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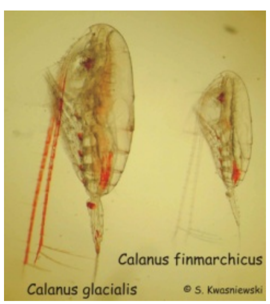
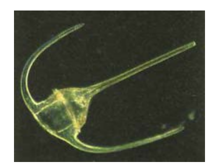
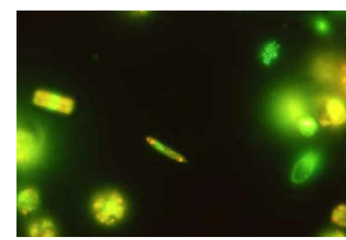
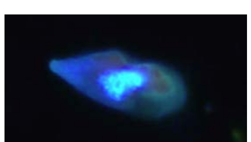
WP3
Marine Pelagic Fauna









Rationales of the project

- Body-size reduction is a third universal response to global warming [Daufresne et al., 2009] (next to changes in the phenology [Durant et al., 2007] and in distribution of the species [Visser & Both, 2005]
- Thus, the goal of the project is to test hypothesis that elevated temperatures will induce size reductions in a large range of animals in the Arctic,
- alternatively, to study size responses in biological structures at different levels (genome, cell, body, population and community) to changing thermal regimes.
- The goal will be achieved by exploring variability of size of biological structures at different levels (genome, cell, body, population and community) in response to changing thermal regimes.

Rationales of the WP3

The PL distributions were non-overlapping for populations from Atlantic and Arctic locations but showed some degree of overlap for populations from Atlantic/Arctic water masses

The negative shift for the Arctic *C. glacialis* occurs because water temperature in its marginal areas influenced by Atlantic water (T > 3°C) is higher than the temperature in its core distribution area (T < 0°C in Arctic Water). The temperature in areas of convergence is probably less influential for the boreal *C. finmarchicus*

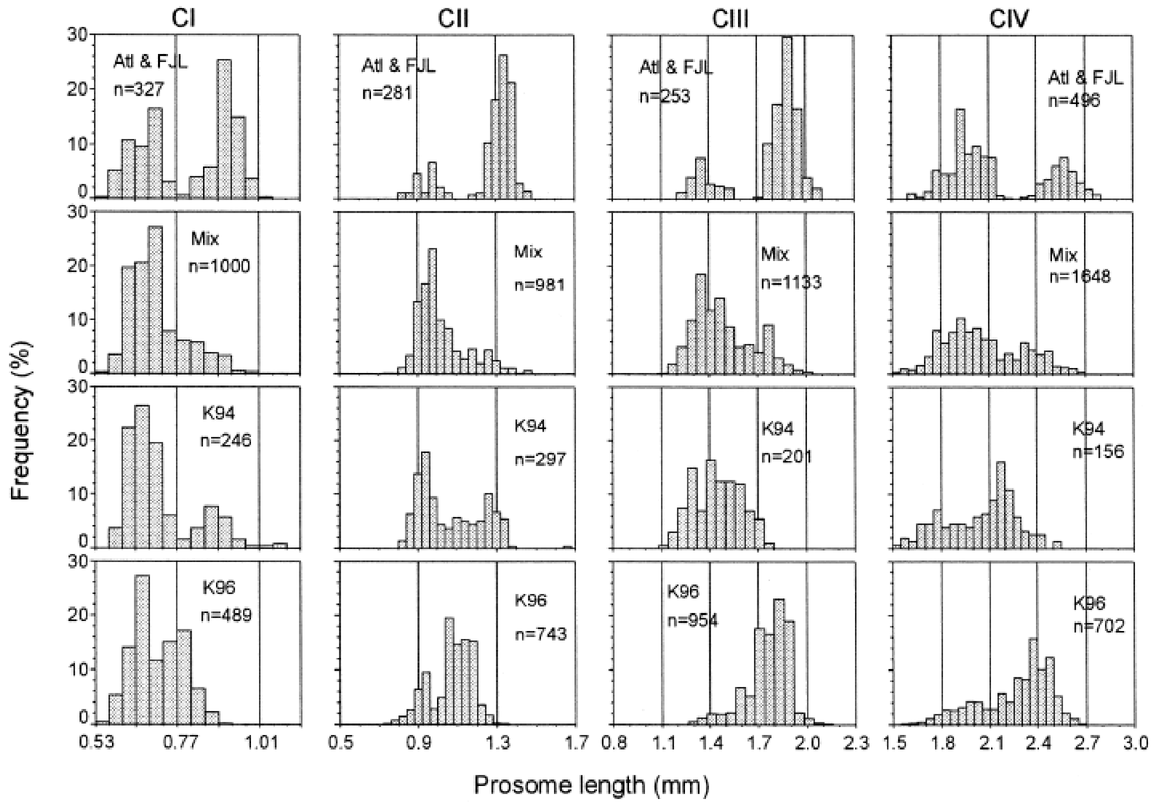
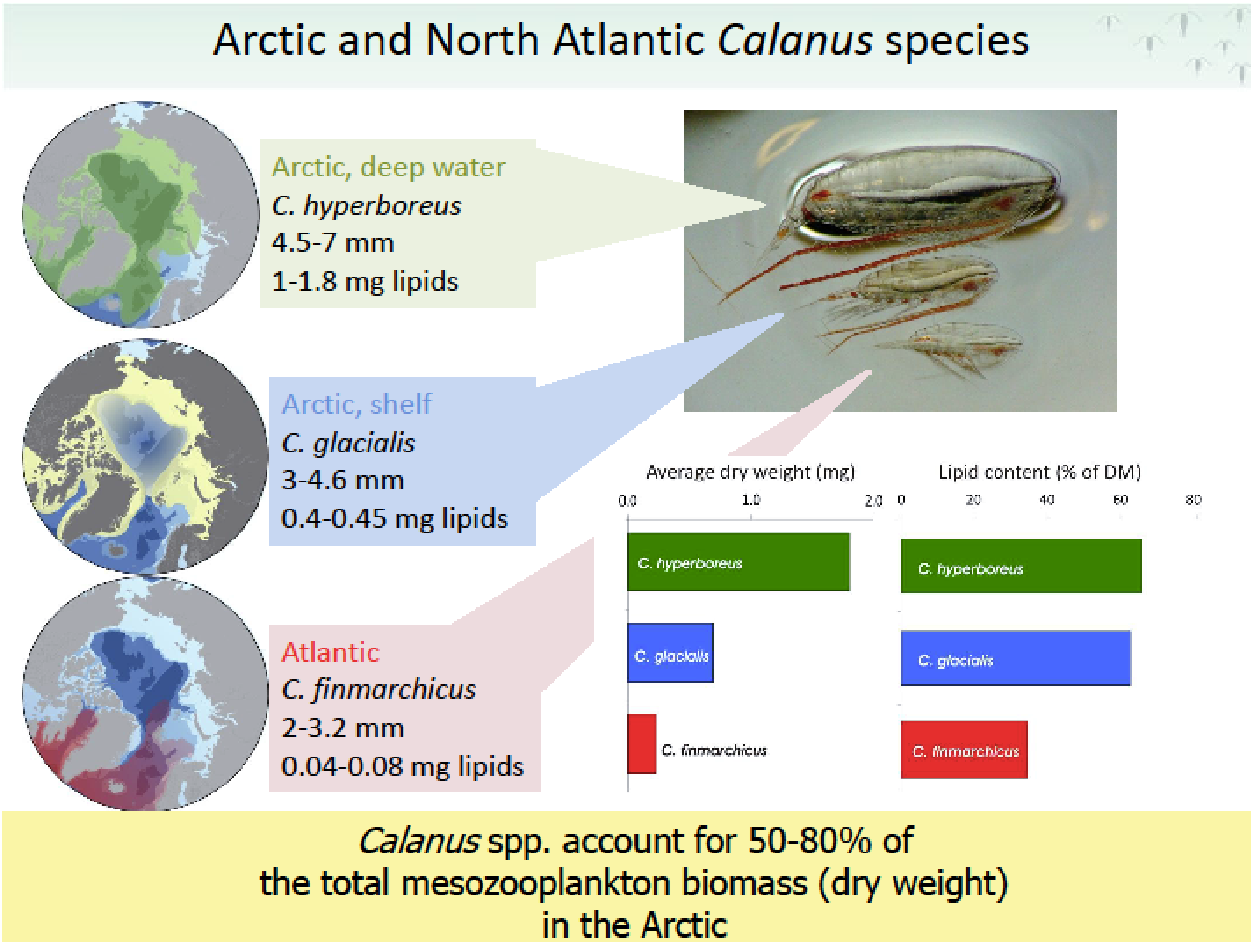


