DWARF WP4 :Marine Benthic Fauna

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DWARF
POLISH-NORWEGIAN RESEARCH PROGRAMME
Narodowe Centrum Badań i Rozwoju
norway grants

DWARF WP 4:

GOAL: to determine how the size structure of populations and communities of benthic marine invertebrates dwelling at high latitudes will change in response to shifts in environmental conditions.

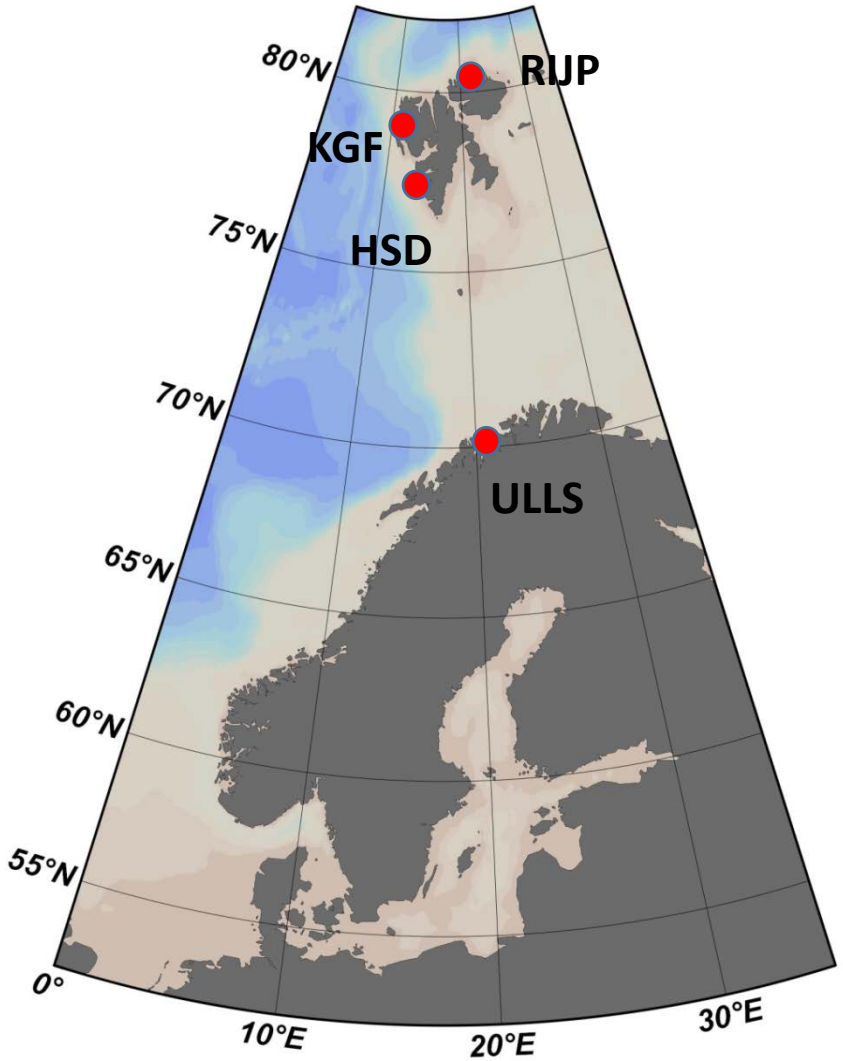
research questions :

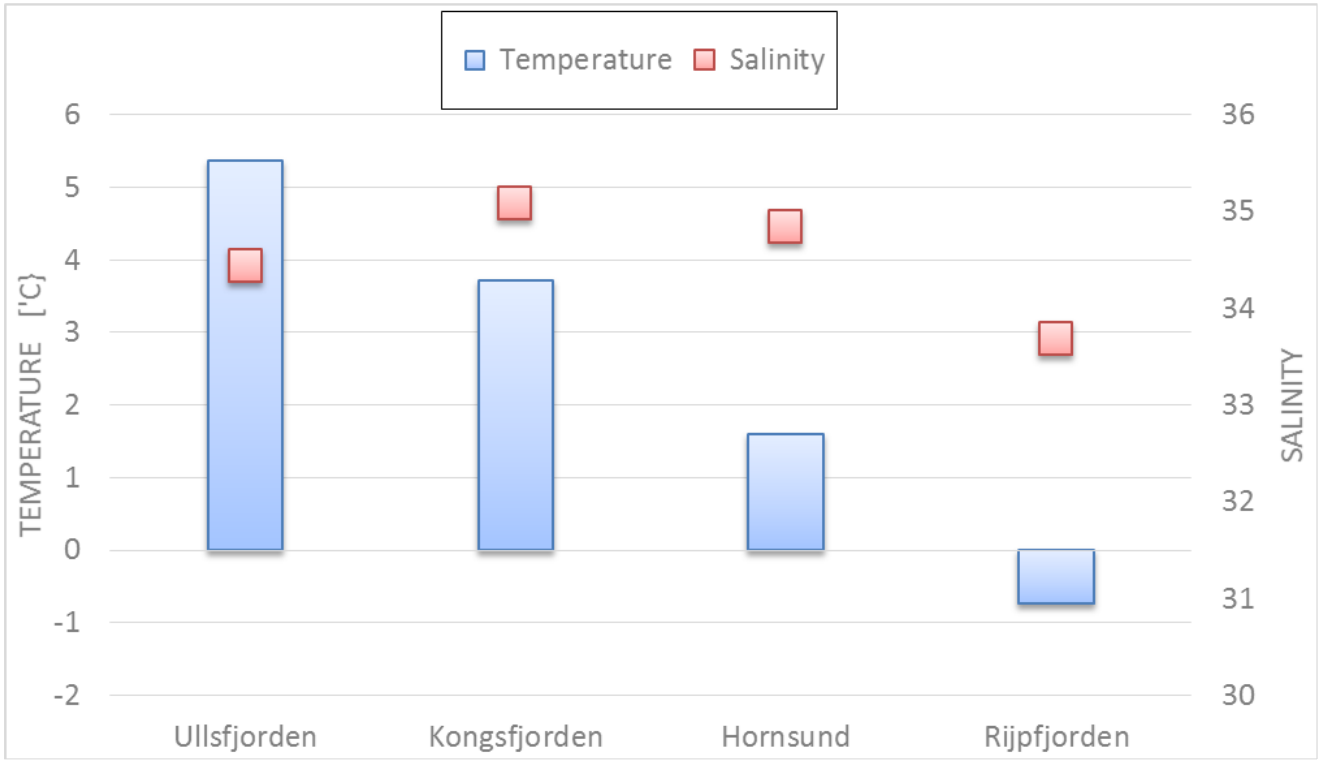
- How does the community size structure change along a gradient of thermal regimes observed off the Norwegian coasts?
- Are changes in size structure documented at community level driven by shifts in species composition (e.g. a shift in dominants towards species of smaller size) or by changes in sizes of individuals of dominant species?
- What are the environmental controls of benthic species size structure?
- What are implications of change in size structure on the functioning of benthic communities (secondary production)?

2 groups in focus: Soft bottom fauna
Hard bottom fauna (Bryozoa)

DWARF WP 4(soft bottom) – SAMPLING:

