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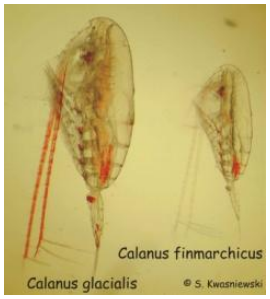
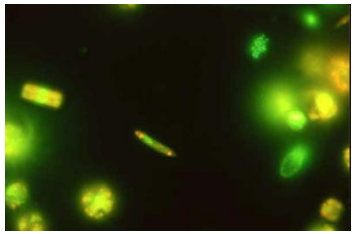
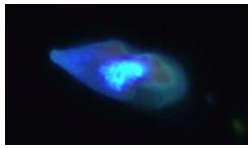
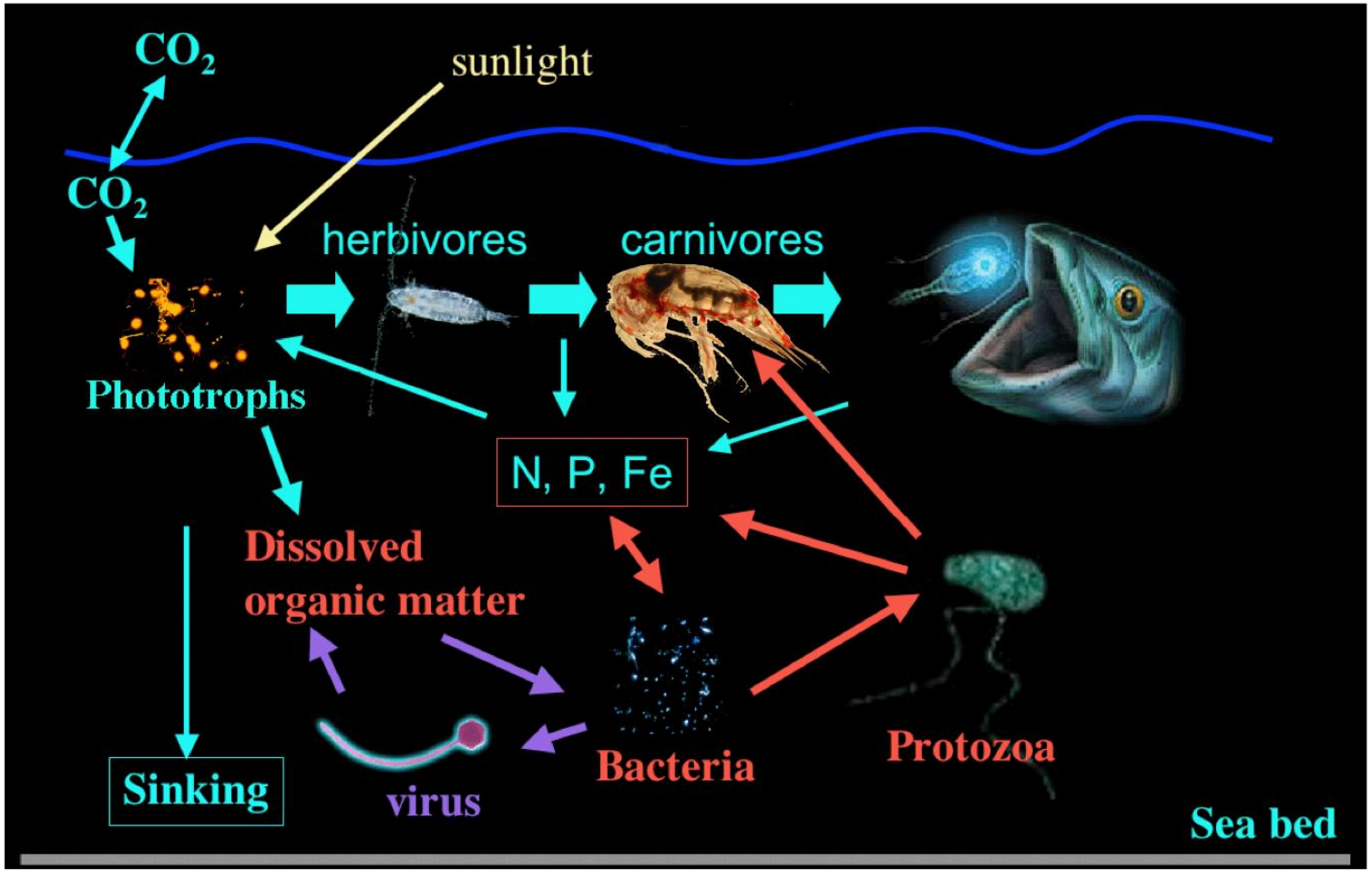
WP3
Marine Pelagic Fauna







