Plankton Sampler (180 µm)

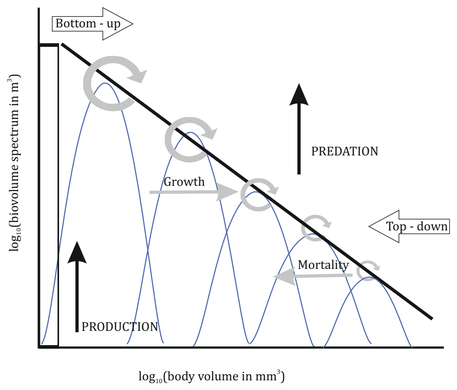
WP-2 net (60 µm)



Laser Optical Plankton Counter (LOPC)

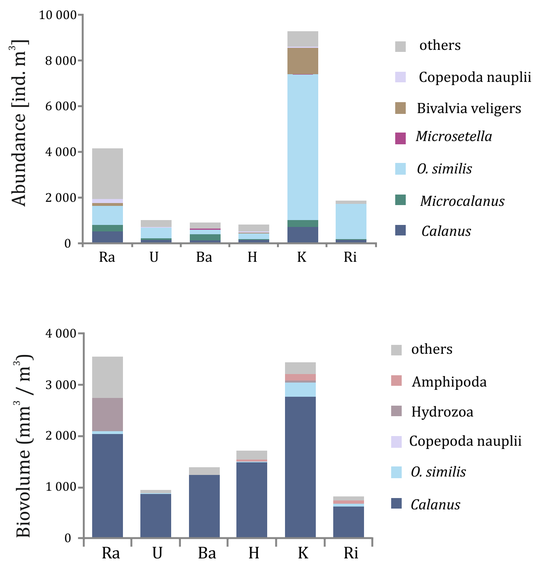


Normalized Biovolume Size Spectrum (NBSS)



COMMUNITY STRUCTURE

Multi Plankton Sampler (180 µm)



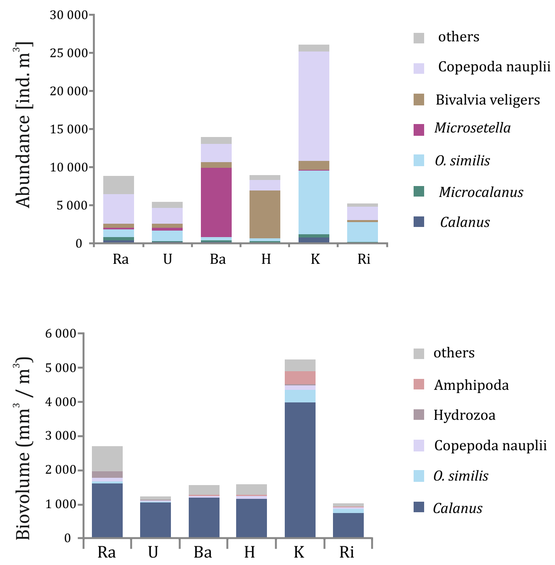
Numerical assessment

* the highest abundance in Kongsfjord
* the highest numerical importance of *O. similis* in MPS and Copepoda nauplii in WP-2 net
* numerous Bivalvia veligers in Hornsund (small) & Kongsfjord (bigger)

Biovolume assessment

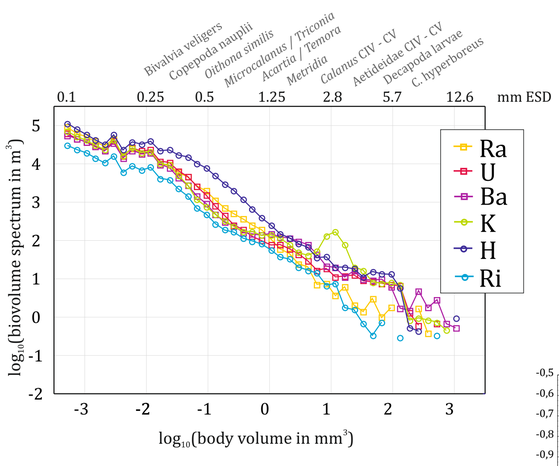
* the highest overall biovolume in Kongsfjord and Raunefjord
* *Calanus* spp. - the main component of the biovolume
* irregular importance of Hydroza (Raunefjord) and Amphipoda (Kongsfjord)

WP-2 net (60 µm)