Fig. 4. Prosome length distributions of *Calanus* CI–CIV from various north latitude locations.

Kwasniewski et al., 2003

Rationales of the WP3



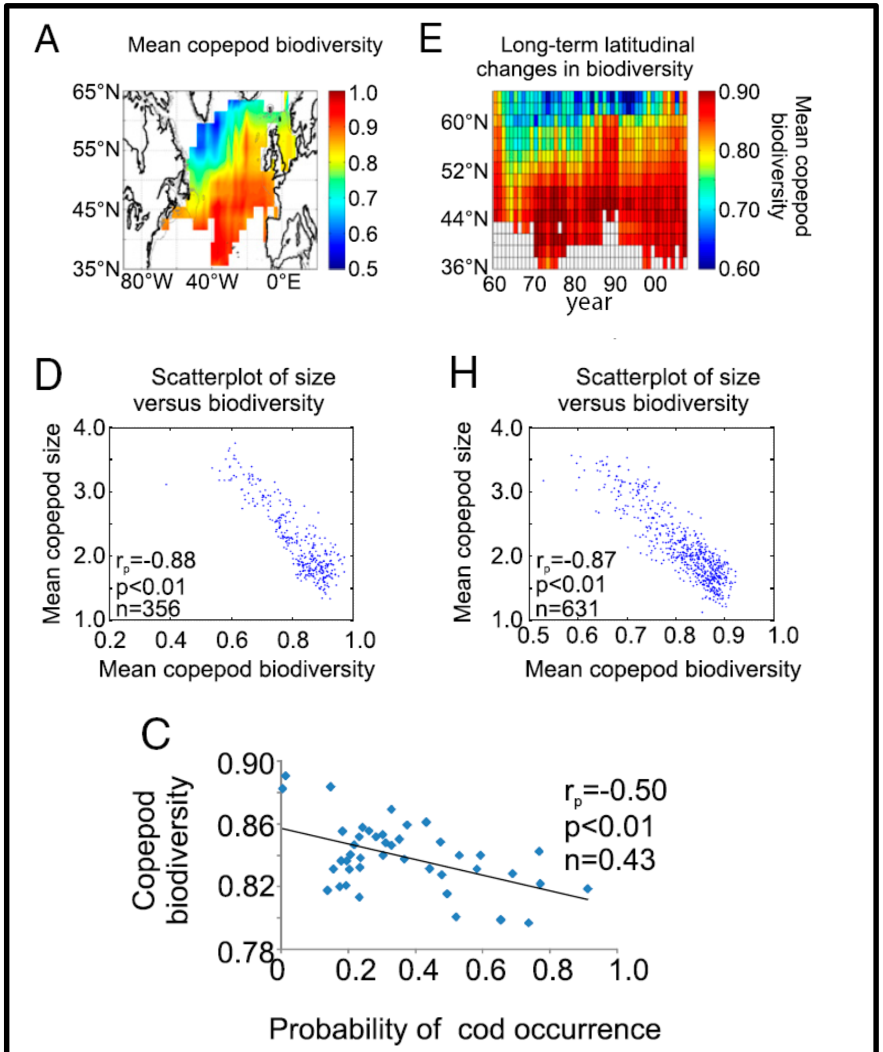
[Falk-Petersen et al., 2010]

Rationales of the WP3

- Importance of temperature & size for living systems

- On the individual level:
  Physiology
  - metabolism
  - growth
  - reproduction

- On the community level:
  Food web structures
  - predator – prey interactions
  - biogeochemical cycles
  - diversity
  - ecosystem functioning



[Beaugrand et al., 2010]

Rationales of the WP3

- **WP 3** aims to document the effects of hydrological conditions on marine plankton composition and size structure with a special focus on *C. glacialis*, a main inhabitant of Arctic shelves, as well as *C. finmarchicus*, its main hypothetical, future competitor. Mesozooplankton will be collected with the use of standard net sampling (MPS, net mesh 180 µm) for size determination of individual species and life stages as well as advanced, high-resolution optical method (Laser Optical Plankton Counter – LOPC) for automatic counting and sizing all plankton particles. The collected specimens will be measured and their size will be converted to biovolume and biomass. Finally the Normalized Biomass Size Spectra (NBSS) of the whole plankton communities in different hydrological regimes will be calculated for production modelling and their trophic relationships.

