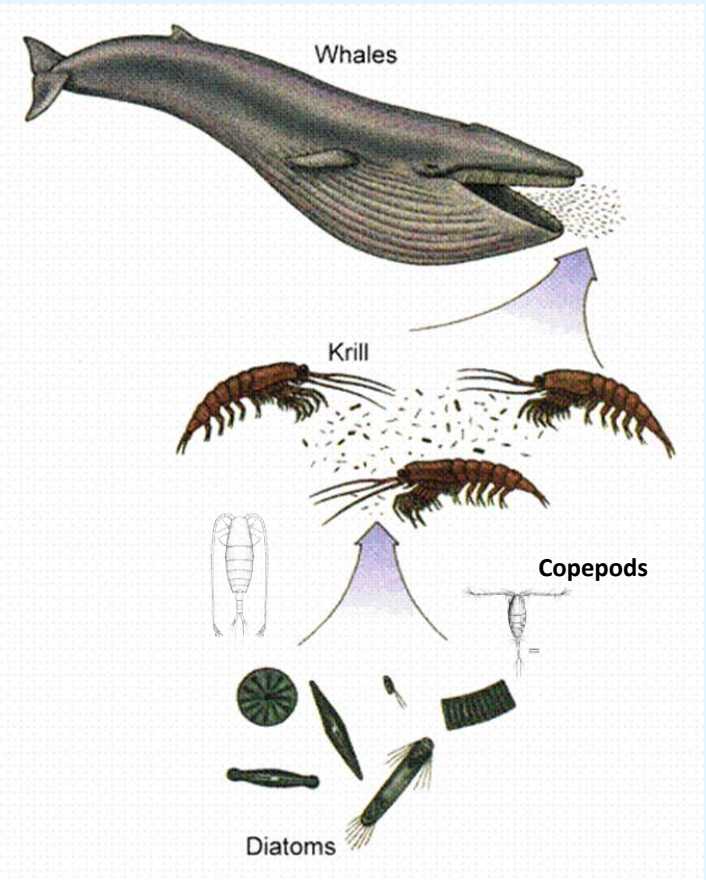


Insights on relationship between distribution of different plankton size fractions along Isfjorden (Spitsbergen) environmental gradients



Katarzyna Błachowiak-Samołyk, Anna Kubiszyn, Sławomir Sagan, Józef Wiktor,
Rafał Boehnke, Emilia Trudnowska

Plankton: NOT attractive, NOT charismatic, even not commercially important as fish but... the basis of marine ecosystem food chain



Motivation:

Increased contribution of small sized plankton taxa - one of negative consequences of global warming.

What is the state in the largest, but scarcely described Spitsbergen fjord (Isfjorden)?



http://blueplanetsociety.blogspot.no/2015_03_01_archive.html

PicMac

Is size so crucial? - complex examination of plankton size structure in the warming European Arctic

Aims:

1. to provide complex examination of plankton from pico- through nano-, micro-, meso- to macroplankton
2. to verify a hypothesis about elongation of Arctic food web (by heterotrophic ciliates and dinoflagellates) within plankton communities



Plankton - body-sized classification

Picoplankton $<3 \mu\text{m}$



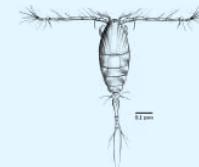
Nanoplankton 3-20 μm :

- autotrophic
- heterotrophic



Microplankton $>20 \mu\text{m}$:

- autotrophic
- heterotrophic



Mesozooplankton $>180 \mu\text{m}$



High resolution - automatic - simultaneous measurements of size structure & CTD & chlorophyll fluorescence

LISST

Laser In Situ Scattering and Transmissometry
1 - 250 μm
Sizes & volume ($\mu\text{L/L}$)
Particle size distribution $\rightarrow \text{mm}^3/\text{m}^3$



LOPC

Laser Optical Plankton Counter
100 μm - 3.5 cm
Sizes & counts (ind./m^3)
Abundance and size distribution $\rightarrow \text{mm}^3/\text{m}^3$



LISST?

JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 115, C08024, doi:10.1029/2009JC005930, 2010

Measurements and characterization of particle size distributions in coastal waters

R. A. Reynolds,¹ D. Stramski,¹ V. M. Wright,¹ and S. B. Woźniak²

Received 19 October 2009; revised 26 March 2010; accepted 16 April 2010; published 25 August 2010.

Harmful Algae 7 (2008) 808–816



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Harmful Algae

journal homepage: www.elsevier.com/locate/hal

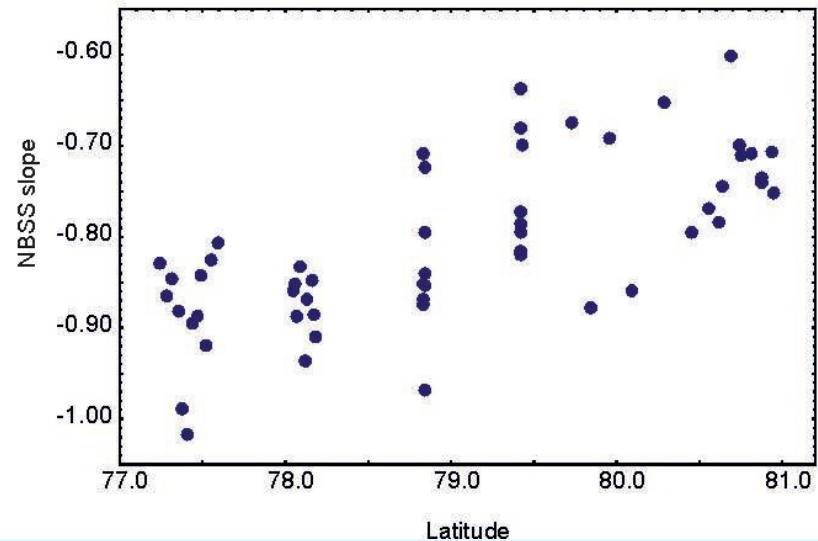
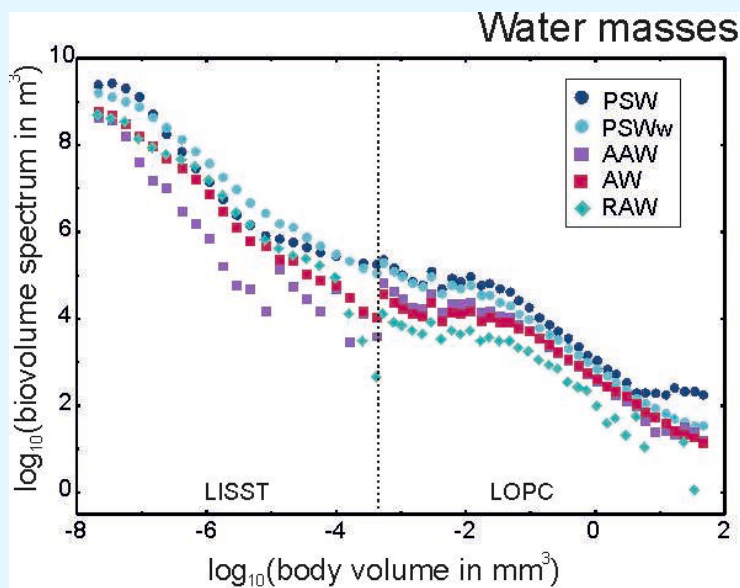
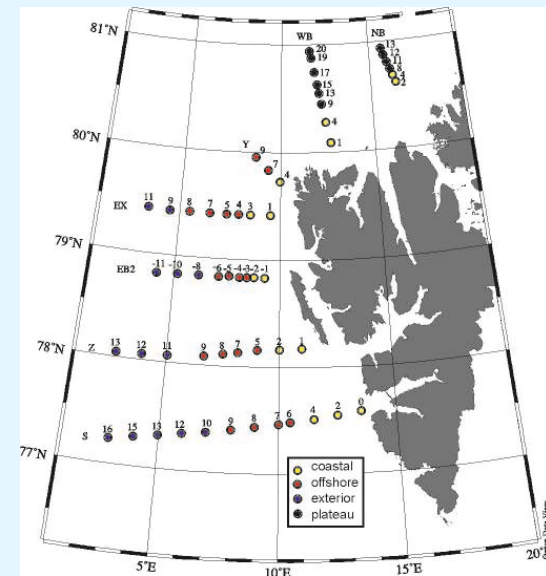