- In 2014 – Ullsfjorden, Kongfsjorden, Hornsund, Ripfjorden

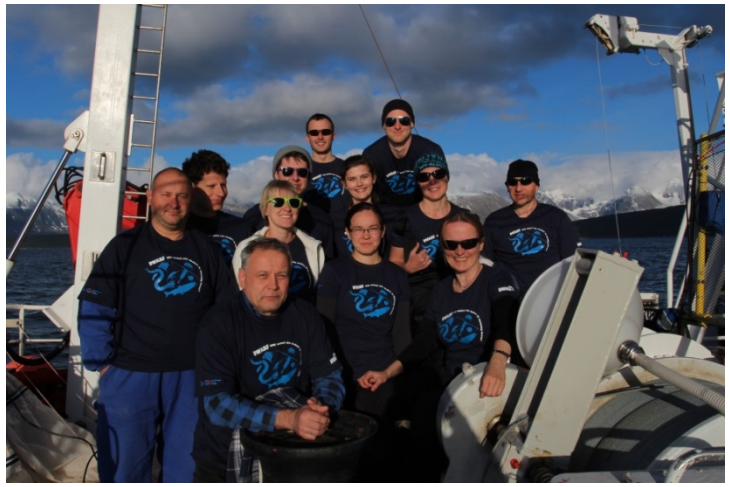




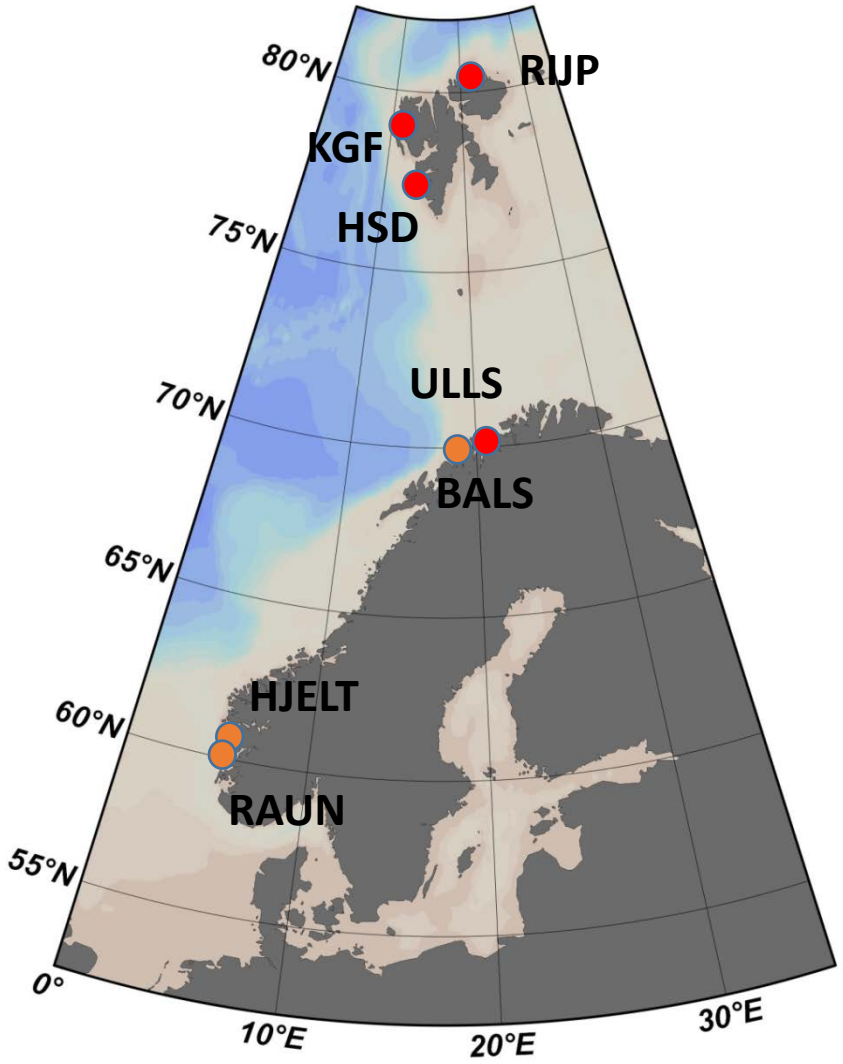
subArctic ‚warm' Arctic ‚cold' Arctic

DWARF WP 4 (soft bottom) – SAMPLING:

3 CRUISES in 2014 : r/v Oceania – June (Ullsfjorden), July (west Spitsbergen), r/v Helmer Hansen – Sept (Ripfjorden)



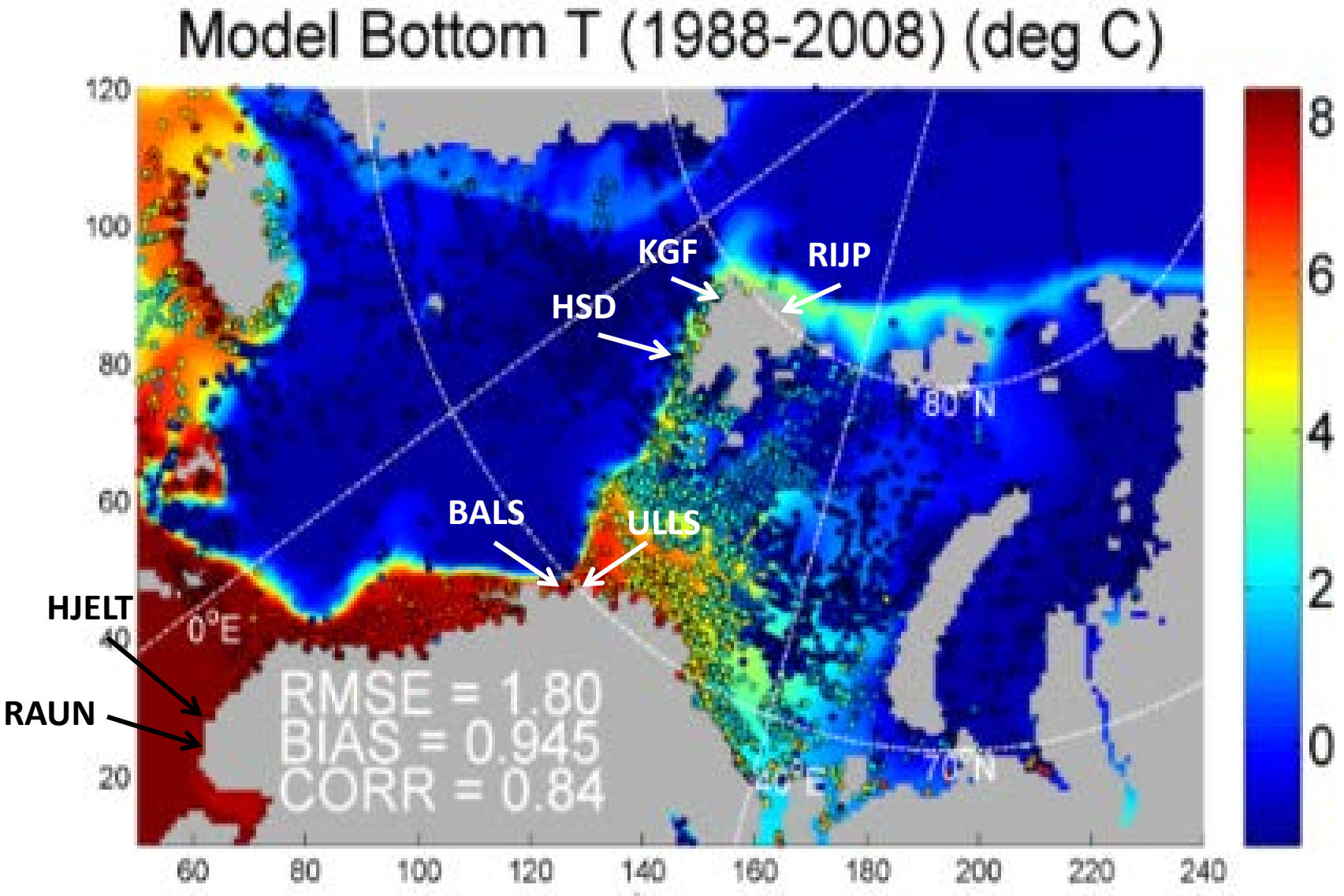
DWARF WP 4 (soft bottom) – SAMPLING:



In 2015:

- Balsfjorden (close to Tromso, but colder than Ullsfjorden)
- Raunefjord, Hjeltefjord (close to Bergen, 60 deg N, expected water temp. - 7-8 °C)

DWARF WP 4 (soft bottom) – SAMPLING:

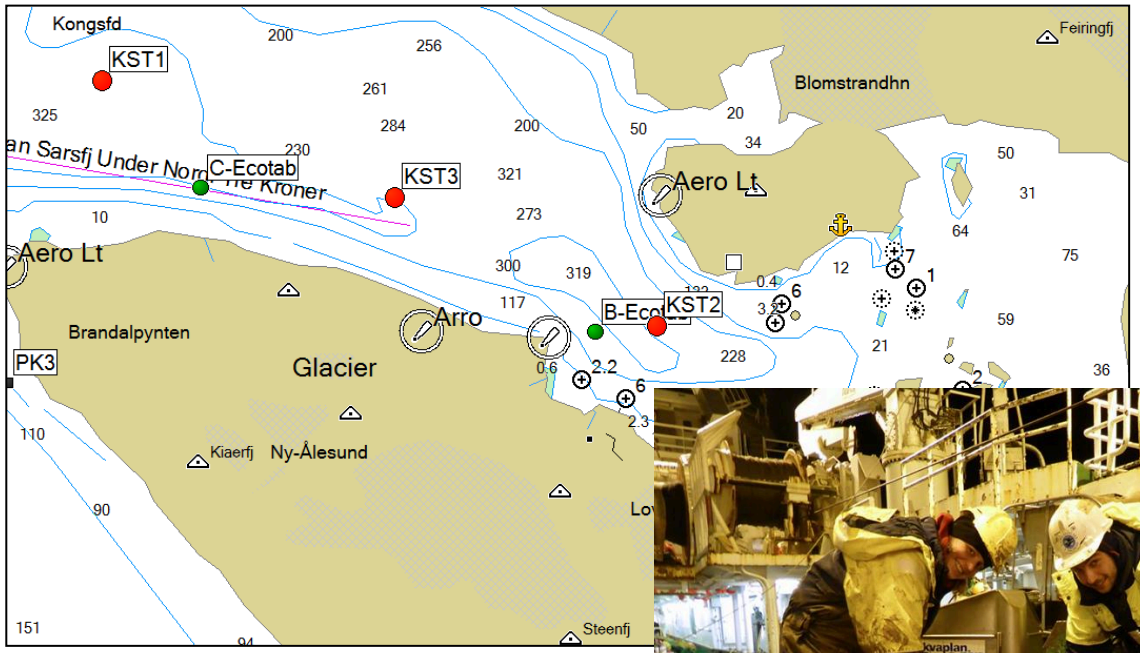


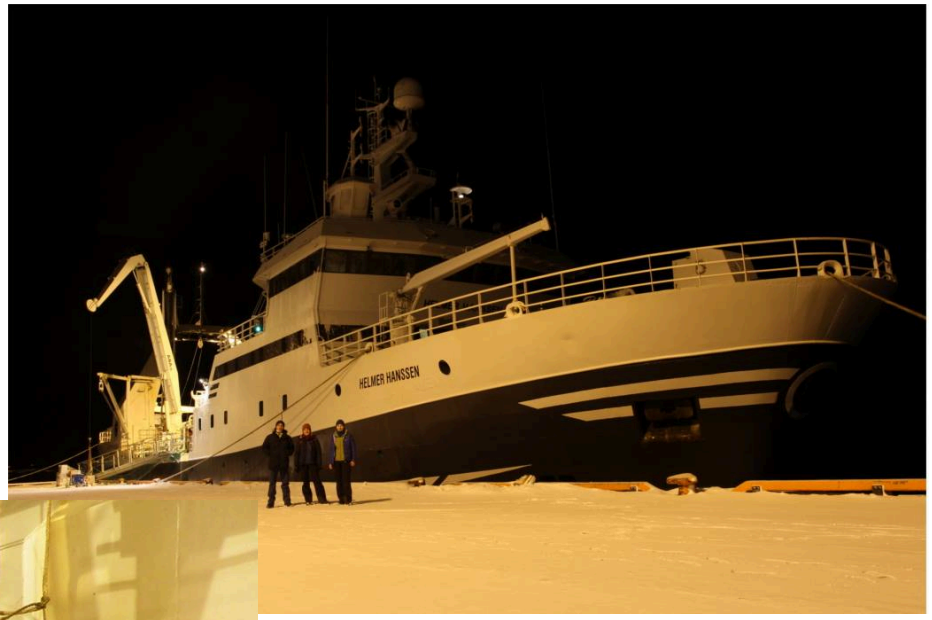
Courtesy of Phil Wallhead (NIVA) and Dag Slagstad (SINTEF)

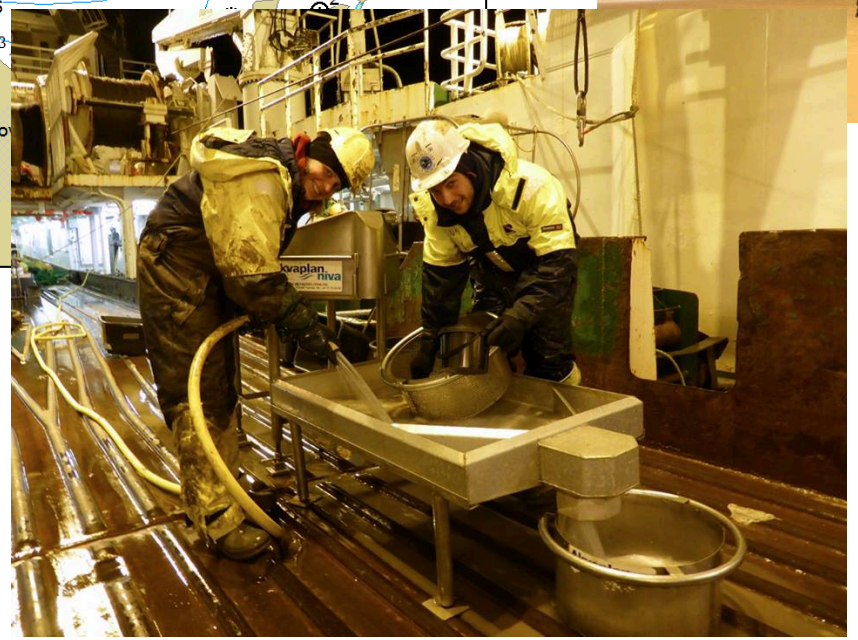
DWARF WP 4 (soft bottom) – SAMPLING:

POLAR NIGHT sampling – January 2015, r/v Helmer Hansen (Kongsfjorden)

Do benthic size structures vary seasonally?







DWARF WP 4 (soft bottom) – Sampling:

SAMPLING: in each fjord – 3-5 stations

ENVIRONMENTAL CONDITIONS

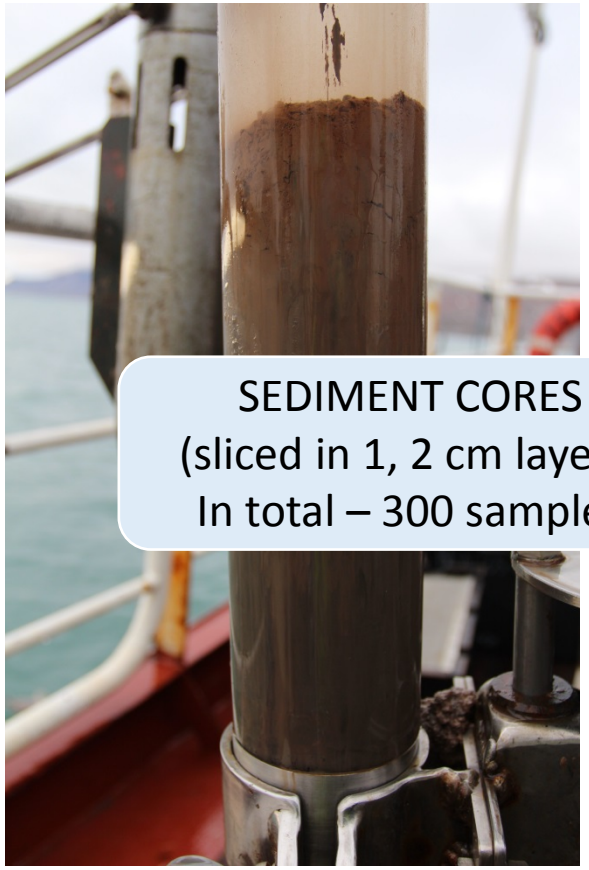
WATER	SALINITY TEMPERATURE
SEDIMENTS	Nemisto corer – 3 cores

BENTHIC COMMUNITY

MEIOFAUNA	A core from box corer 0-5 and 5-10 cm depth
FORAMINIFERA	A core from box corer 0-5 cm depth
MACROFAUNA	Van Veen grab 0.5 mm sieve
‚GIANT NEMATODES’	A Nemisto core 0-5 and 5-10 cm depth

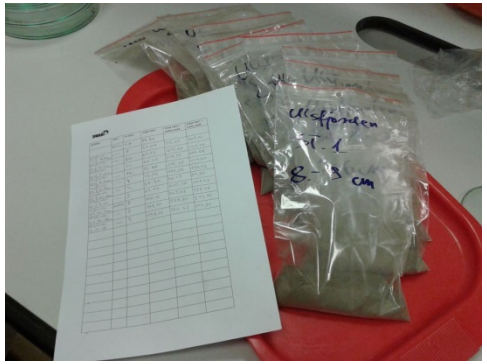
DWARF WP 4 (soft bottom) – sampling/analyses - sediments:

SAMPLING



SEDIMENT CORES
(sliced in 1, 2 cm layers)
In total – 300 samples

SAMPLE PREPARATION
(2014)



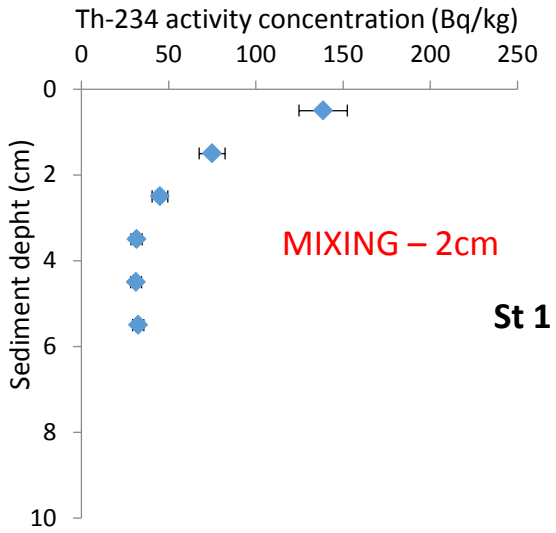
ANALYSES
(2014/2015)