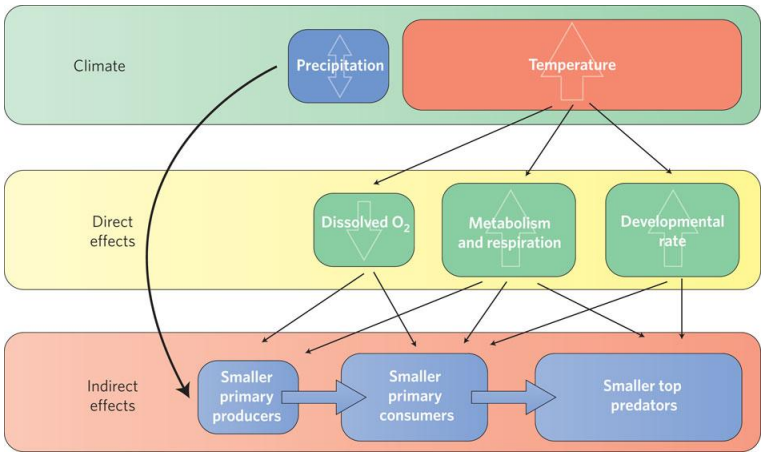
Objects of the study



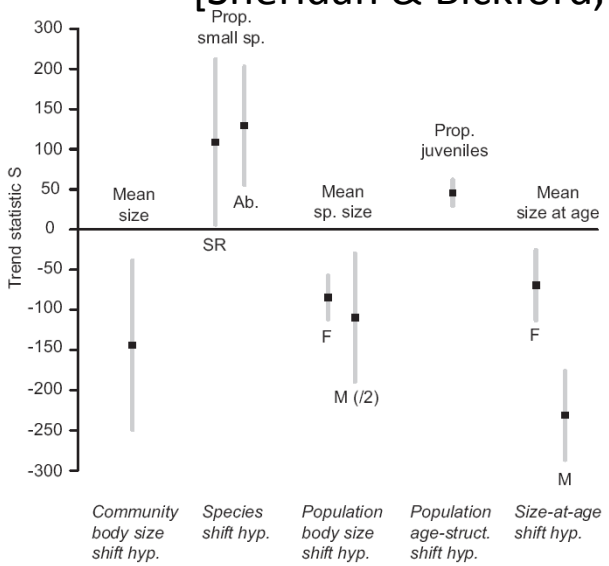
[Rassoulzadegan, 2010]

Rationale of the study

- 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]



[Sheridan & Bickford, 2011]

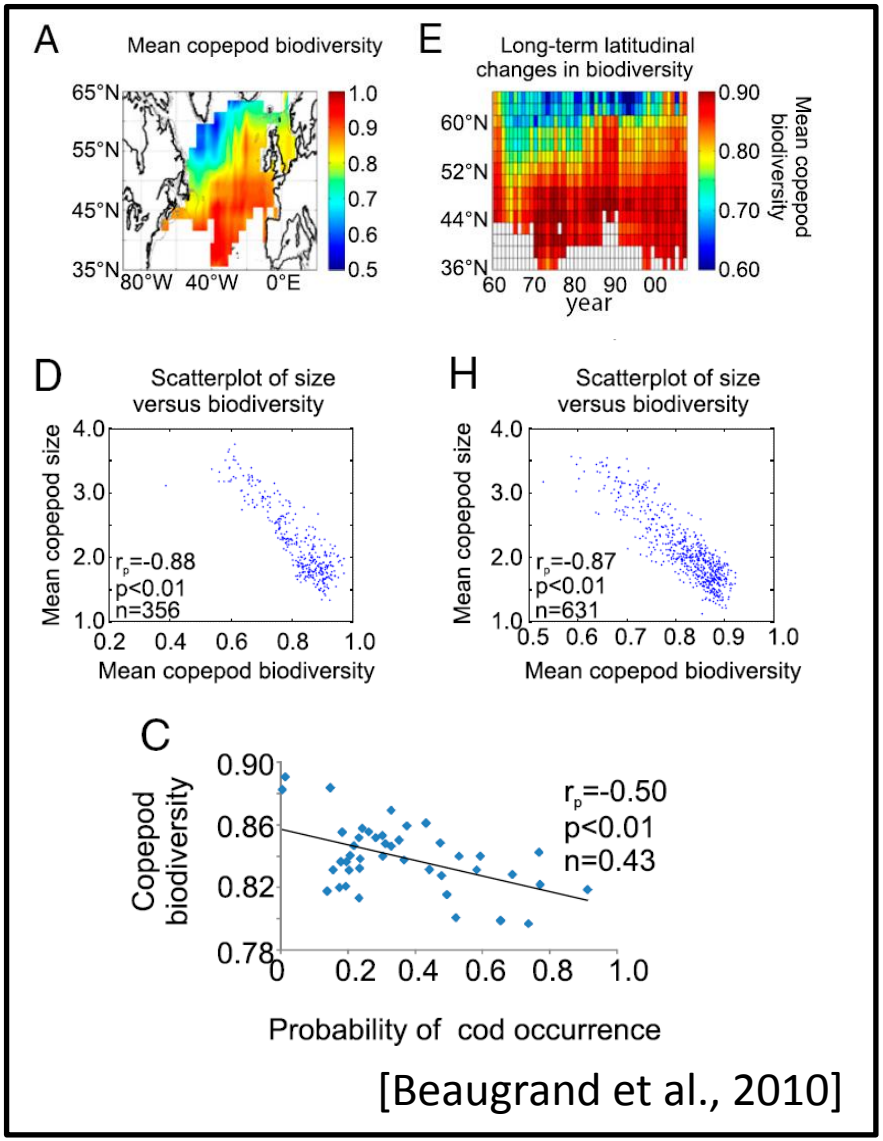


[Daufresne, 2009]