High-resolution spatio-temporal distribution of a coastal phytoplankton bloom using laser in situ scattering and transmissometry (LISST)

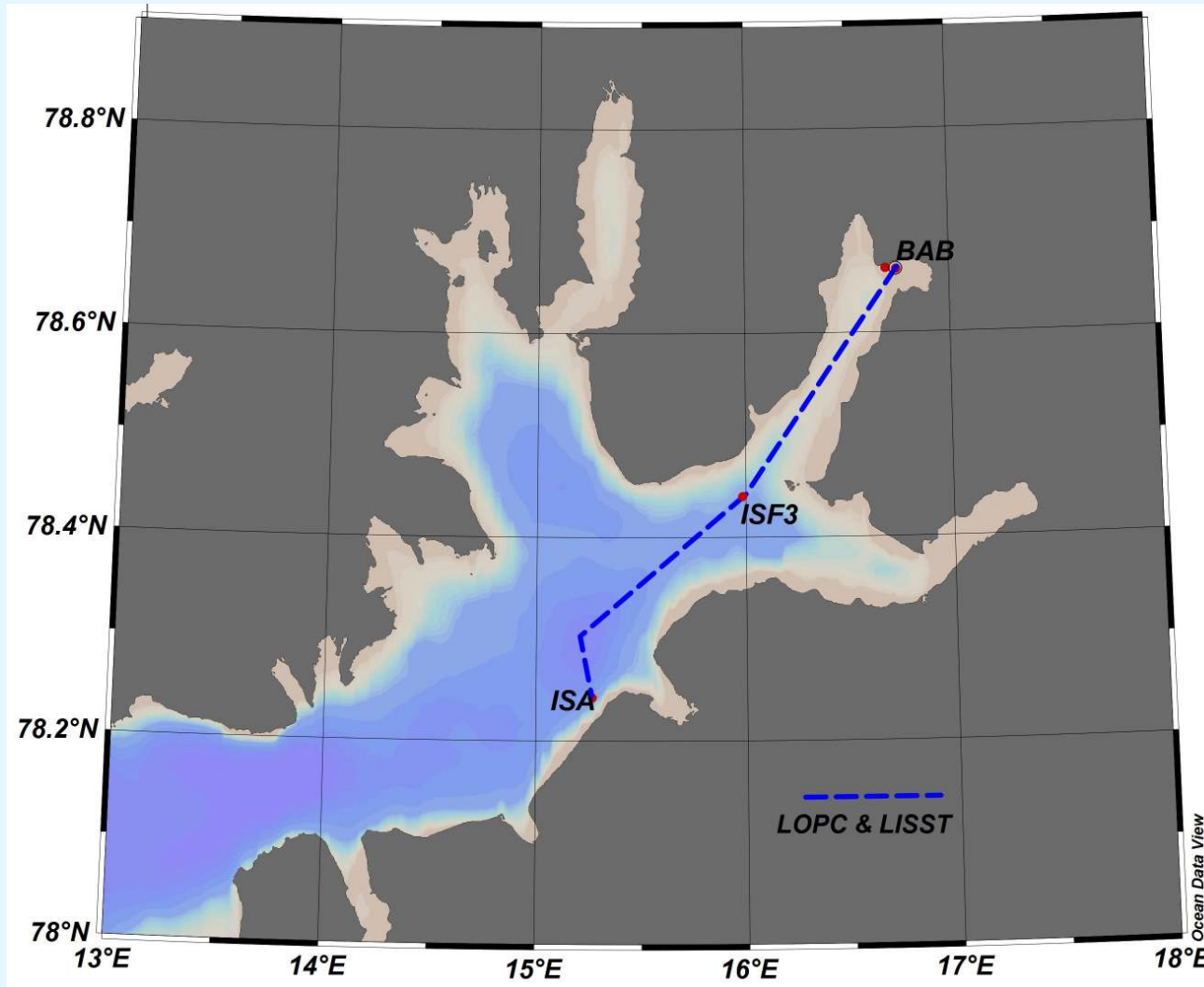
S. Anglès^{a,*}, A. Jordi^b, E. Garcés^a, M. Masó^a, G. Basterretxea^c

Latitudinal and vertical gradients in structure and distribution of size-fractionated plankton in the eastern Fram Strait region

Trudnowska E., Sagan S., Basedow S., Zhou M., Blachowiak-Samolyk K. (in review *Limnology & Oceanography*)



Transect of plankton measurements: from Billefjorden (st. BAB) to Adventfjorden (st. ISA)



Summer measurements

4 years (2013-2016):

- Chlorophyll a concentrations;
- Niskin bottles for nano- and microplanktonic protists (taxonomic composition and abundance);
- Net samples for mesozooplankton enumeration and taxonomy;
- Transect Laser Optical Plankton Counter (LOPC- CTD – Fluorometer) continuous measurements along transect.

2 years (2015-2016):

- Optical - a combination of Laser In-Situ Scattering, Transmissometry (LISST-100x) and Laser Optical Plankton Counter (LOPC) measurements for wide particles/ plankton-size structure (between 1 μm to 10 mm).