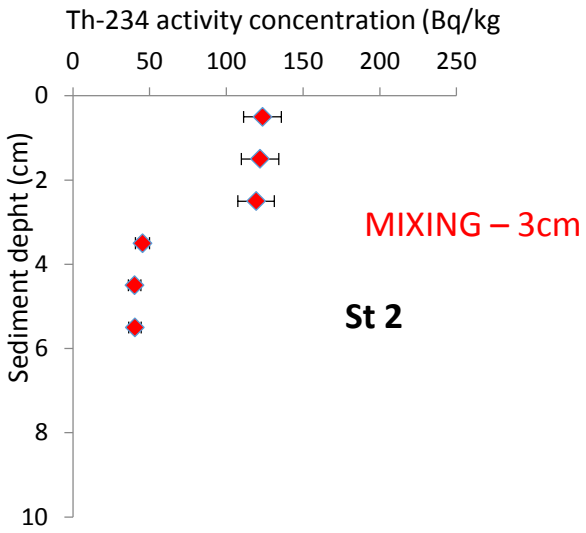
GRAIN SIZE	basic sediment chracteristics
POC	organic matter quantity
delta13C, photosynthetic pigments	organic matter quality
Pb-210, Cs-137	sediment accumulation rate (together with POC) – OM accumulation rate over years
Th-234	Bioturbation

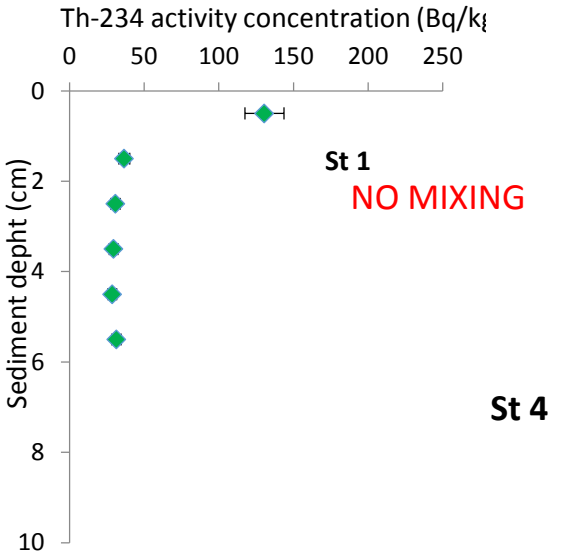
- Analyses of materials collected in 2014 – untill summer 2015
- Analyses of materials collected in summer 2015 – autumn 2015
- Manuscript on sedimentary conditions and organic carbon accumulation in fjords – beginning 2016

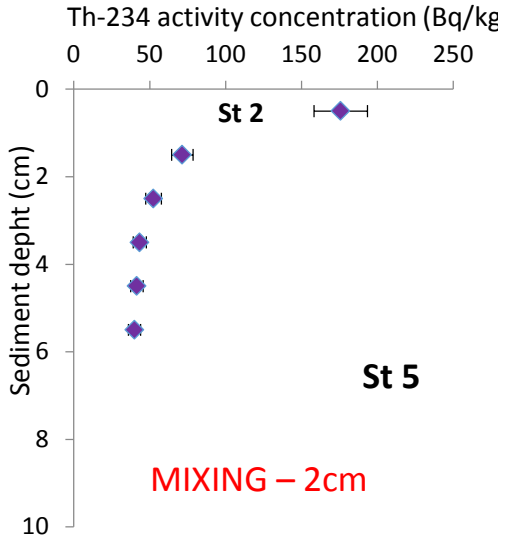
DWARF WP 4 (soft bottom) – sediments – Th-234 - bioturbation:

ULLSFJORD

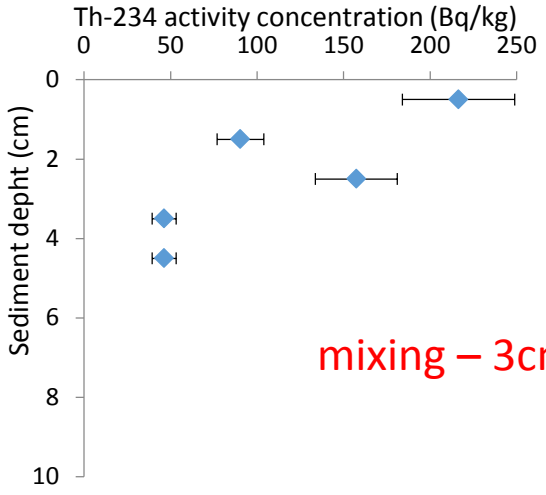


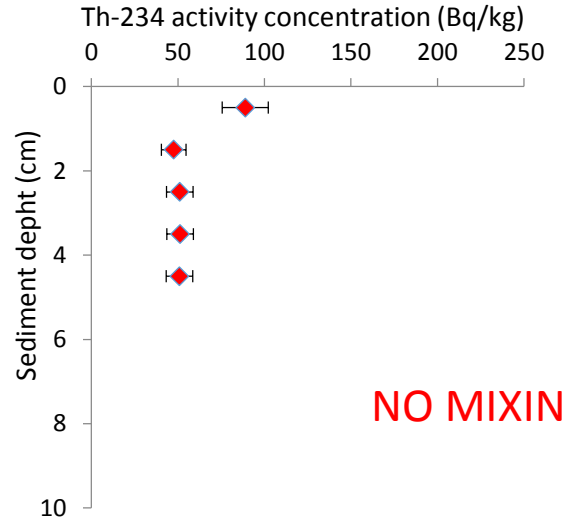




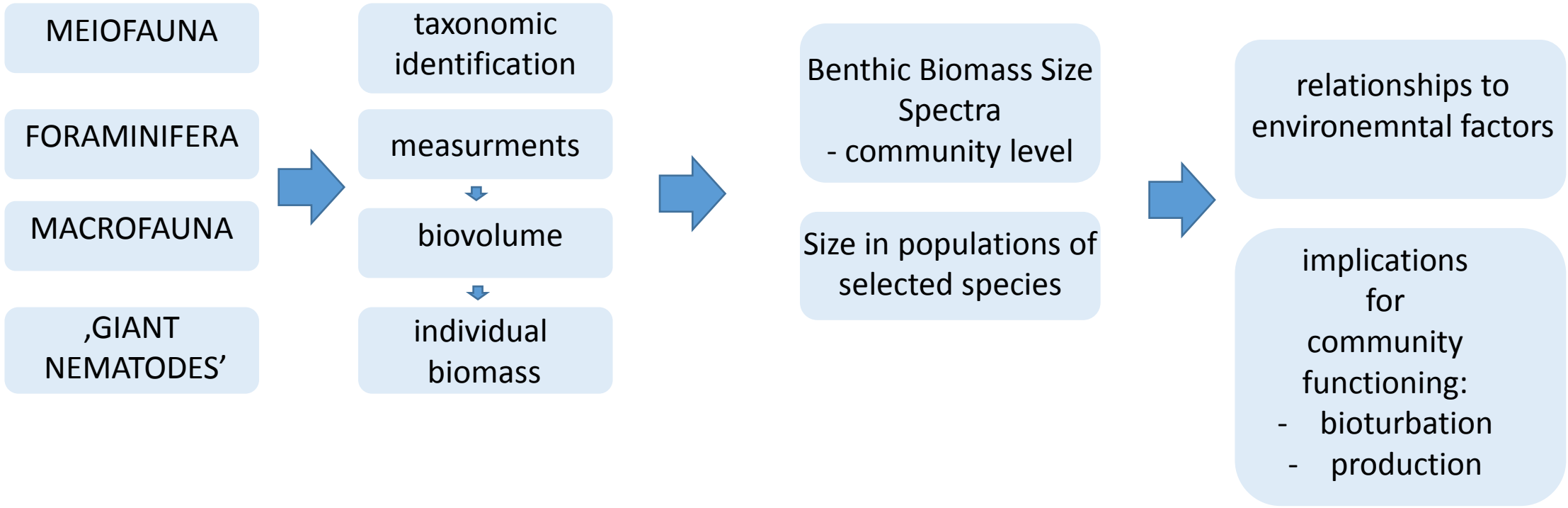


RIJPFJORD

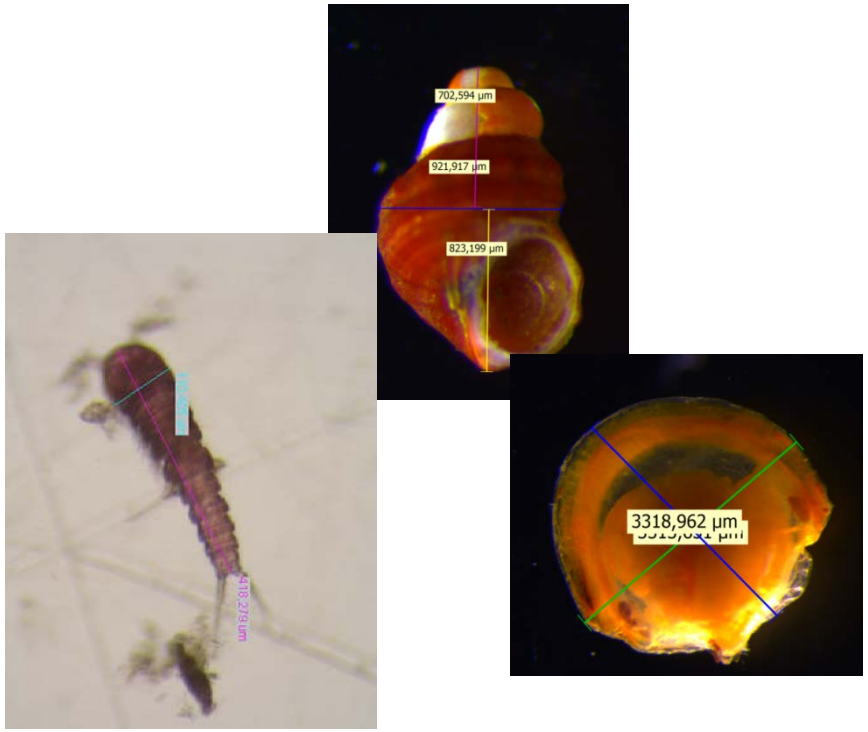




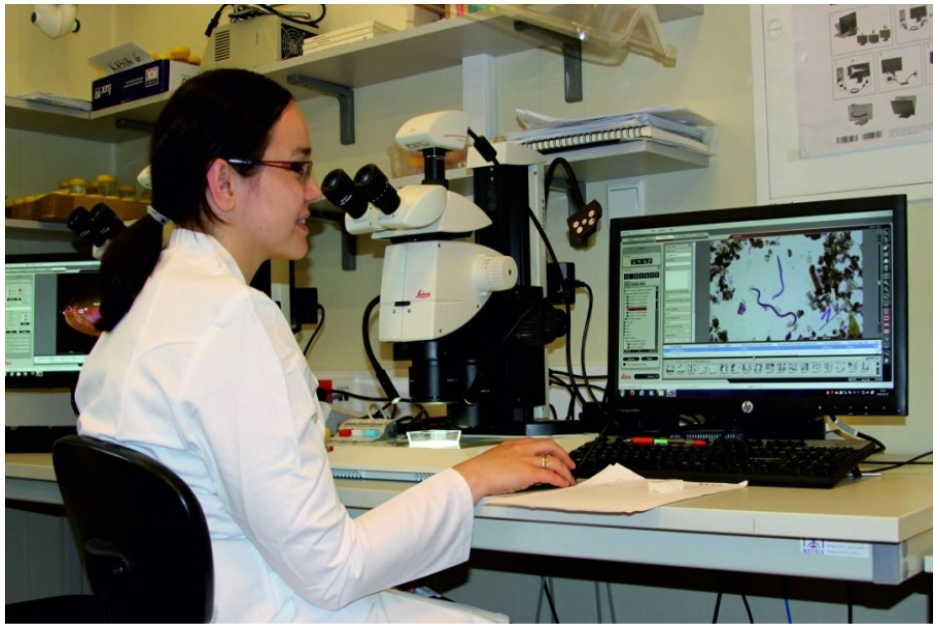
DWARF WP 4 (soft bottom) – analyses - fauna:



DWARF WP 4 (soft bottom) – analyses - fauna:



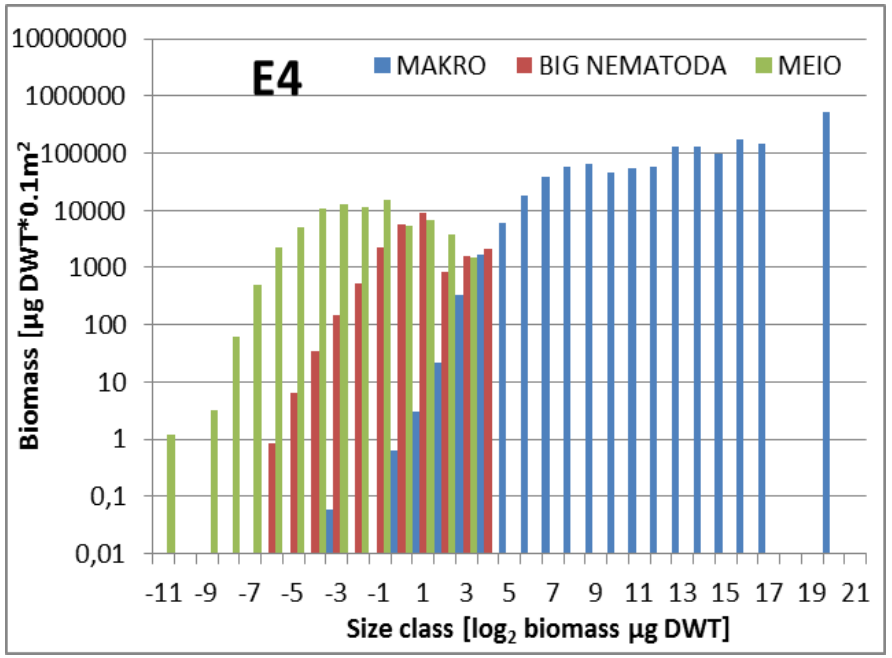
measurements (Leica miscroscope based system of image analyses)



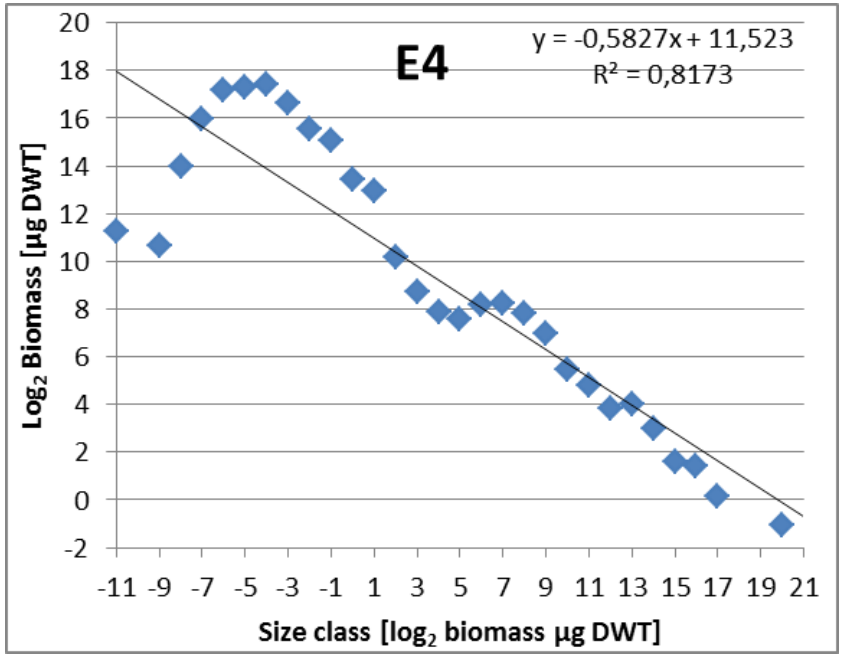
- Analyses of Kongsfjorden materials (seasonal comparisons) – untill summer 2015
- Manuscript on seasonal comparisons – end of 2015
- Analyses of other materials - until begining 2016
- Manuscripts on community and population size distributions along latitudinal/ temperature gradients - autumn 2016

DWARF WP 4 (soft bottom) – analyses - fauna:

Biomass in size classes in Kongsfjorden

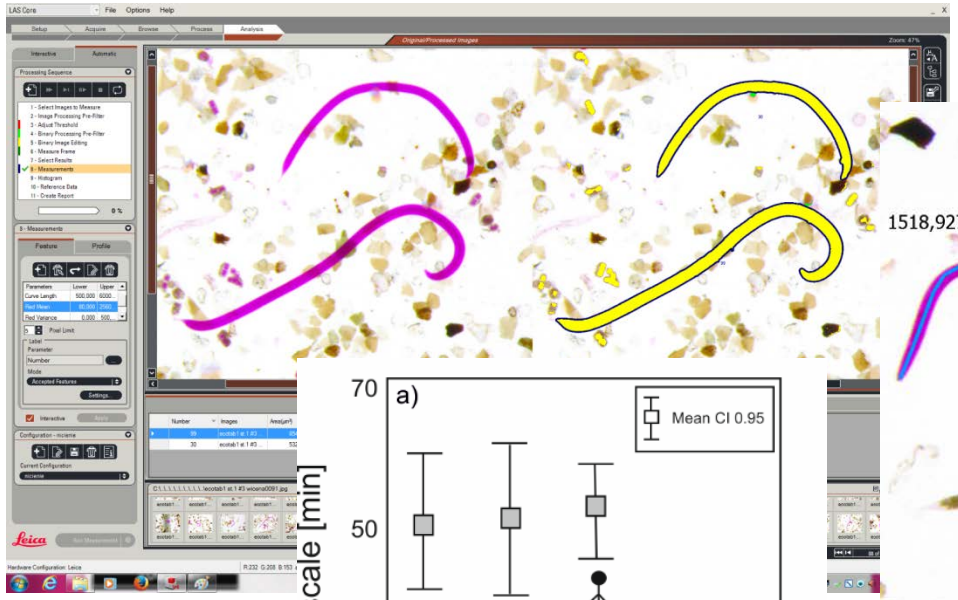


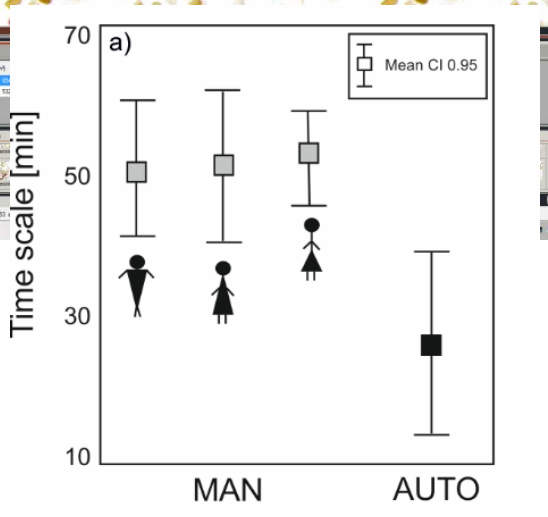
Normalised Biomass Size Spectra

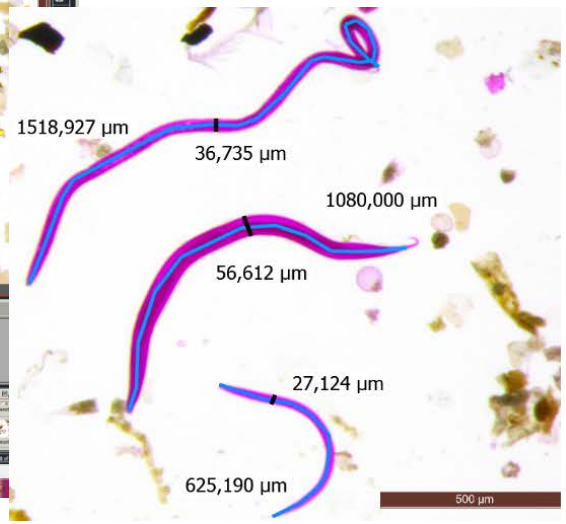


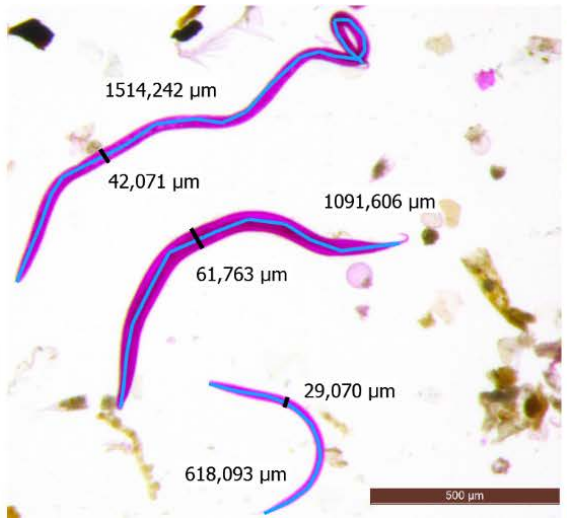
DWARF WP 4 (soft bottom) – analyses - fauna:

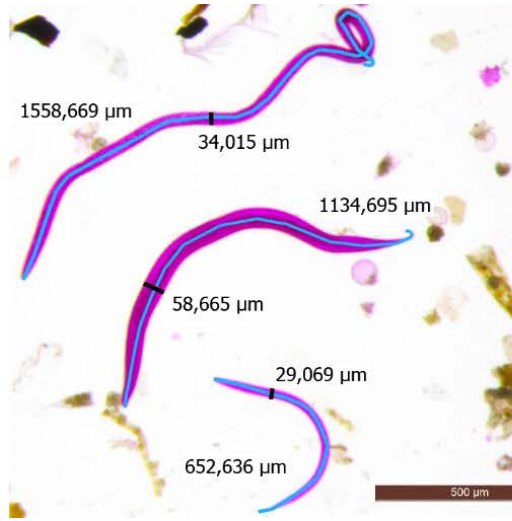
Semi-automated method of estimation of nematode biomass







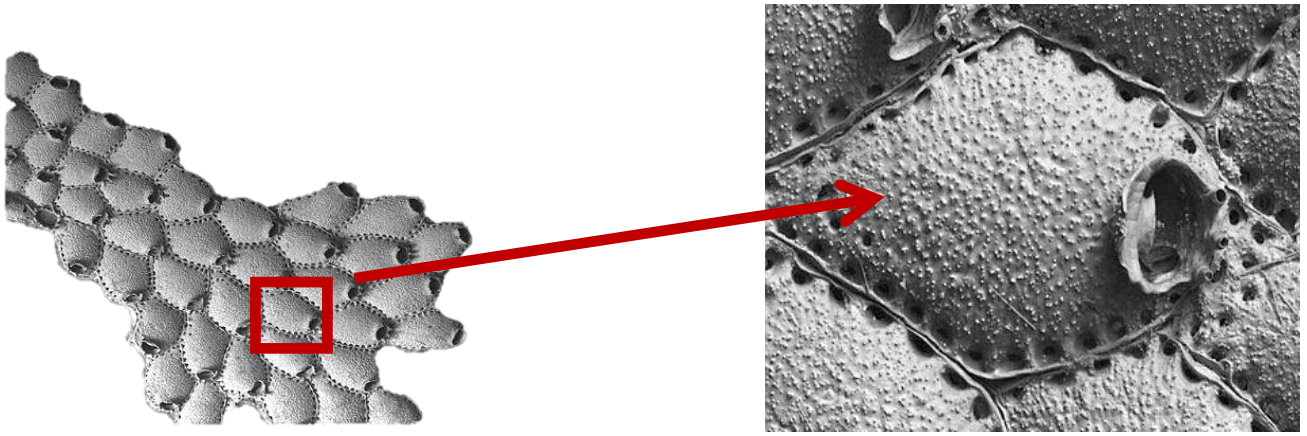




- Mazurkiewicz et al., „Assessment of nematode biomass in marine sediments - semi-automated image analysis method” manuscript ready to submission (to Limnology & Oceanography Methods)

DWARF WP 4 (Bryozoa) – Introduction

AIM: to find relationships between environmental controls and bryzoan zooid size



TASKS

1. Collection of samples of bryozoan taxa from shallow rocky bottom.

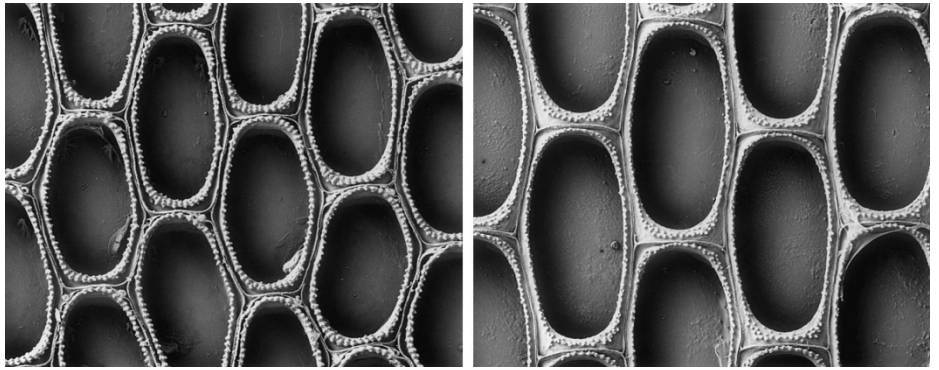
2. Assessment of bryozoan size distribution in relation to spatial environmental gradients (own collection)

3. Assessment of bryozoan size distribution in relation to depth and temperature (Iceland BIOICE collection)

4. Comparative analyses of zooid size in Bryozoa in historical and recent collections (Trondheim Natural History Museum collection)