Gardner et al., 2011

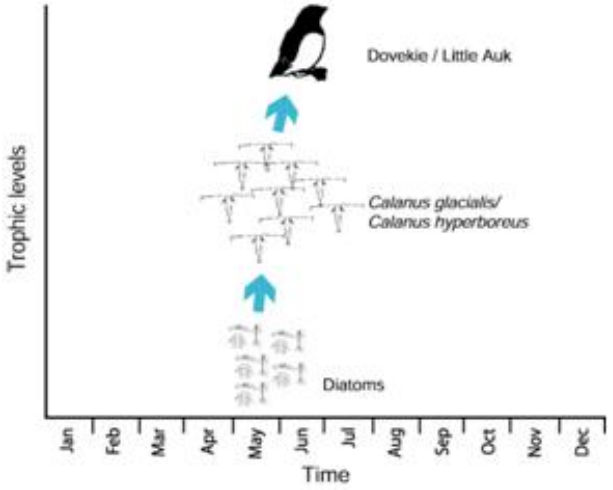
Rationale of the study

- 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



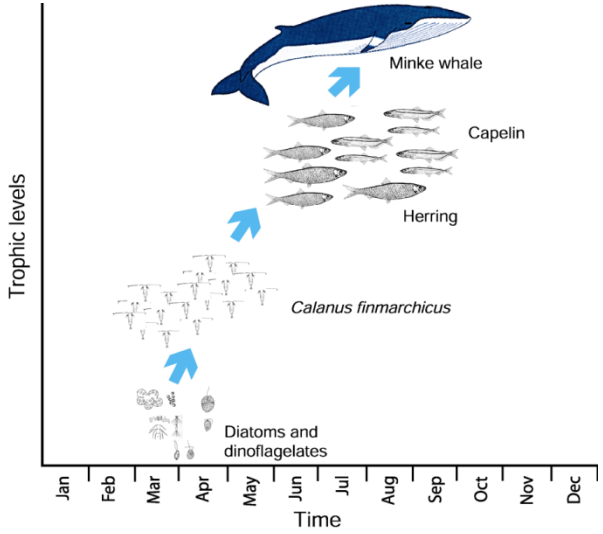
[Beaugrand et al., 2010]

Arctic zooplankton



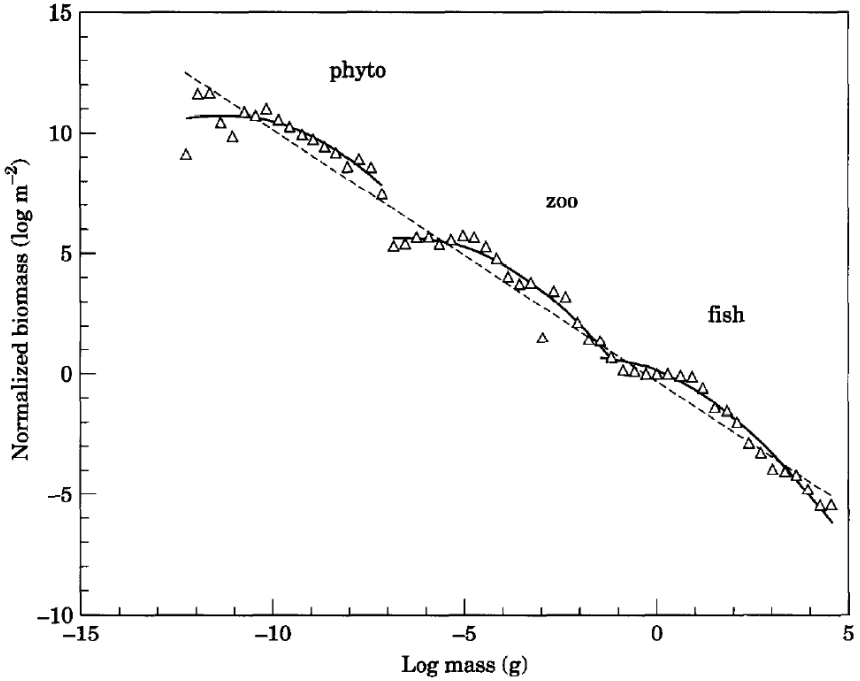
The importance of size in Arctic pelagic systems

The process of warming causes a switch in the food web from large, Arctic herbivores to smaller Atlantic species, thus reducing the food resources available to the top predators.