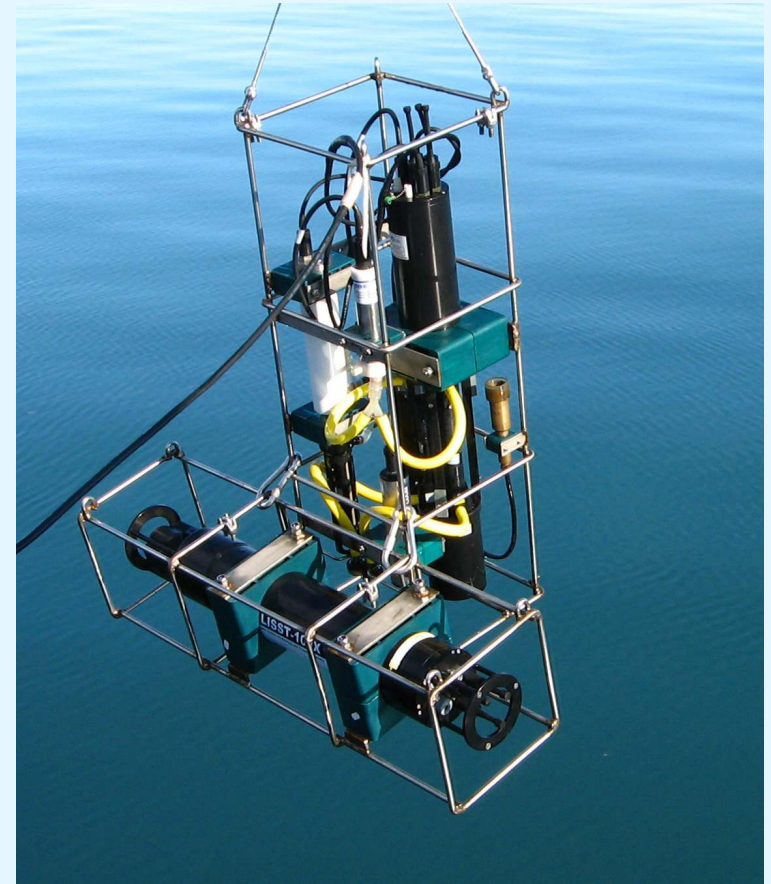


Traditional sampling: net/Niskin bottles



Protists, chlorophyll a sampling
at 3 stations: BAB, ISF3 and ISA

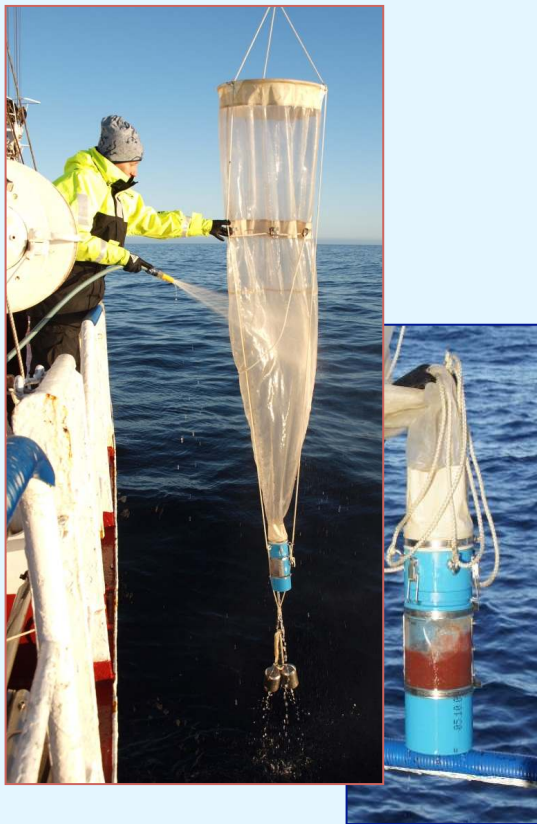
Innovative: LISST



vs.

Continuous measurements in the upper 60
m from Billefjorden (BAB) to Adventfjorden
(ISA) along 60 km transect from BAB to ISA

Traditional: plankton net sampling



Zooplankton sampling
at 3 stations: BAB, ISF3 and ISA

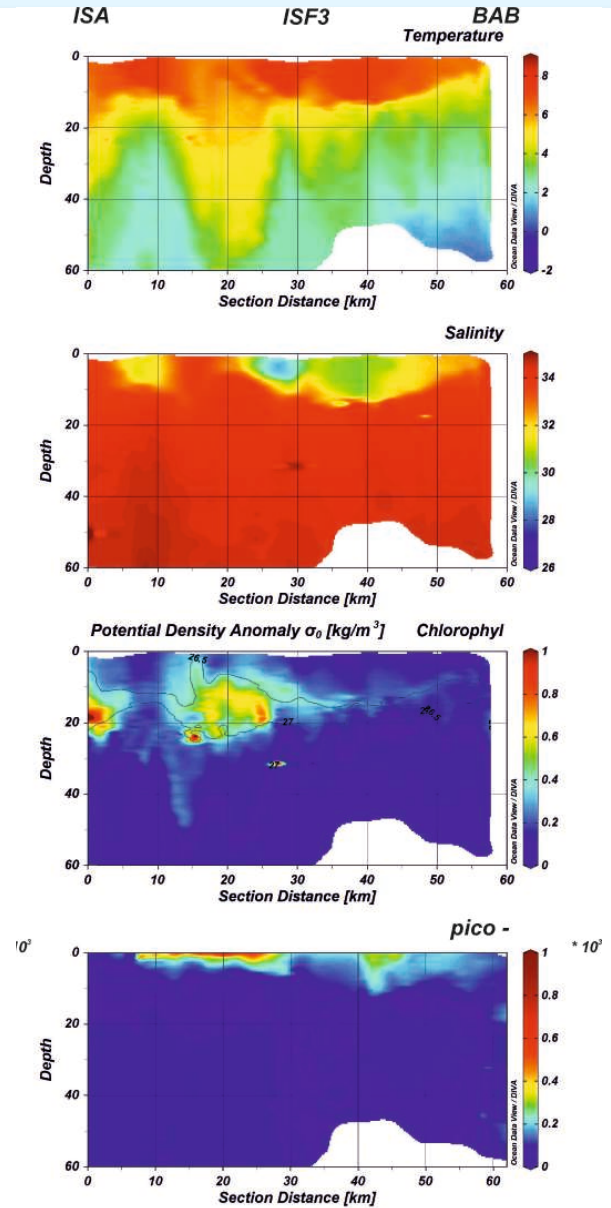
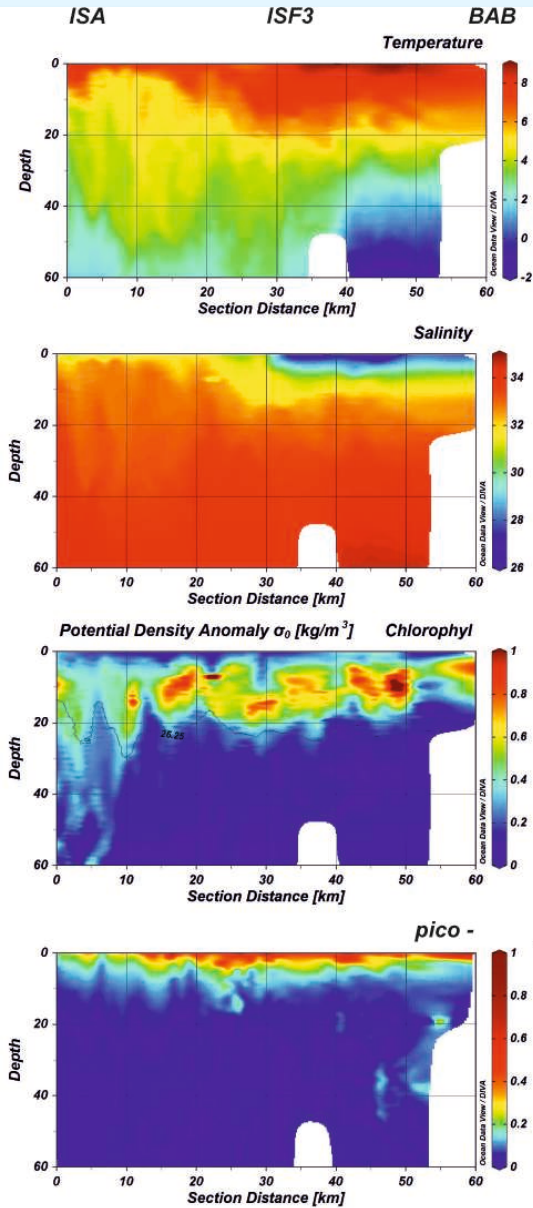
Innovative: LOPC