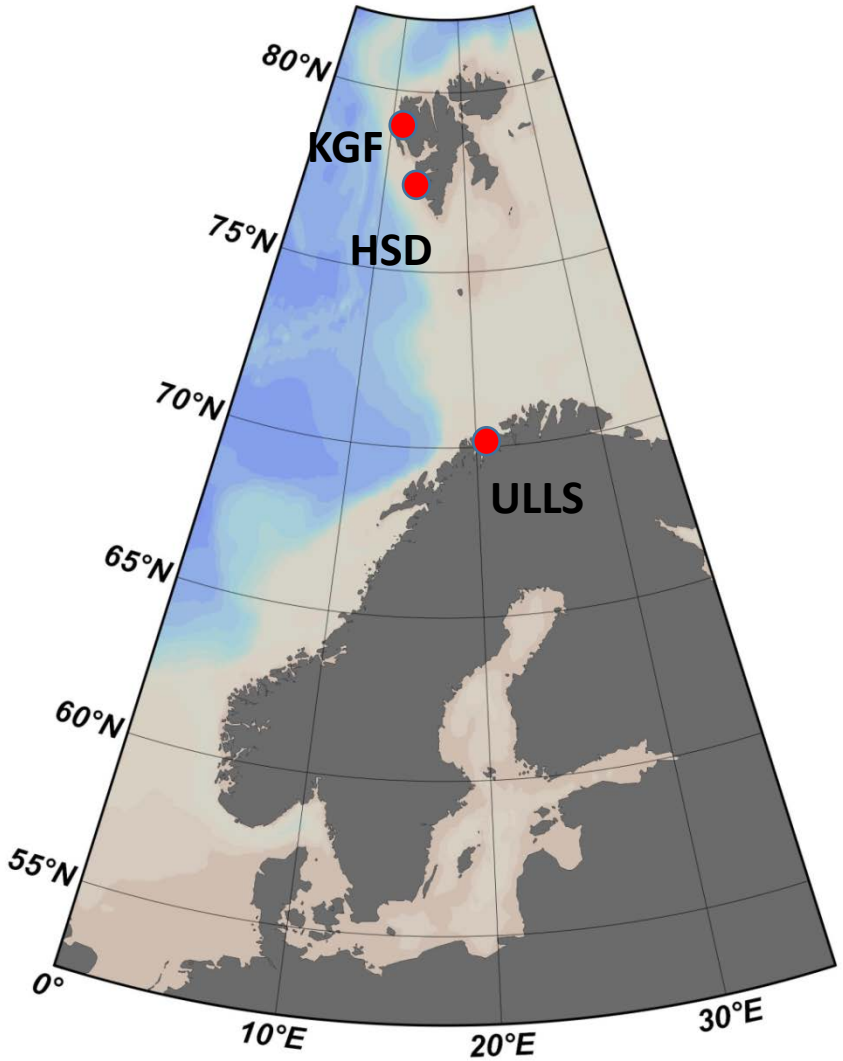
Conopeum seurati

22 °C 14 °C



After O'Dea and Okamura 1999

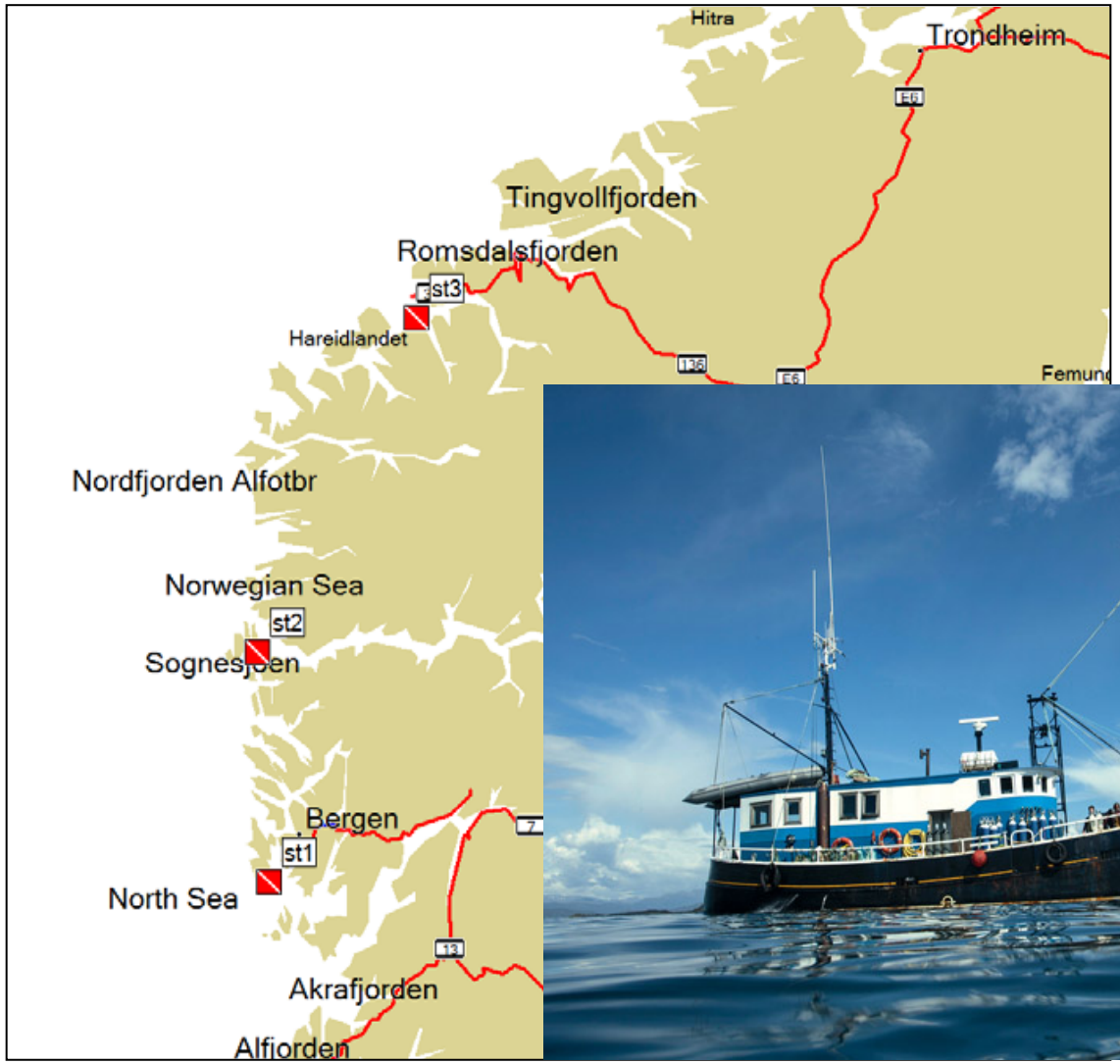
DWARF WP 4 (Bryozoa) – sampling in 2014:



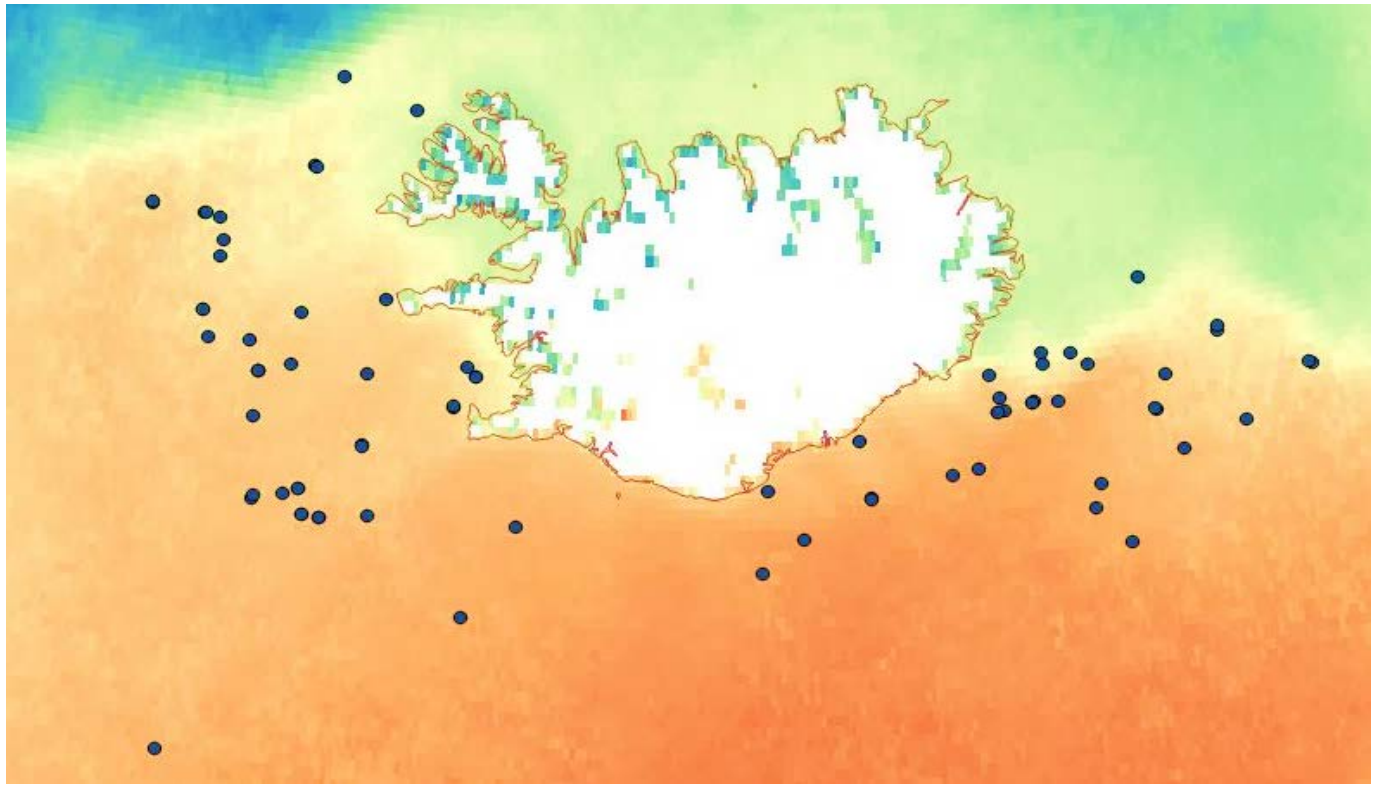
Deep-water dredging – 50-150 m in fjords – r/v Oceania