Falk-Petersen et al., 2007, Stempniewicz et al., 2007 Weslawski et al., 2009

Size spectra analysis



Sprules and Stockwell, 1995

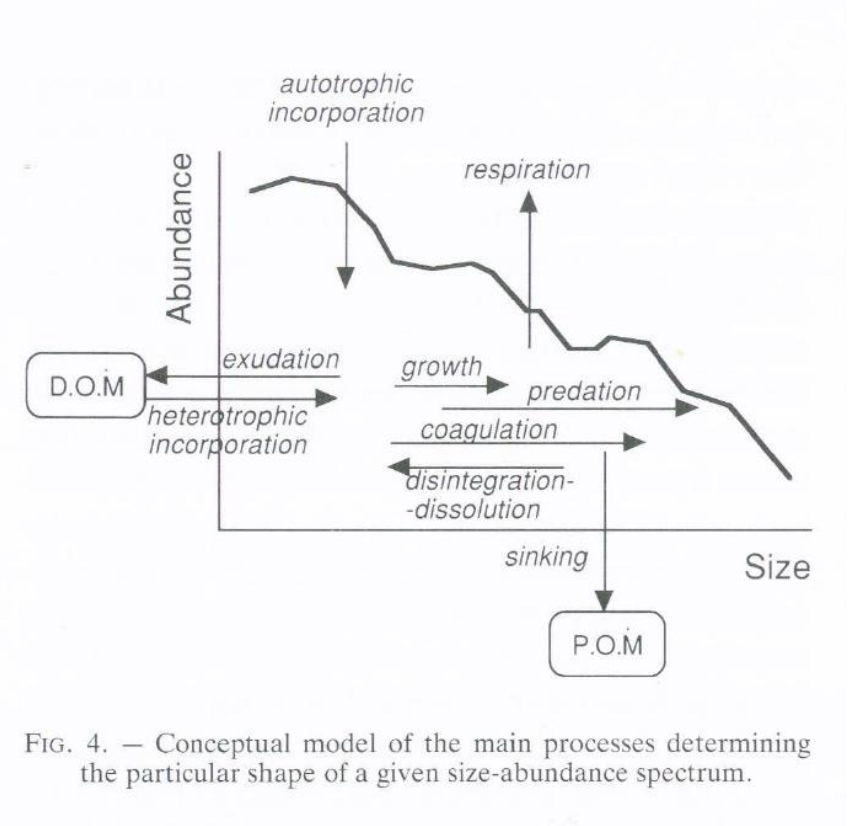


FIG. 4. — Conceptual model of the main processes determining the particular shape of a given size-abundance spectrum.

Rodriguez, 1994

Size spectra analysis

$$\text{Biomass spectrum}(b) = \frac{\text{Biomass}(\mu\text{gC})\text{in the size interval}(\Delta w)}{\text{The size}(\mu\text{gC})\text{interval}(\Delta w)}(\text{m}^{-3}) \quad (1)$$

x –turnover time of body weight
αA – the time scale of system energy loss
q – exponent for feeding efficiency

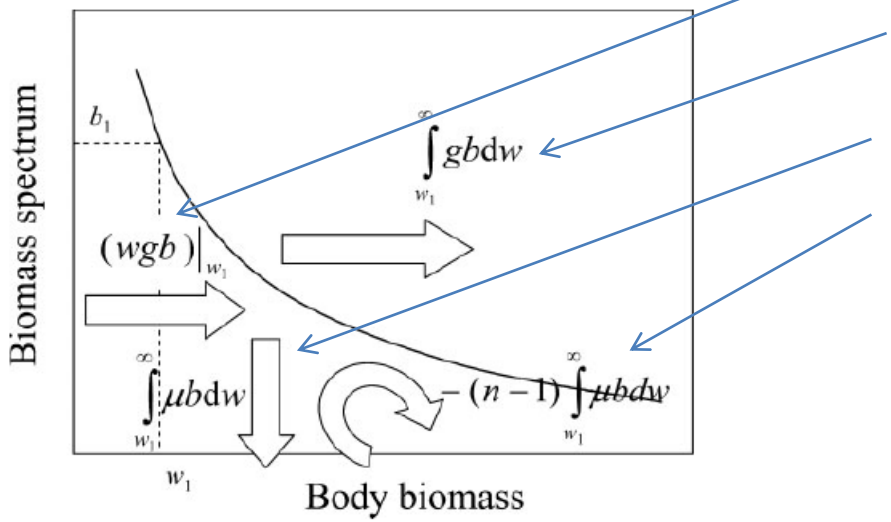


Fig. 1. A sketch of biomass fluxes through a biomass spectrum.