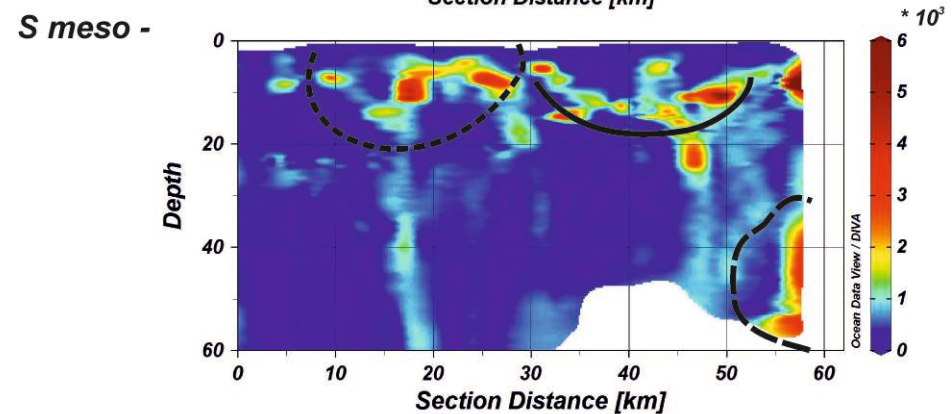
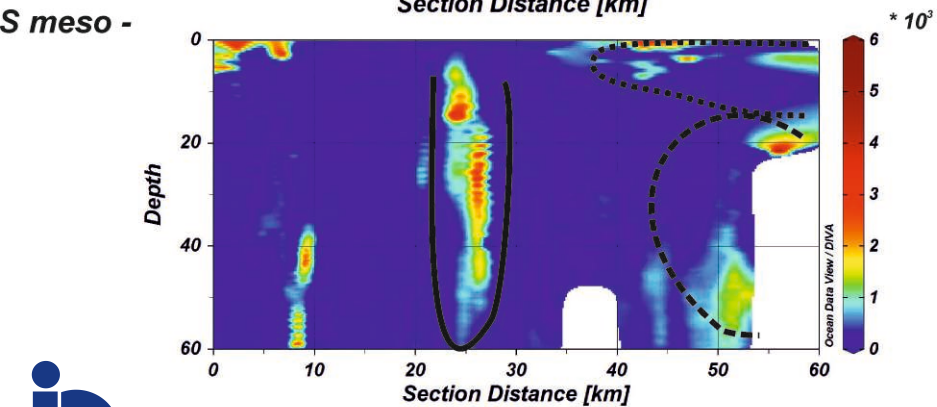
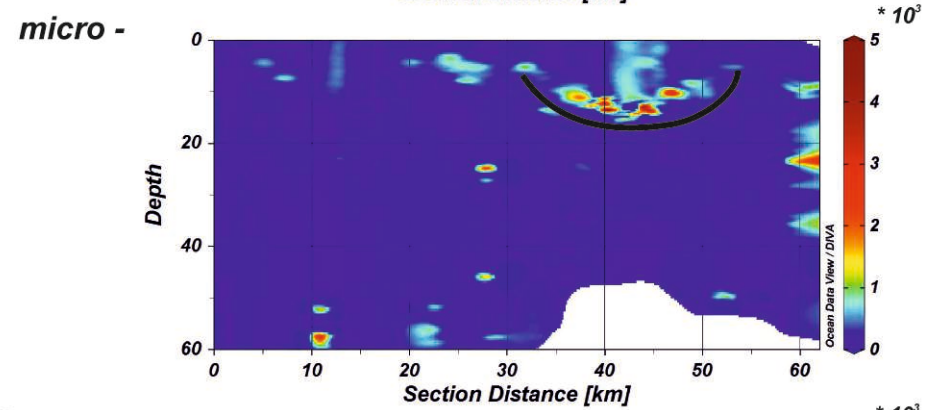
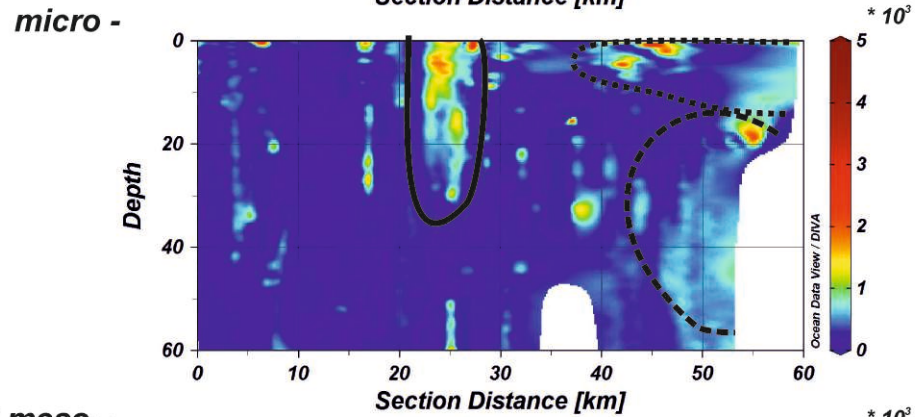
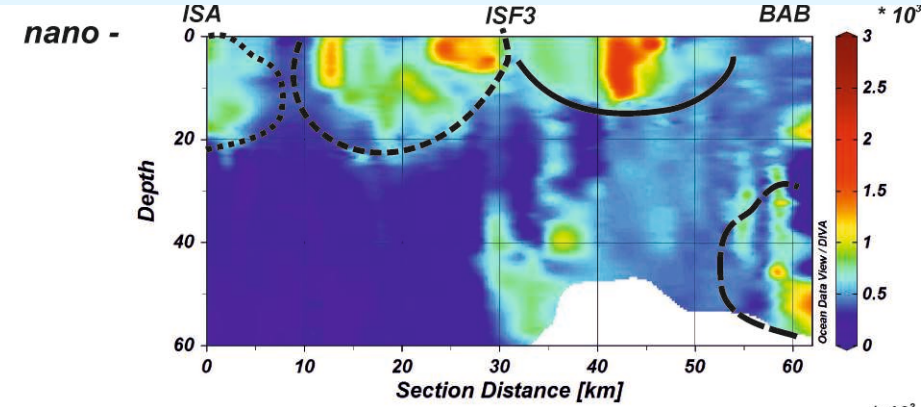
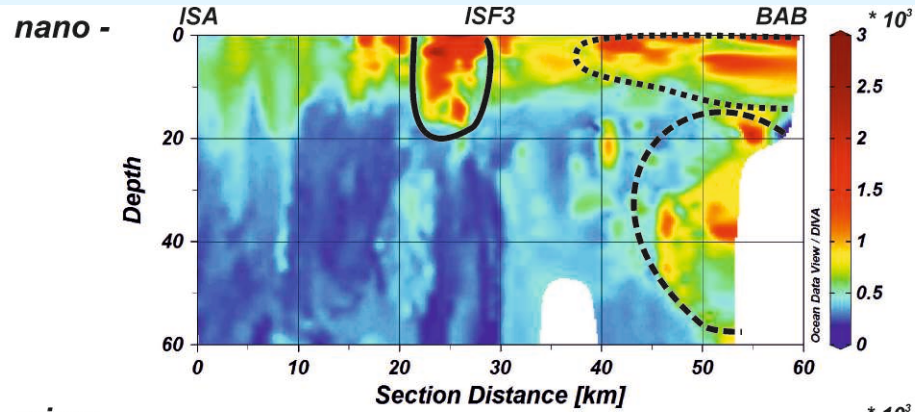
VS.