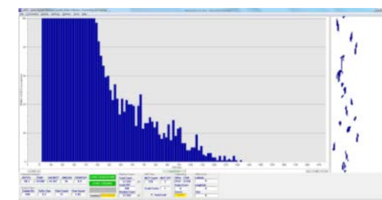
Methods

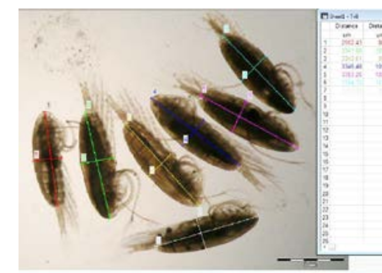
LOPC
0.1 – 35 mm

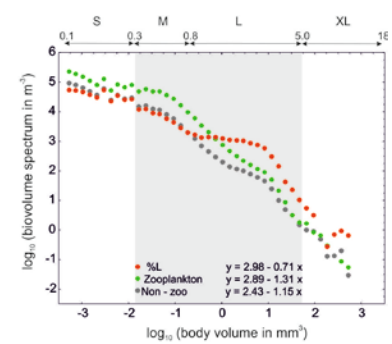
MPS
0.18 mm

WP2
0.06 mm

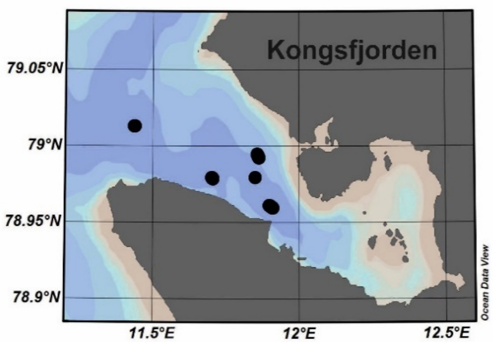
Size spectra
Individual/community level

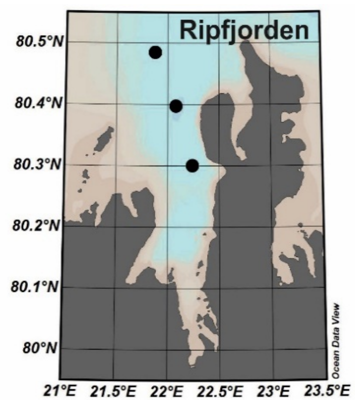


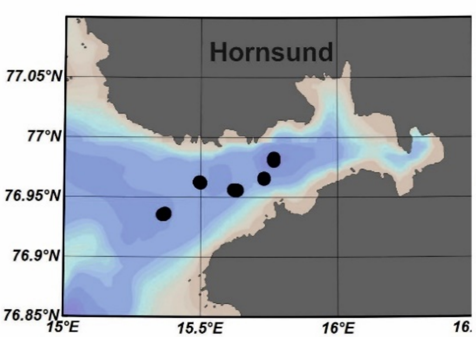


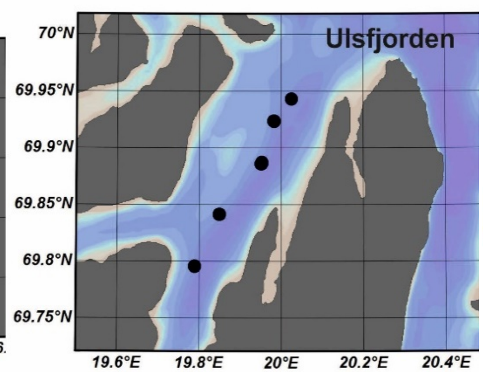


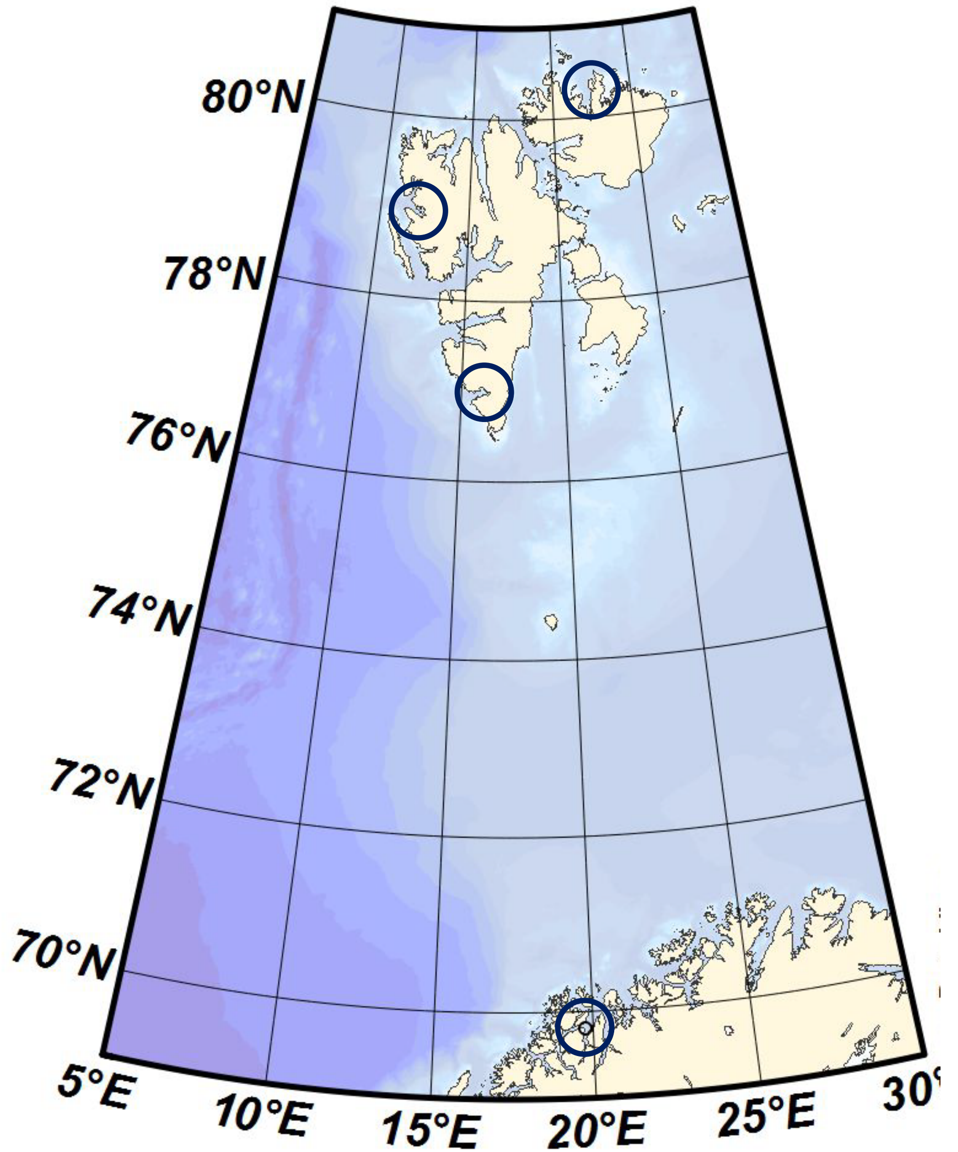
Results so far







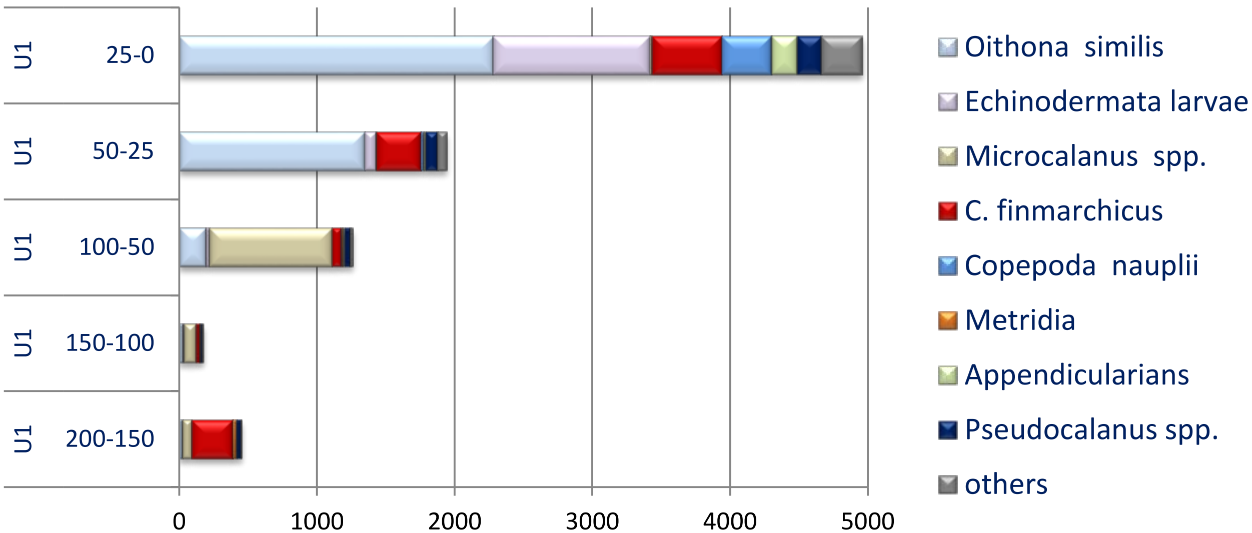




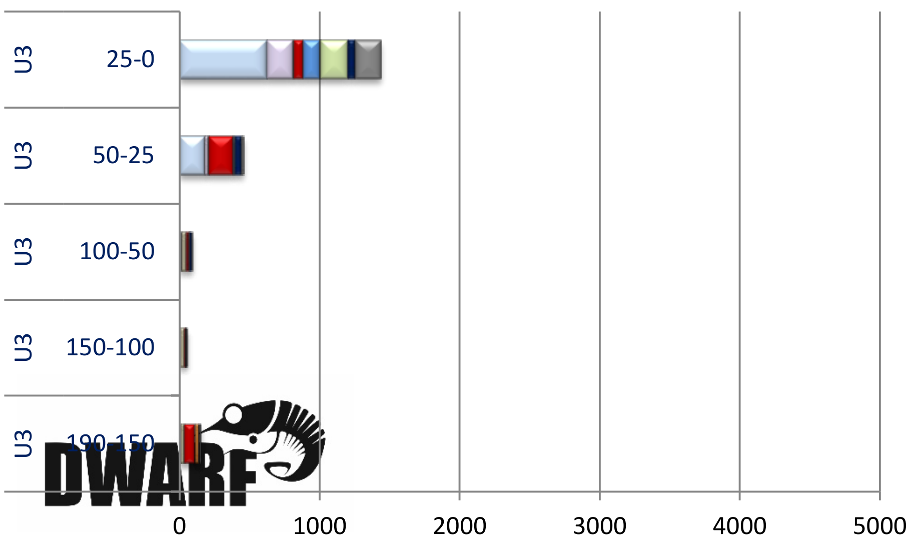
Results so far