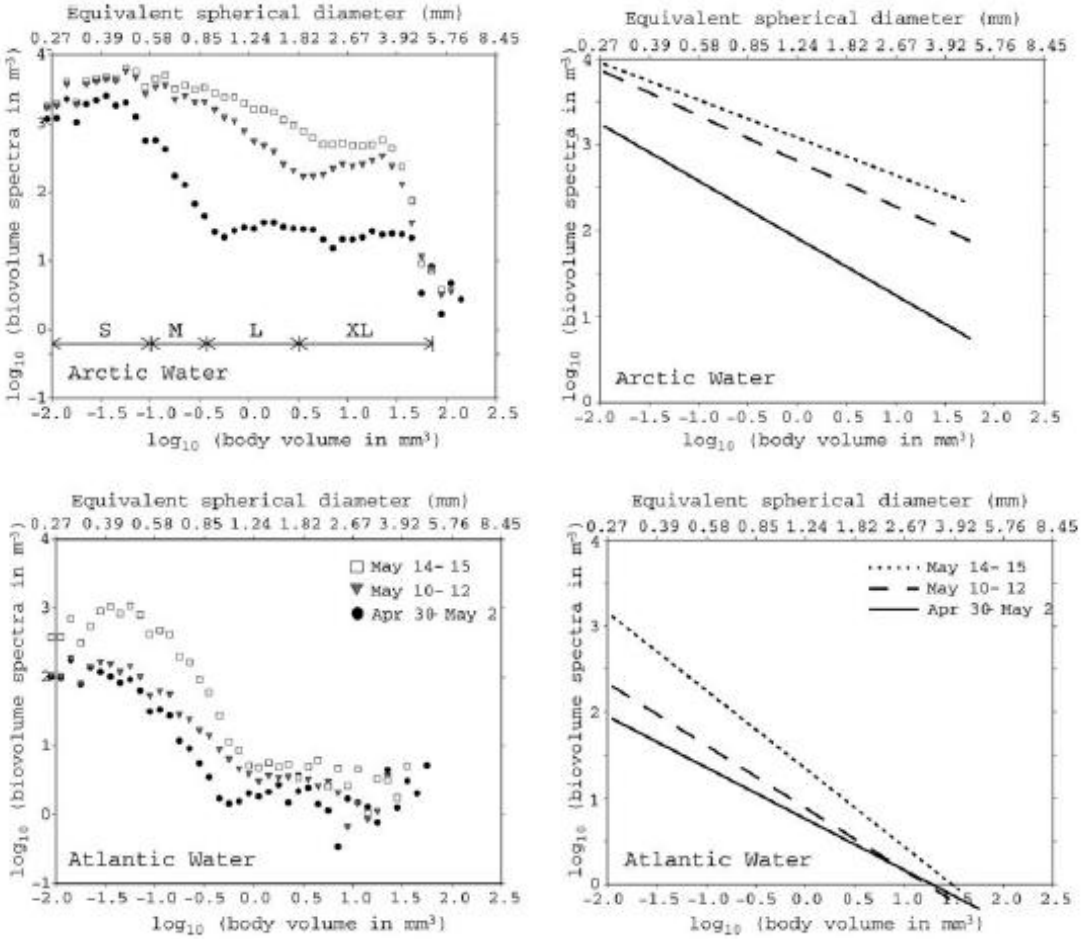
Synthetic information on:

- import
- growth
- mortality
- biomass recycling

- system productivity
- trophic levels

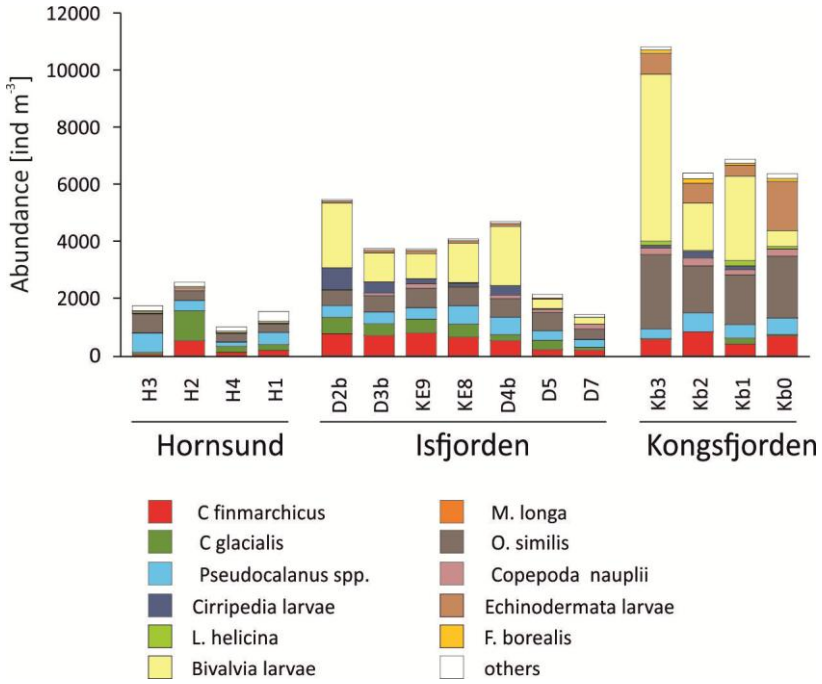
Zhou, 2006

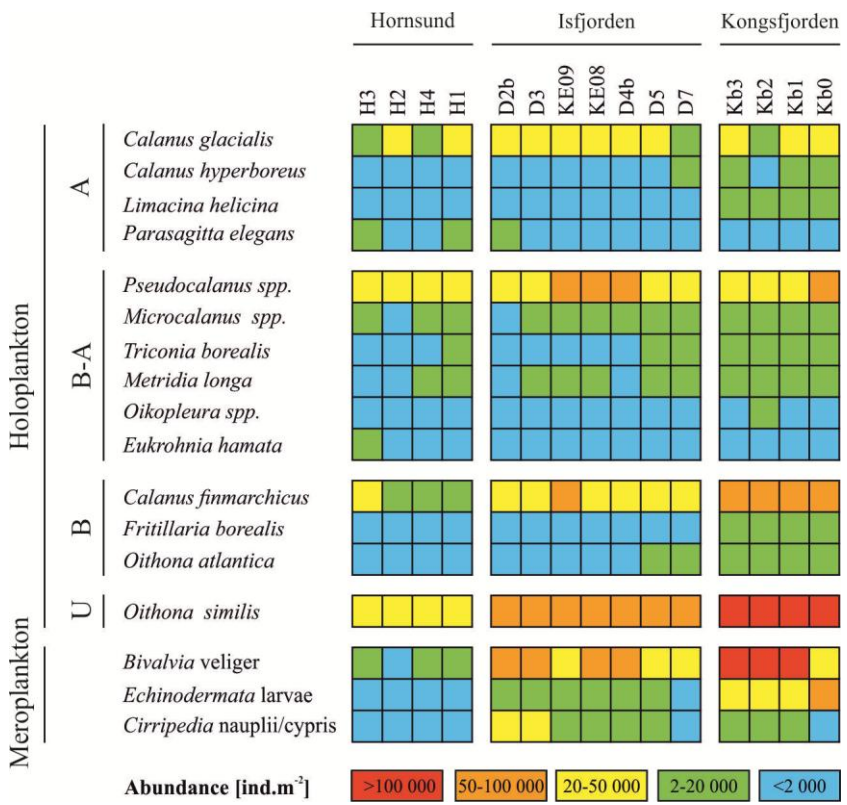
Size spectra analysis in the Barents Sea