LOPC- CTD – Fluorometer
Continuous measurements in the upper 60 m
from Billefjorden (BAB) to Adventfjorden (ISA)
along 60 km transect from BAB to ISA

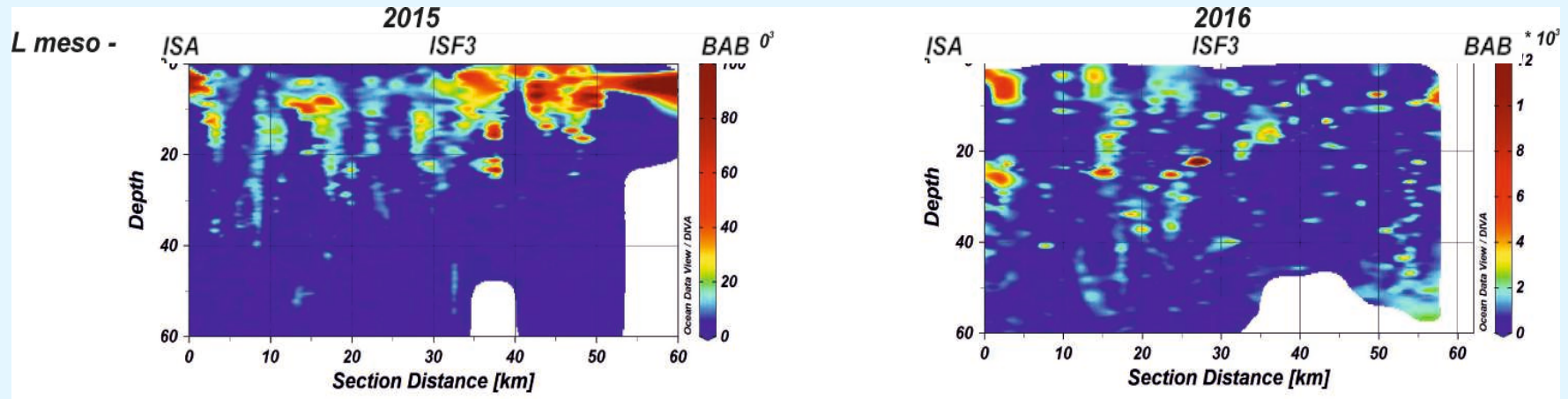
Environmental conditions



Vertical distribution of plankton size fractions in biovolumes ($\text{mm}^3 \text{m}^{-3}$) (2015-2016)



Vertical distribution of large zooplankton fraction in biovolumes ($\text{mm}^3 \text{m}^{-3}$) (2015-2016)



Vol. 560: 1–18, 2016
doi: 10.3354/meps11925

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Published November 24

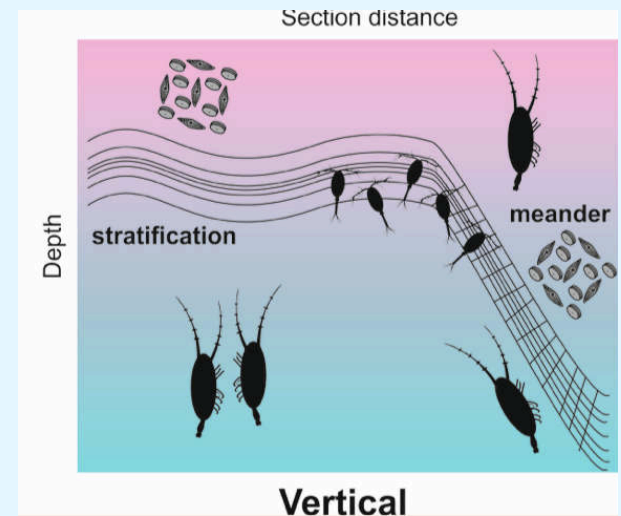


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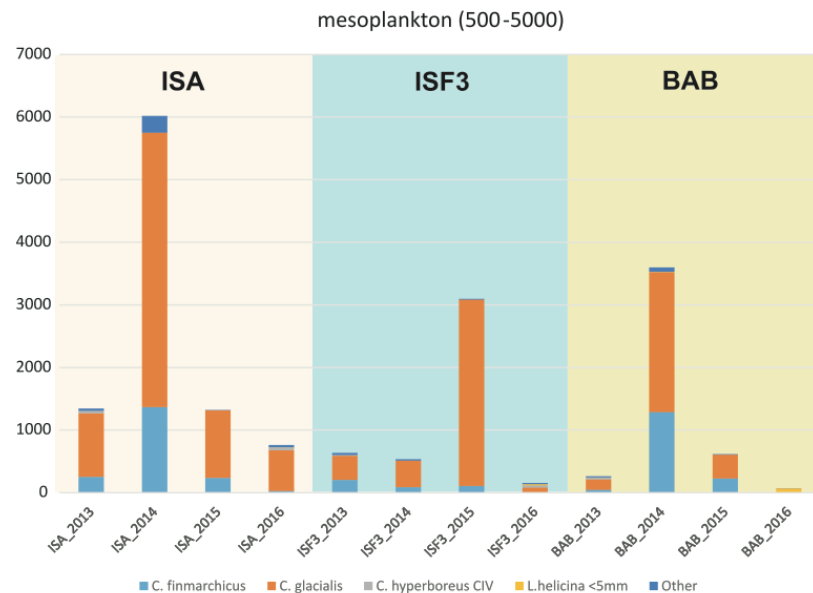
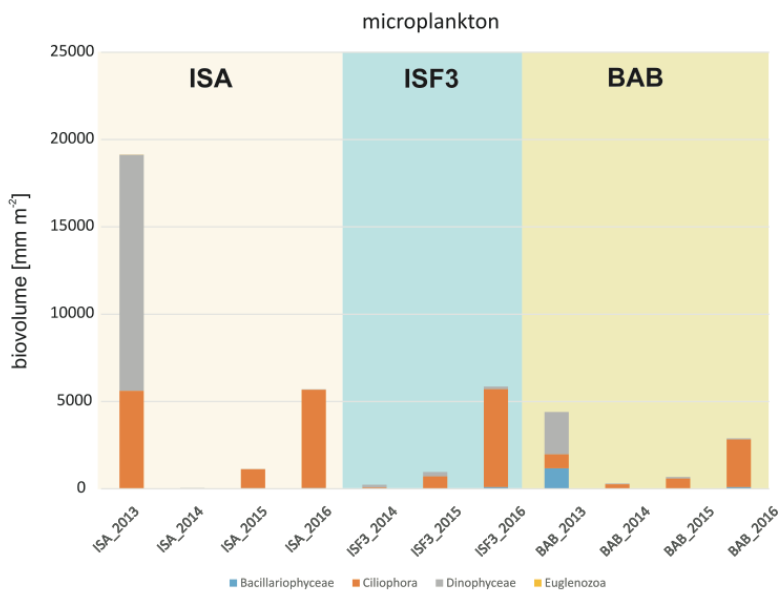
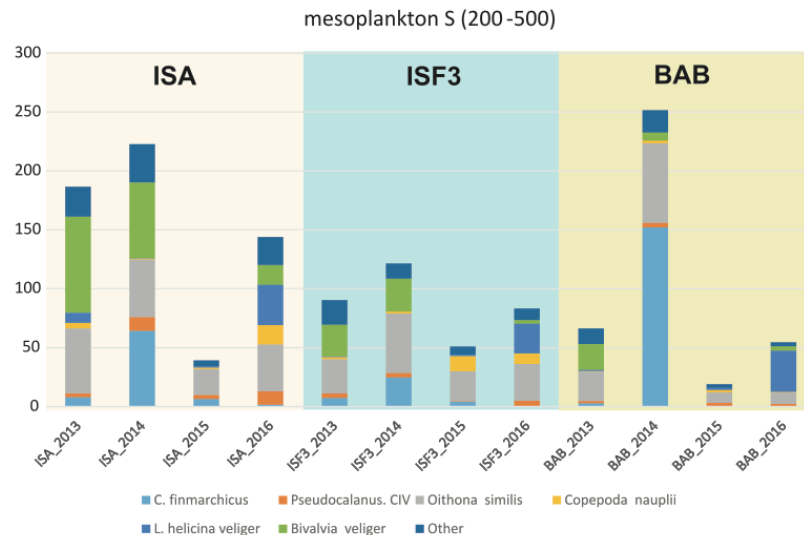
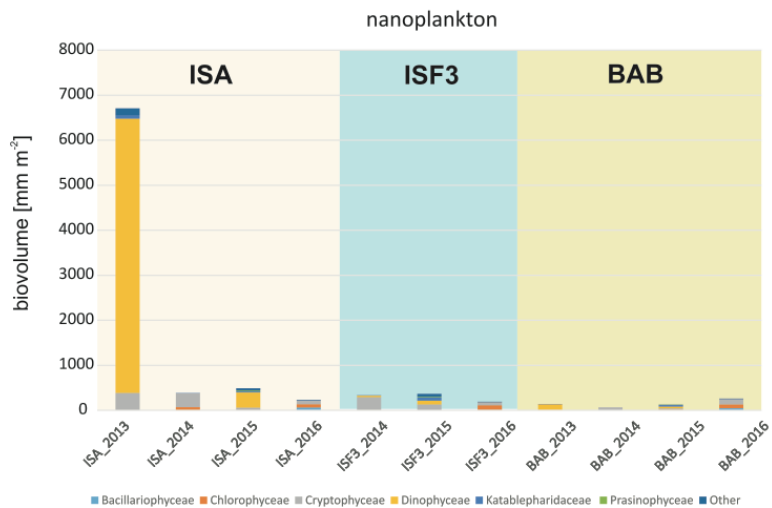
Plankton patchiness in the Polar Front region of the West Spitsbergen Shelf