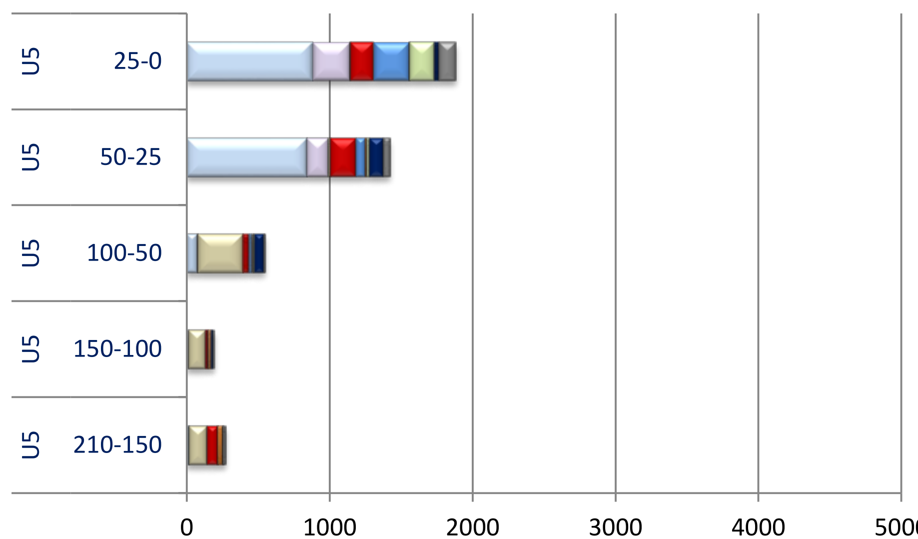
Fiord	MPS 180 um	WP2 60 um	LOPC
Ulsfjorden	5 stations & 5 depth layers 25 samples	5 stations & 3 depth layers 15 samples	5 stations & 3 vertical tows 15 profiles
Hornsund	5 stations & 5 depth layers 25 samples	5 stations & 3 depth layers 15 samples	5 stations & 3 vertical tows 15 profiles
Kongsfjorden	5 stations & 5 depth layers 25 samples	5 stations & 3 depth layers 15 samples	5 stations & 3 vertical tows 15 profiles
Rijpfjorden	3 stations & 5 depth layers 15 samples	3 stations & 3 depth layers 9 samples	3 stations & 3 vertical tows 9 profiles