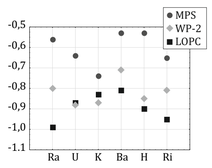


SIZE SPECTRA

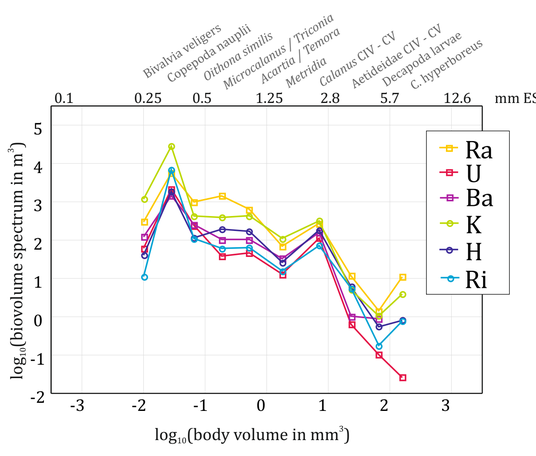
LOPC



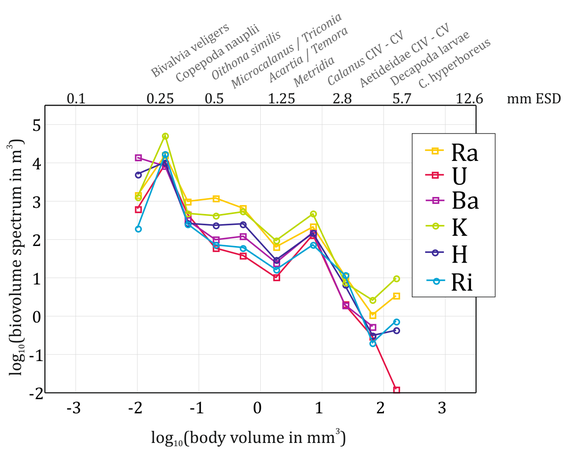
NBSS slopes



MPS



WP-2



* the highest biovolume in Hornsund
* the lowest biovolume in Rijpfjord
* very pronounced peak of *Calanus* in Kongsfjord

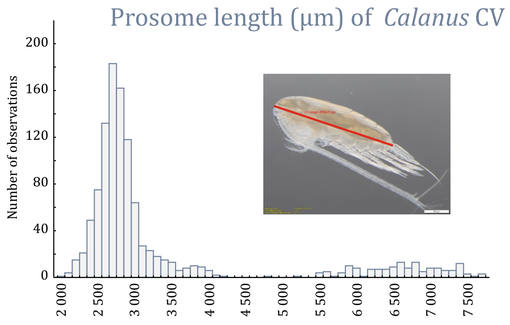
* the correspondance between NBSS of LOPC and WP-2 net
* very flat size spectra slopes for MPS samples biovolume

* the highest biovolume in Raunefjord and Kongsfjord
* the lowest biovolume in Rijpfjord and Ulsfjord
* biovolume peaks of nauplii Copepoda and meroplankton

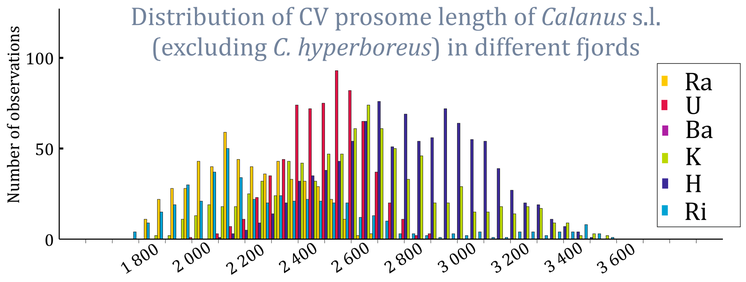
INDIVIDUAL SIZE

Size measurements
of preserved, photographed individuals
(prosome lenght, total lenght, width)

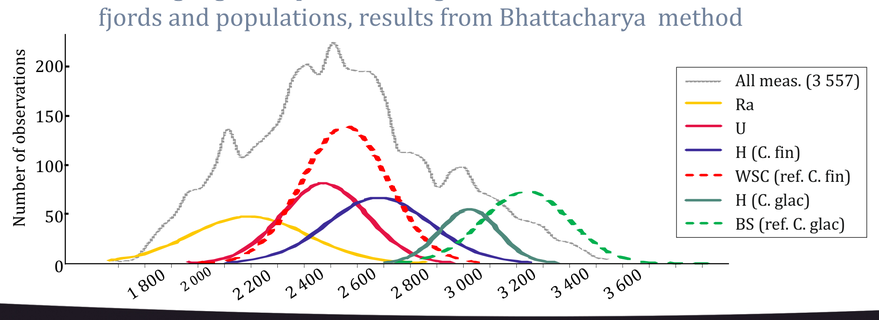
Prosome length (µm) of *Calanus* CV



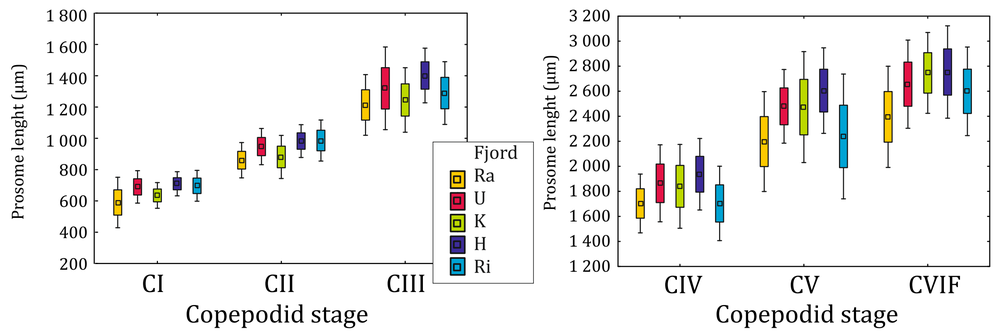
Distribution of CV prosome length of *Calanus* s.l. (excluding *C. hyperboreus*) in different fjords



Disentangling of CV prosome length distribution from different fjords and populations, results from Bhattacharya method



Prosome length (µm) of *C. finmarchicus* copepodid stages in different fjords



The results show *Calanus* size (prosome length) decreases in higher ambient temperature but the deviations observed suggest an influence of other factors (for example feeding conditions) can't be overlooked