Emilia Trudnowska*, Marta Gluchowska, Agnieszka Beszczynska-Möller,
Katarzyna Blachowiak-Samolyk, Sławomir Kwasniewski

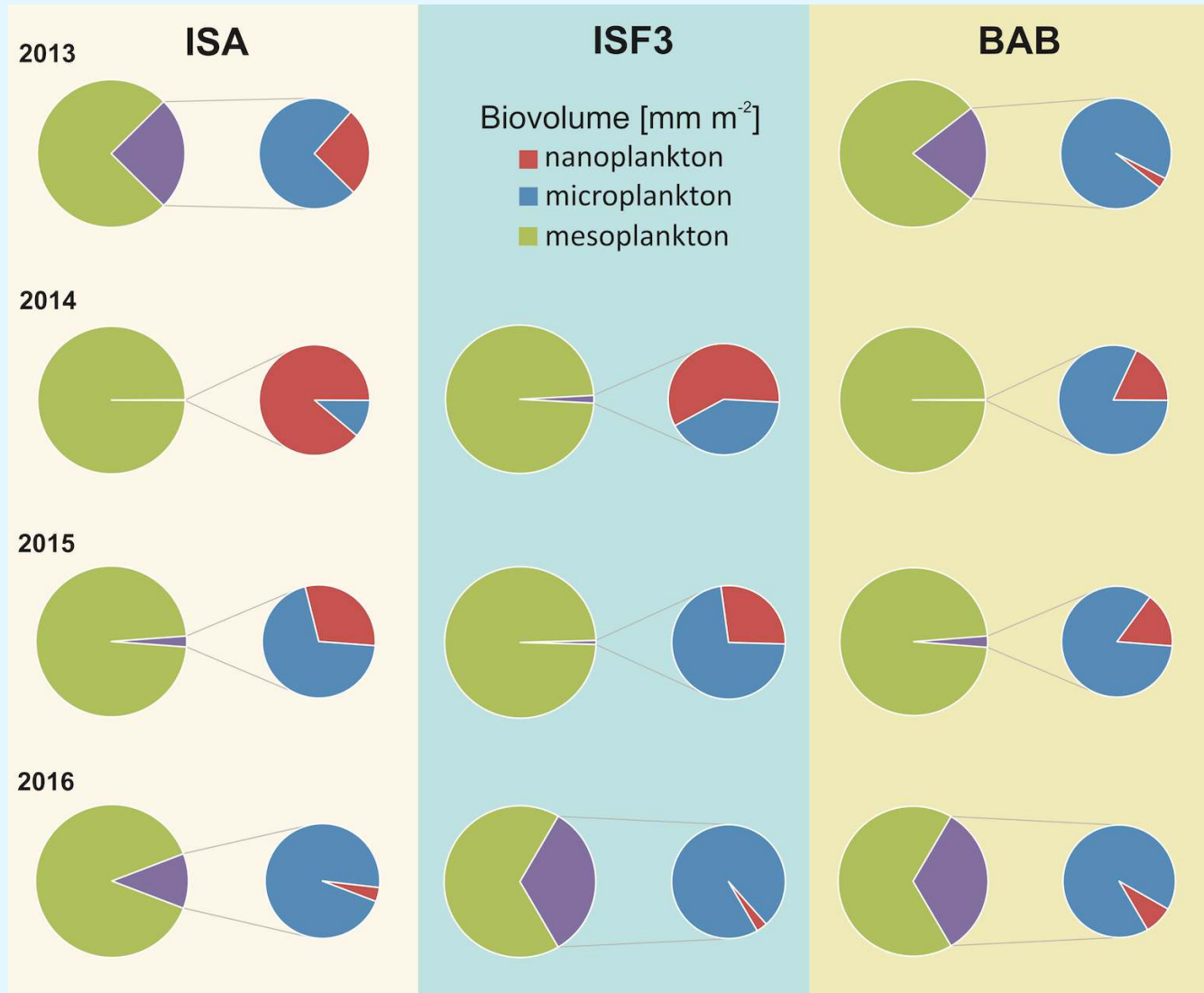
Institute of Oceanology Polish Academy of Sciences, 81-712 Sopot, Poland