Ulsfjorden – species composition

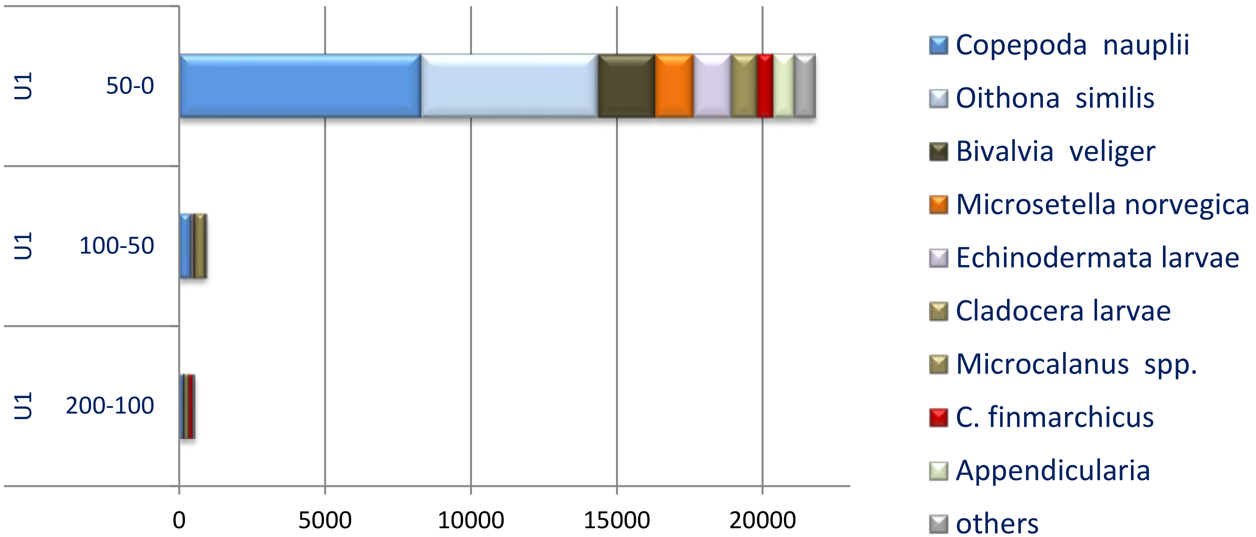


MPS 180 um

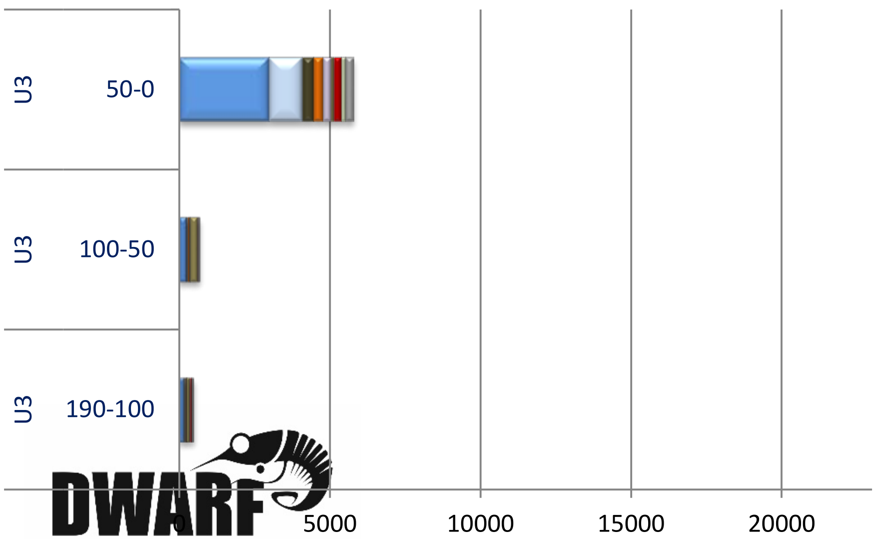


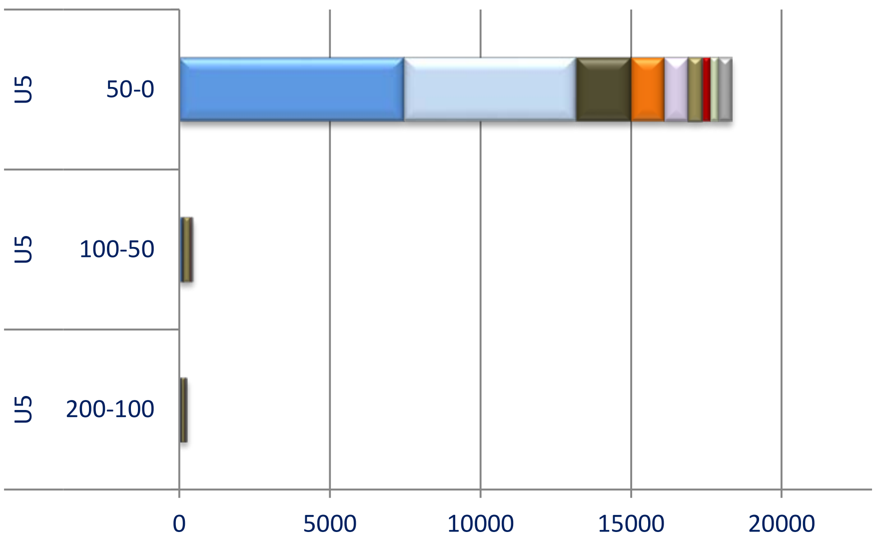


Ulsfjorden – species composition



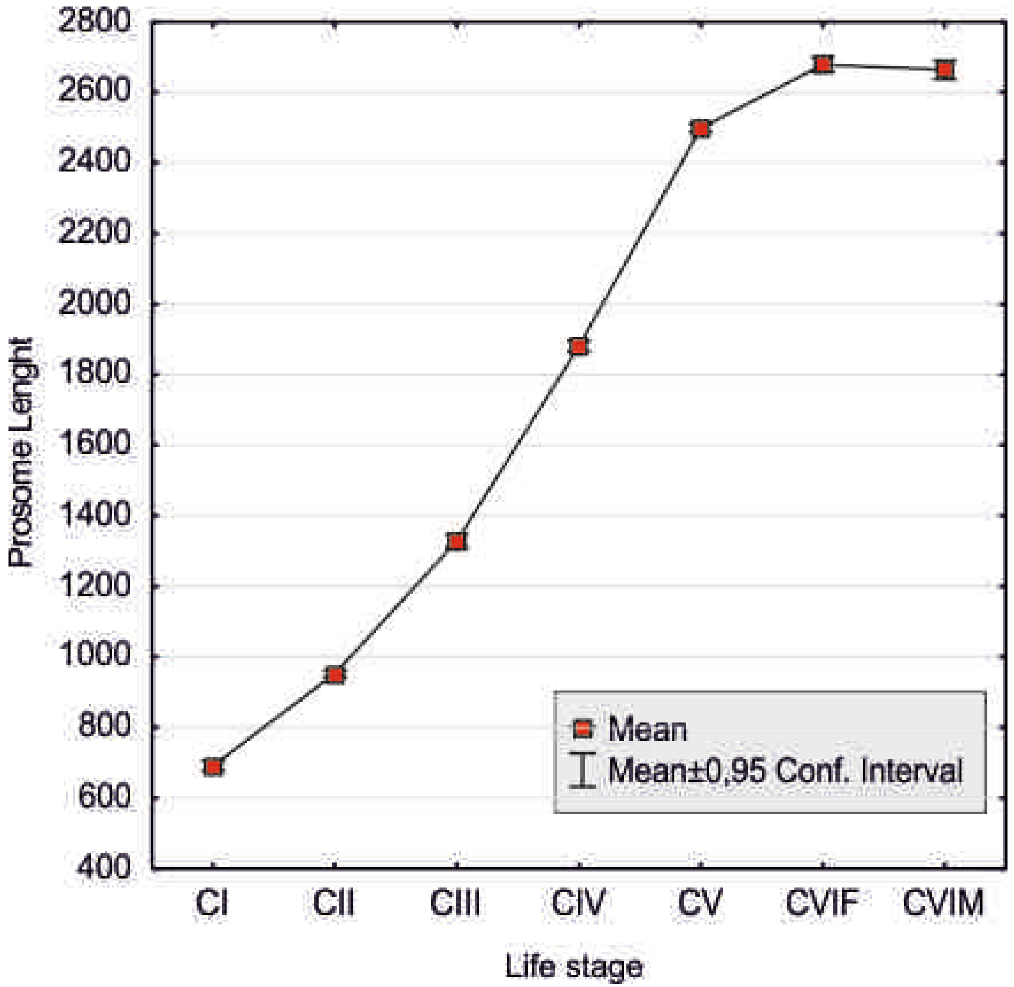
WP2 60 um





Ulsfjorden – species size structure

Species	No
C. finmarchicus	1851
Metridia	1065
Acartia	77
C. hyperboreus	74
Cladocera	149
Euphasiaucea	118
Microcalanus	1070
Harpacticoida	278
Nauplii_Copepoda	896
Oithona	964
Paraeuchaeta	63
Pseudocalanus	808