Basedow et al., 2010

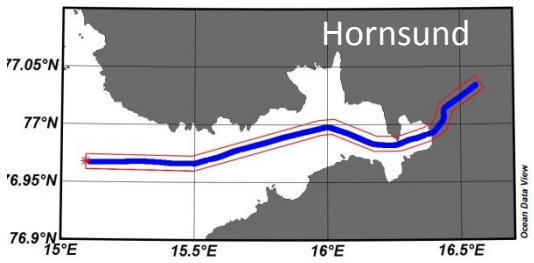
Earlier studies 2013

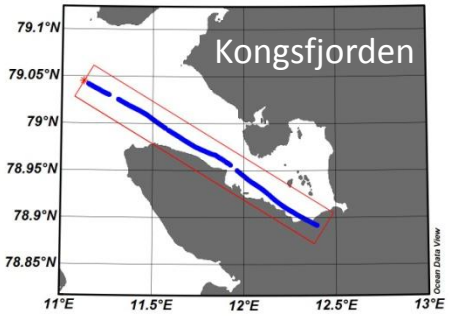




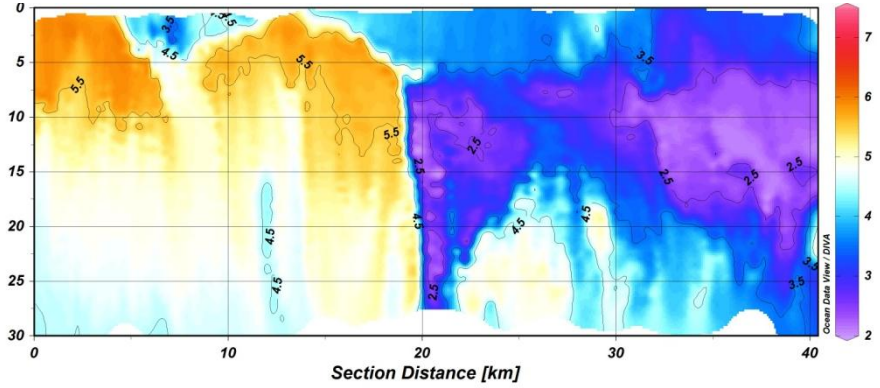
Gluchowska et al., in prep

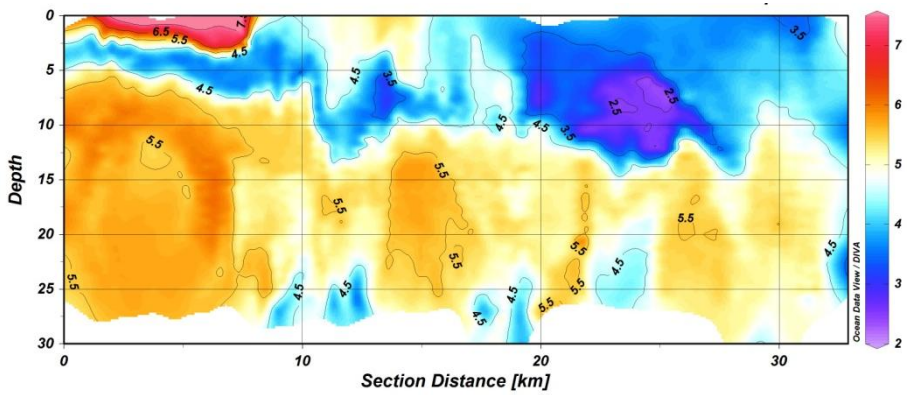
Earlier studies 2013



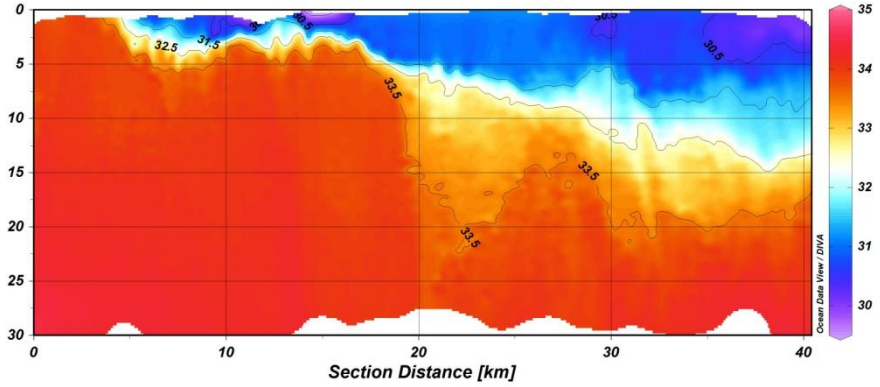


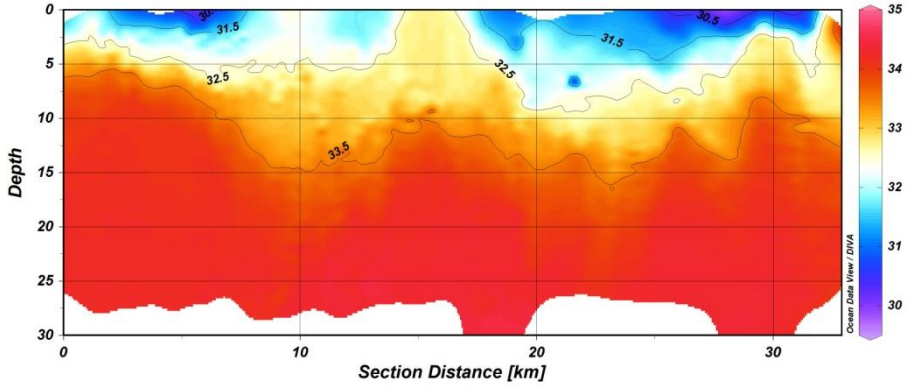
Temperature





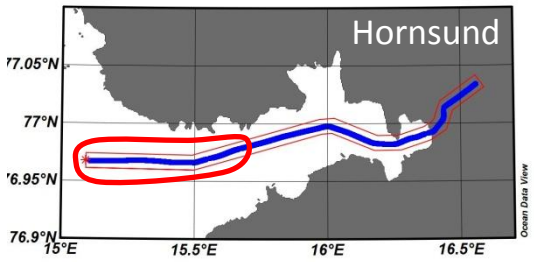
Salinity

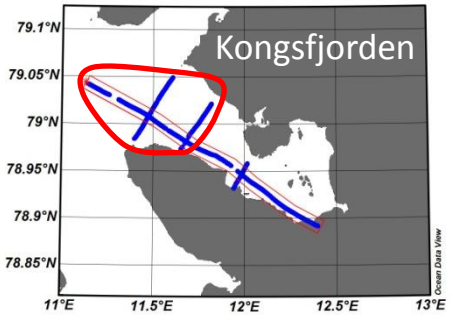




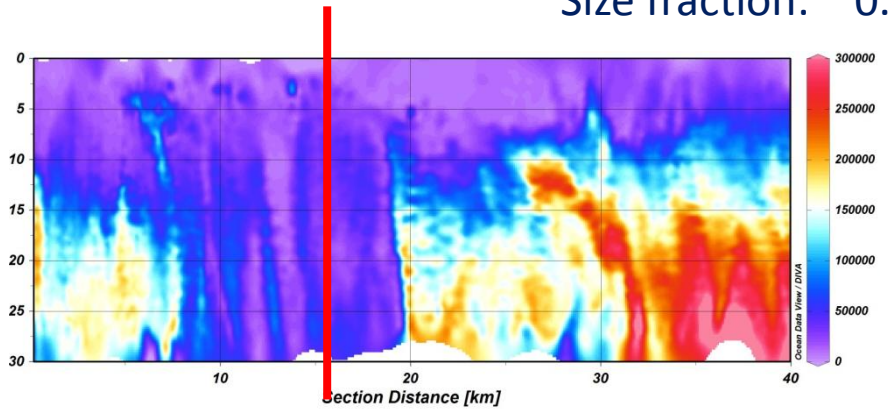
IO PAN data

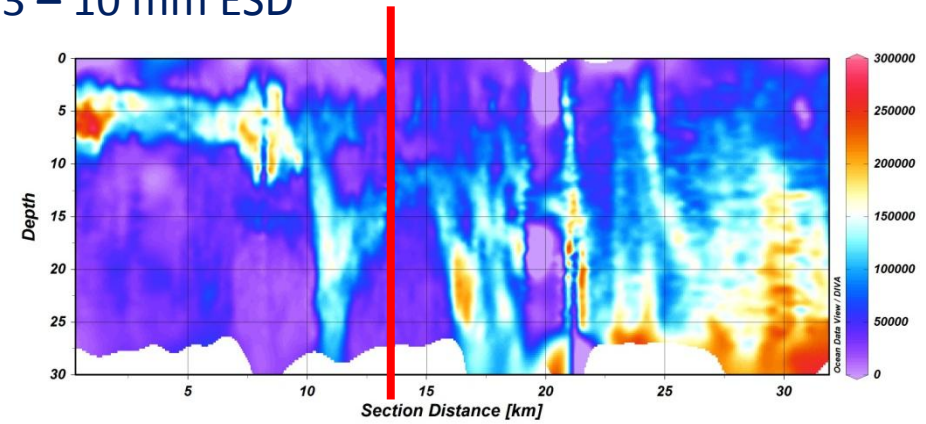
Earlier studies 2013