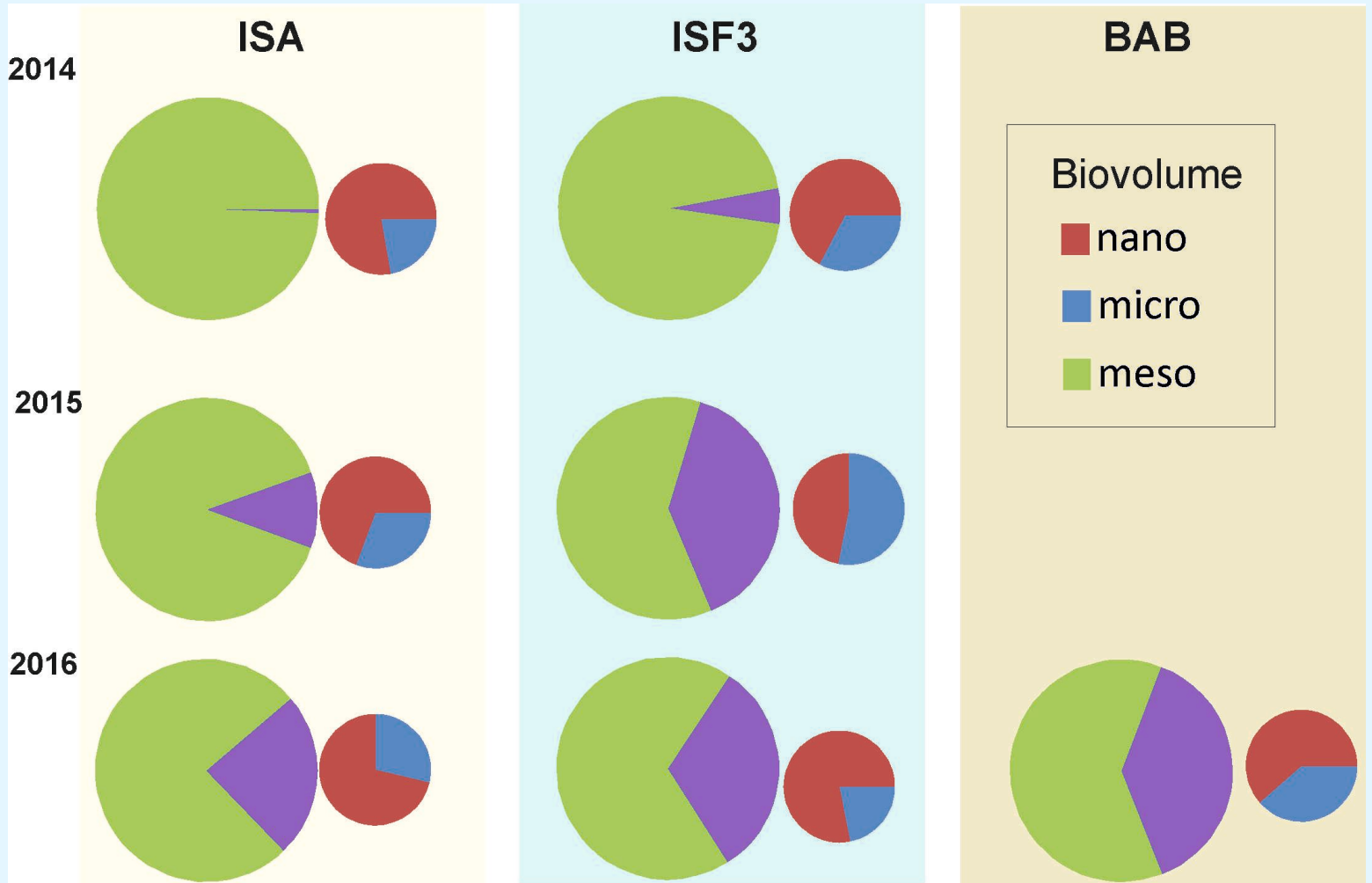
Biovolumes (mm³ m⁻³) from microscopic analysis



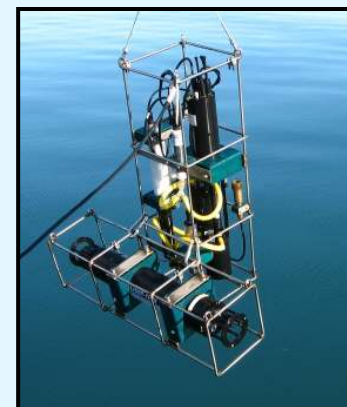
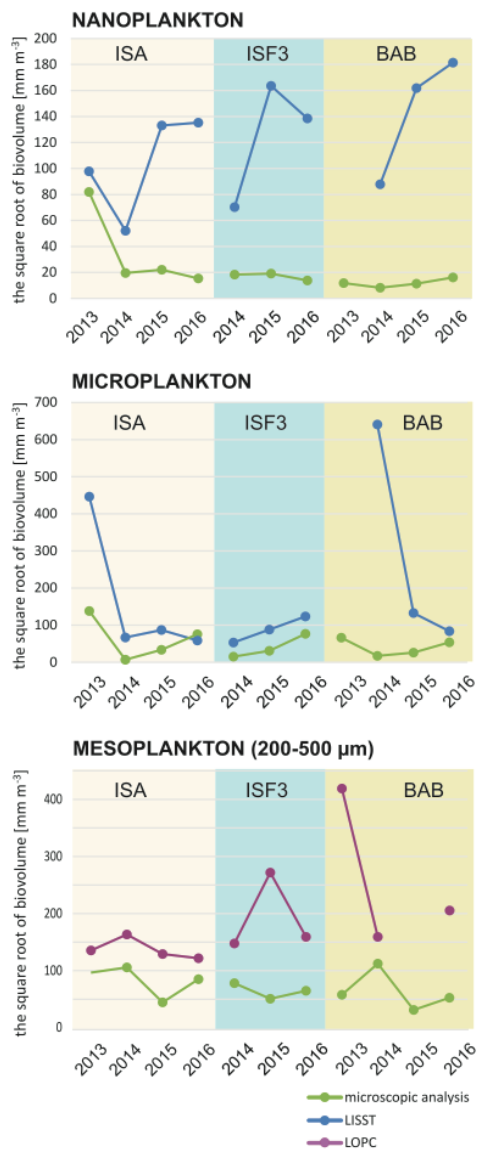
Share (%) of protists and mesozooplankton in total plankton biovolume ($\text{mm}^3 \text{m}^{-3}$) traditional methods



Share (%) of protists and mesozooplankton in total plankton biovolume ($\text{mm}^3 \text{m}^{-3}$) innovative methods



Traditional vs. optical methods - comparison (biovolumes, $\text{mm}^3 \text{m}^{-3}$)



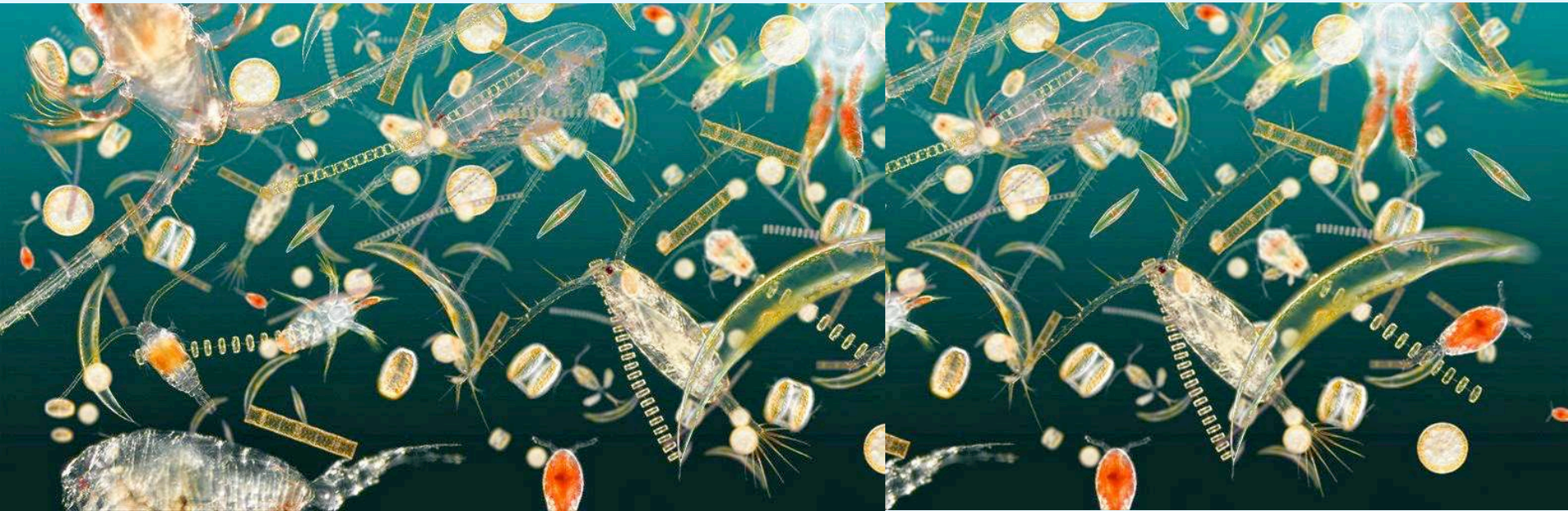
Vs.