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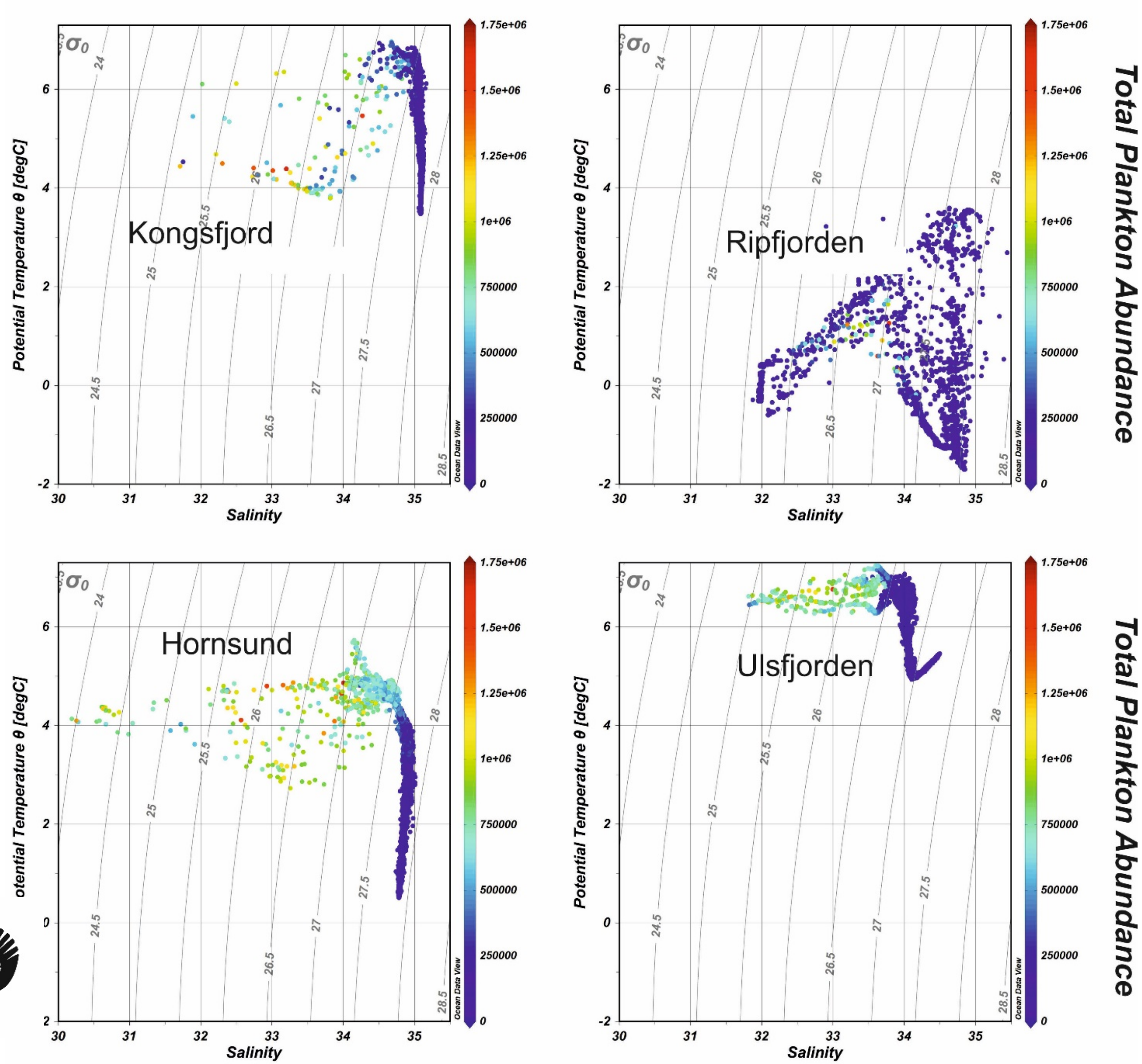
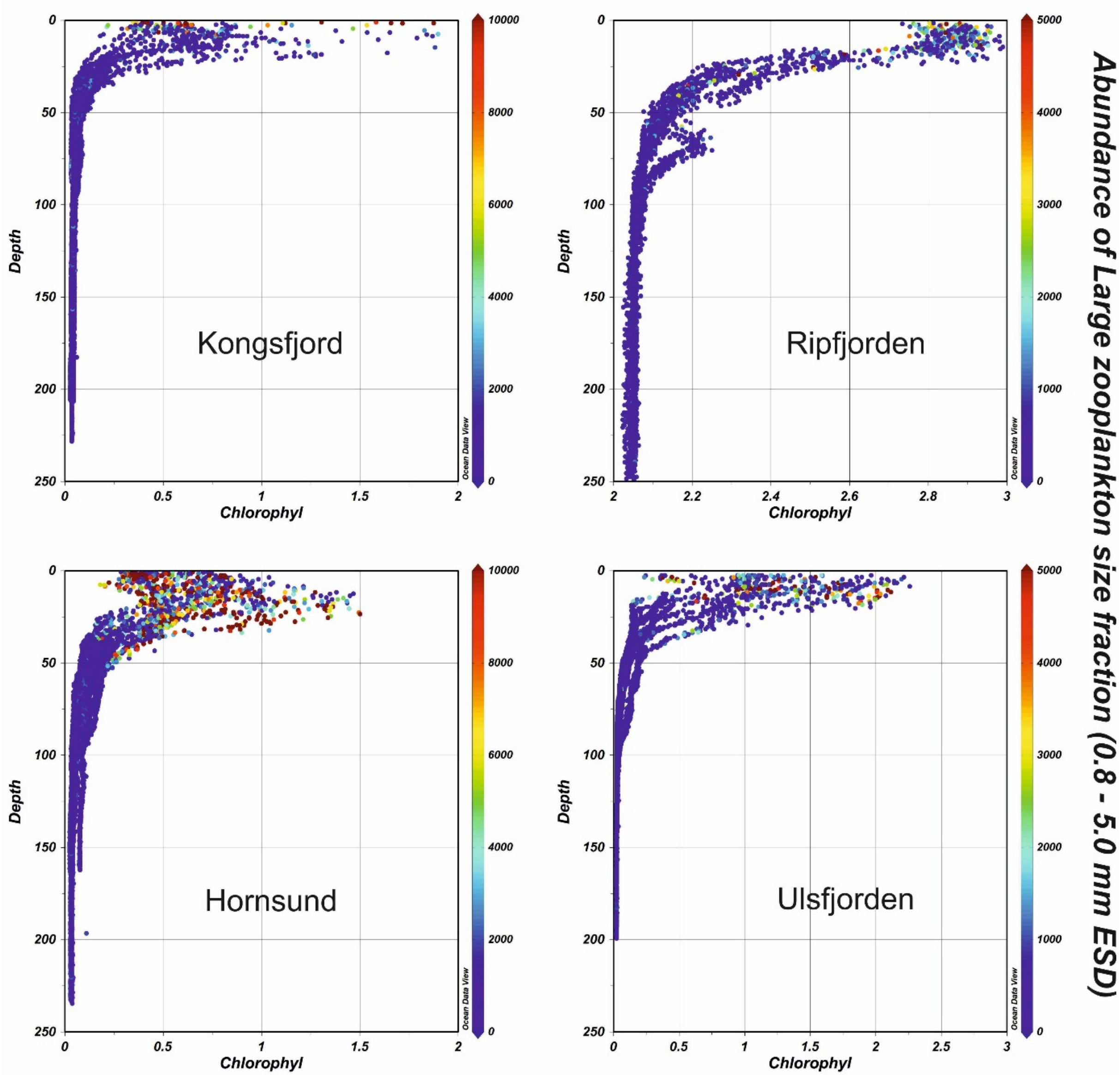
CTD & Total abundance



Vertical profiles of chlorophyll fluorescence and the abundance of larger size fraction in colour