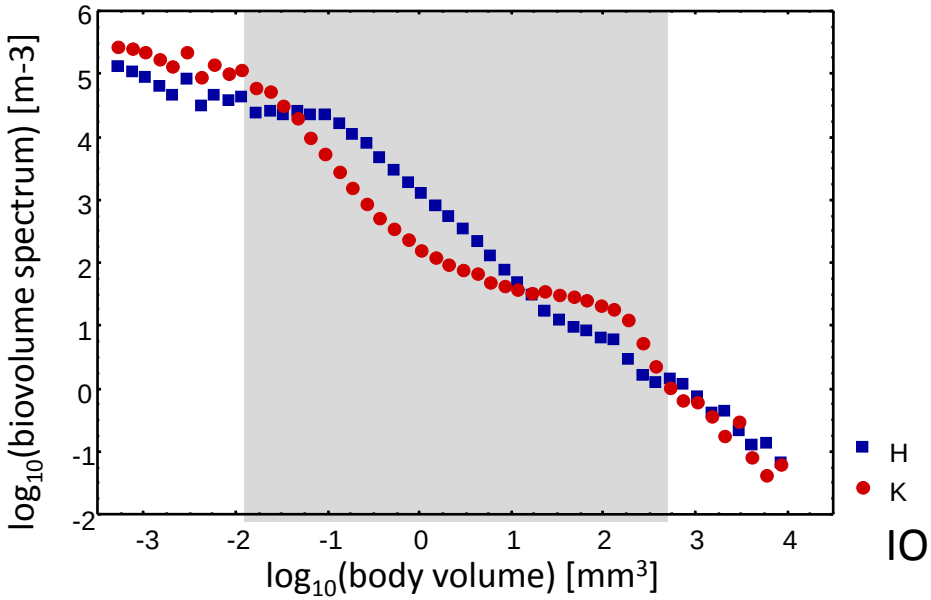




Size fraction: 0.3 – 10 mm ESD







$H = 2.98 - 1.11x$

($R^2 = 0.98$, $p<0.001$)

$K = 2.69 - 0.89x$

($R^2 = 0.91$, $p<0.001$)

IO PAN data

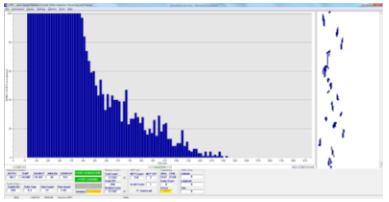
Methods

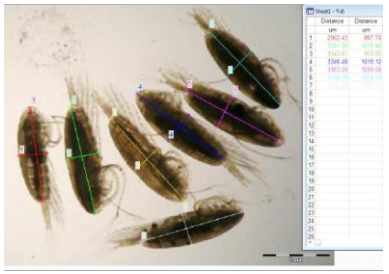
LOPC
0.1 – 35 mm

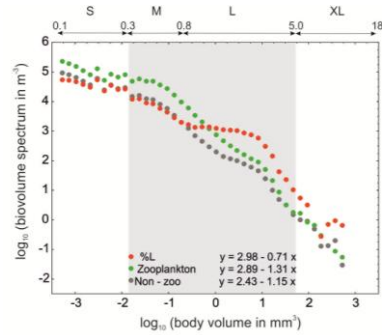
MPS
0.18 mm

WP2
0.06 mm

Size spectra
Individual/community level







Working Plan & Activities in 2014

Sampling :

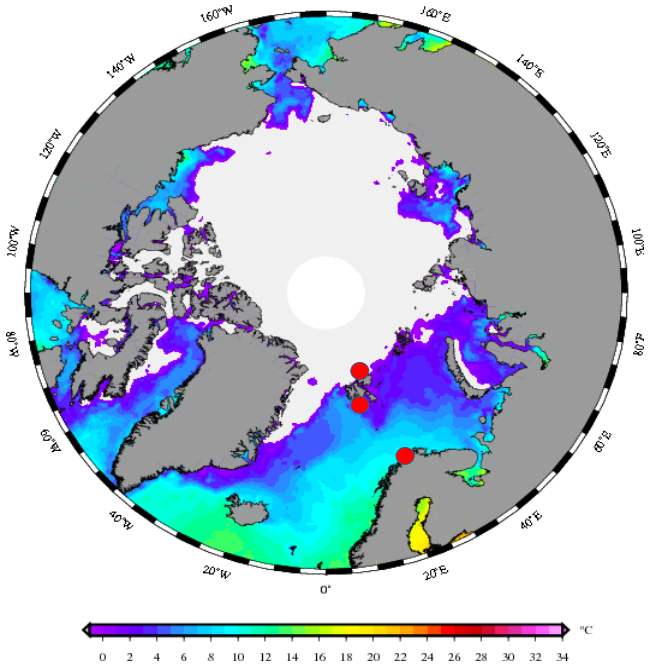
Summer 2014

• four differnt localities
along the temperature gradient:

1. Tromsø
2. Hornsund
3. Kongsfjorden
4. Rijpfjorden

• at least three stations within each fjord

• stratified vertical profiles of:
-> net samples
-> LOPC – CTD – F platform
-> water samples: *Chl_a*



Analyses :

- Lab evaluation of community composition and measurements of species and developmental stages
- Size spectra of plankton community

Tasks and Deliverables

- **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.

- **Deliverable 1**: Manuscript of a paper on body size distribution 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
- **Deliverable 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.