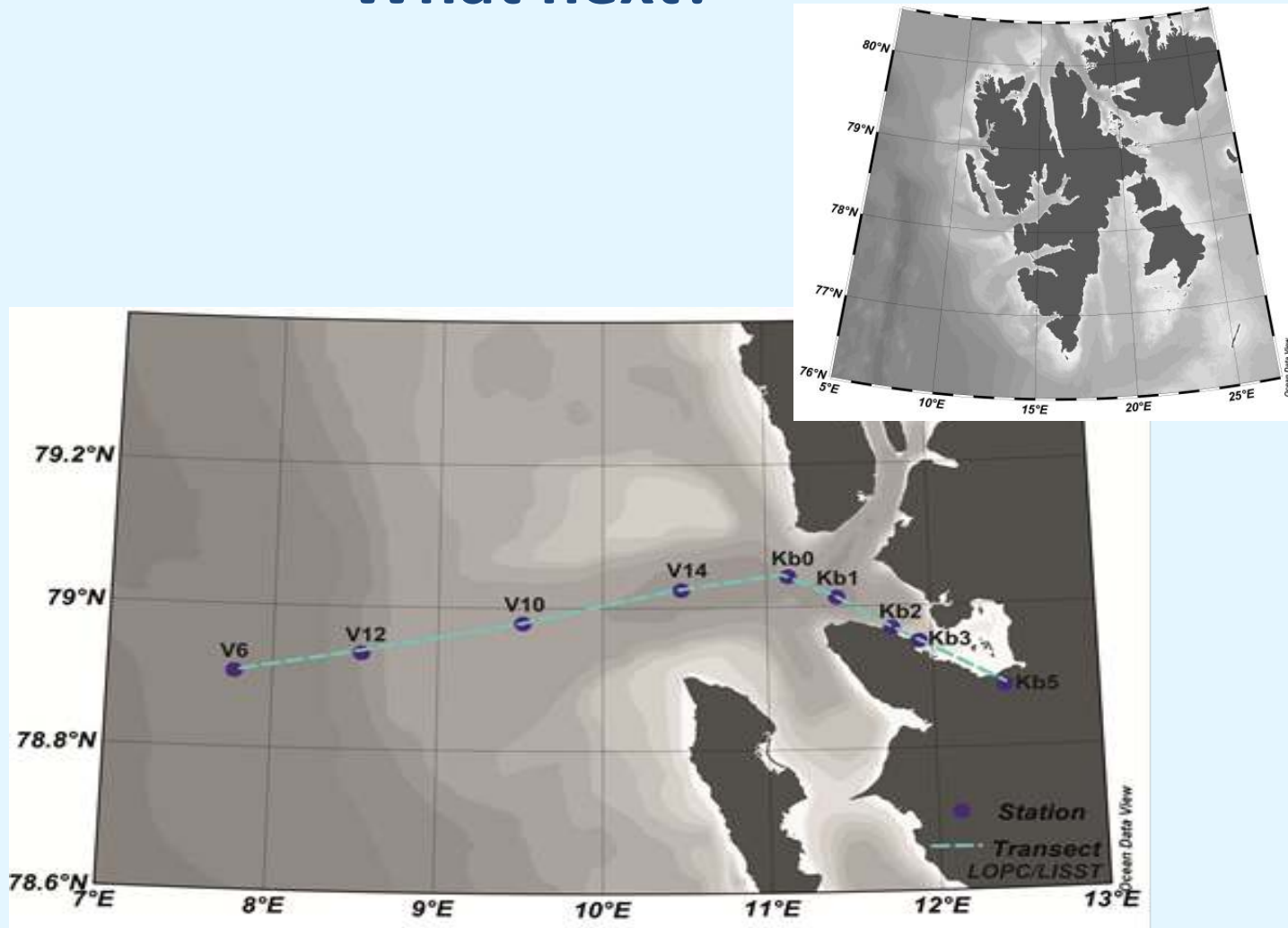
Vs.

Linking traditional with innovative, high-resolution measurements - a step towards more complex picture of relationships between different plankton size fractions.

Spatial distribution and qualitative/quantitative structure of plankton community differed along the environmental gradient of Isfjorden (glacier run-off vs. advection of Atlantic waters).

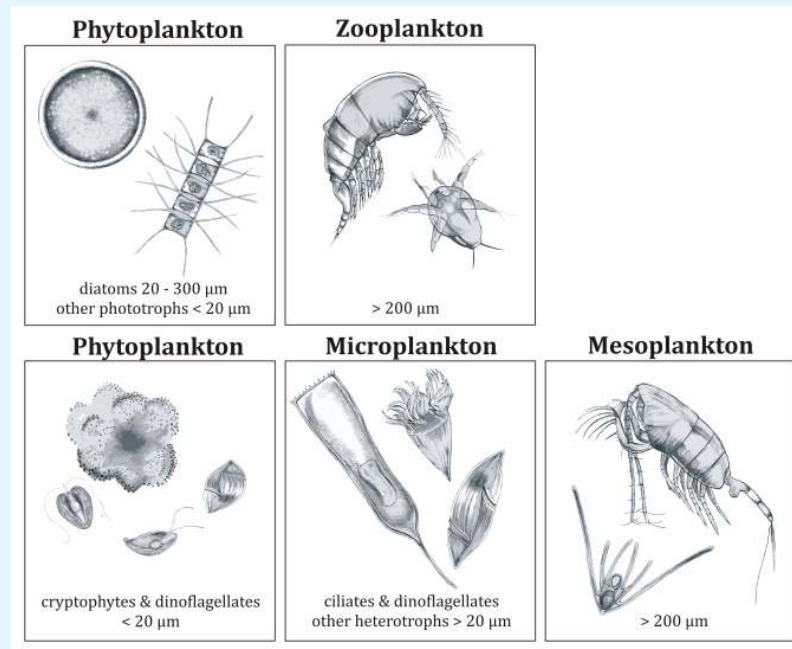


What next?



Summer Kongsfjorden measurements (2014 & 2015):

- Chlorophyll a concentrations
- Niskin bottles for nano- and microplanktonic protists (taxonomic composition and abundance)
- Net samples for mesozooplankton enumeration and taxonomy
- LISST/LOPC- CTD-Fluorometer continuous measurements along transect.
- **Stable isotopes of nitrogen ($\delta^{15}\text{N}$) and carbon ($\delta^{13}\text{C}$)**
- **Picoplankton fraction (autofluorescence, DAPI)**
- **Nutrients**



Acknowledgements:

Polish National Science Centre (PicMac project DEC 2013/09/B/NZ8/03365)

Polish-Norwegian Research Programme under the Norwegian 849 Financial Mechanism (DWARF project no. Pol-Nor/201992/93/2014)