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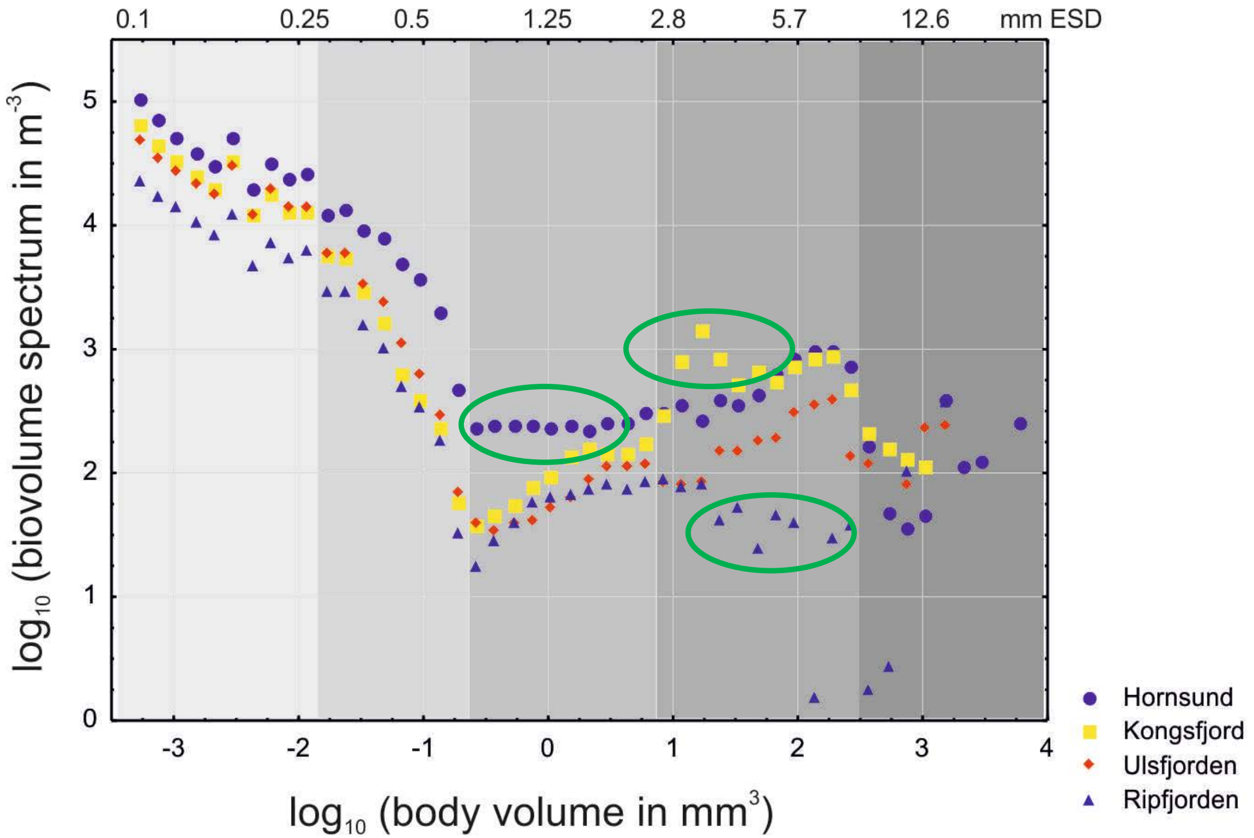
Size spectra



0.1 - 0.3 mm ESD : small particles, Acartia CI-CIII, O. similis, Bivalvia veligers., Triconia, Copepoda Nauplii

0.3 - 0.8 mm ESD : O. similis, Bivalvia veligers, Triconia, Copepoda Nauplii, Pseudocalanus CI-CV, Microcalanus, Metridia CI - CIV, O. atlantica, C. finmarchicus CI - CIII, C. glacialis CI-CII Acartia CIV-CVI, Cyrripedia larvae, Polychaeta larvae, Euphausiacea calyptopis,

0.8 - 2.5 mm ESD : Metridia CV-CVI, C. finmarchicus CIV-CVI, C. glacialis CIII-CVI, Euphausiacea furcilia, C. hyperboreus CIV, small Themisto, Paraeuchaeta,

2.5 - 10.0 mm ESD : C. hyperboreus CV-CVI, Themisto, Decapoda larvae, Paraeuchaeta, Euphausiacea

10.0 - 35.0 mm ESD : macrozooplankton, not representatively caught

Tasks (acc. project description)

- Task 3.1. Sampling and field work.
- Task 3.2. Assessment of the taxonomic, age and size/biomass structures of mesozooplankton communities based on MPS sampling, including the study on body size of Calanus species.
- Task 3.3. Assessment of the NBSS of mesozooplankton communities based on LOPC surveying.
- Task 3.4. Assessment of the relationships between the taxonomic and size/biomass structures of the mesozooplankton communities and the environmental variables, and of the potential influence of varying structures of mesozooplankton on pelagic food webs and matter and energy fluxes in ecosystems functioning in different temperature regimes.

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Deliverables (acc. project description)

- D 3.1. Manuscript of a paper on body size of Calanus species from ecosystems under different temperature regimes, and on the potential importance of the body size differences for the role of Calanus as grazer in pelagic food webs (submitted to a peer-reviewed journal). - M34
- D 3.2. Manuscript of a paper on the taxonomic and size/biomass structure of the mesozooplankton communities across different temperature regimes, and on the potential consequence of varying mesozooplankton community structure for matter and energy fluxes in marine ecosystems (submitted to a peer-reviewed journal). - M36

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Milestones (acc. project description) M14

- M 3.1. Completion of field sampling in summer season at three selected locations. - M20 - **To be completed**
- M 3.2. Completion of laboratory examinations of community samples, size measurements of Calanus populations. - M27 – **In progress**
- M 3.3. Retrieving the in situ remote sensing measurements of plankton community size spectra. Gathering of measurements of environmental variables. - M27 – **In progress**
- M 3.4. Building the data base of relevant measurements. - M29 - **Idle**
- M 3.5. Submission of manuscripts. - M36 -**Idle**

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Plan of future activities

Month	Activity
IV – VI 2015	Lab work on **Hornsund** samples
VI	Research cruise and **sampling** near **Bergen**
VII – X	Lab work on **Kongsfjorden** samples
XI - XII	Lab work on **Rijpfjorden** samples
I – III 2016	Lab work on **Bergen** samples
III - V	**Lab work** continuation
VI - VIII	**Data** compilation and comparisons
IX - XII	Writitng **manuscripts**

Perspectives for achieving the milestones and deliverables

So far so good