DWARF WP 4 (Bryozoa) – sampling in 2014:

Shallow water sampling – scuba diving – r/v Halton
In cooperation with Heriot and Watt University in Edinburgh, Scotland

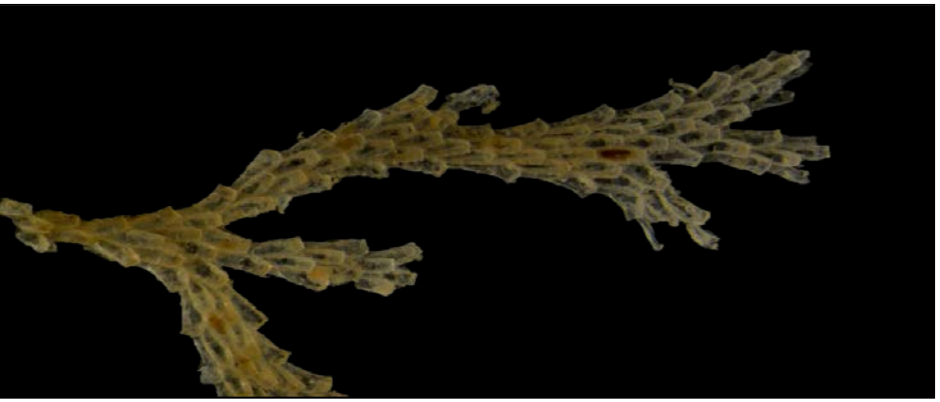


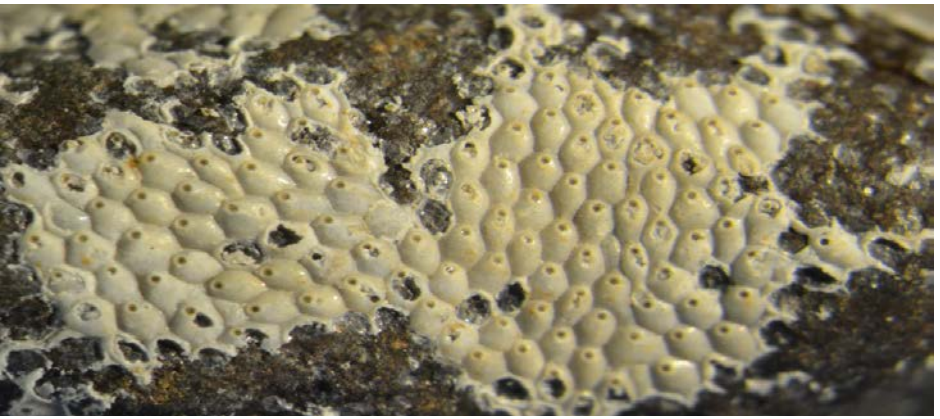
DWARF WP 4 (Bryozoa) – Zooid size distribution in relation to depth and temperature (BIOICE collection)

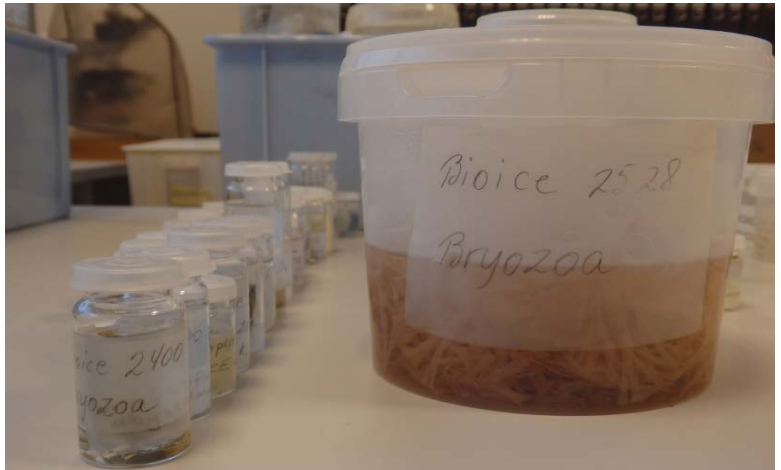


- BIOICE program - sampling 1994-2002
- collections stored at Islandic Institute of Natural History
- Research visits to IINH in October 2014 and March 2015
- 78 samples from 6 depths zones (about 30m, 100, 200, 300, 500, and 1000m) were selected for DWARF study

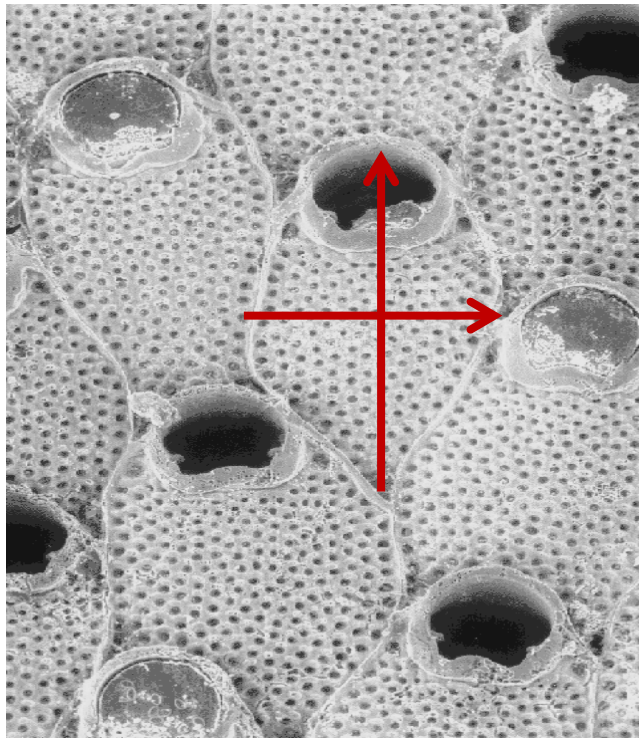
DWARF WP 4 (Bryozoa) – Zooid size distribution in relation to depth and temperature (BIOICE collection)







DWARF WP 4 (Bryozoa) – Zooid size distribution in relation to depth and temperature (BIOICE collection)



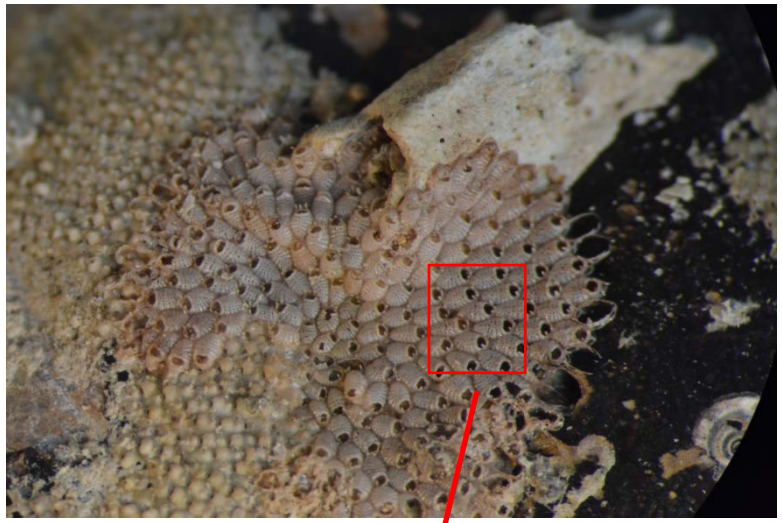
13 species → minimum 5 colonies per species/per depth ↓

20 randomly choosed zooids from each colony ↙

maximum length and width of each zooid were measured

- Laboratory analyses of materials – untill summer 2015
- Manuscript on depth and temperature correlates to zooid size based on BIOICE colection– end 2015

DWARF WP 4 (Bryozoa) :



Analyses of zooid size in selected species along latitudinal/temperature gradient

Laboratory analyses of materials collected in summer 2014 and archive collections of IOPAN – 2015

Analyses of zooid size in historical collections

Research visit to Trondheim Natural History Museum - planned for September/October 2015

DWARF WP 4 – Milestones & Deliverables:

M 4.1 Data set of Bryozoa zooid sizes in museum collections M23
M 4.2 Data set of size distributions in macrobenthic species M26
M 4.3 Data set of size spectra in soft bottom community M29
M 4.4 Data set of Bryozoa zooid sizes in collected samples M29
M 4.5 Submission of paper on size in macrobenthic species M36
M 4.6 Submission of paper on BBSS in soft bottom communities M33
M 4.7 Submission of paper on bryozoan zooid size changes M36

D 4.1. Manuscript of a paper on change in BBSS in soft bottom communities and functional consequences of change in size distribution. M36

D 4.2. Manuscript of a paper on change in size in selected macrobenthic species. M34

D 4.3. Manuscript of a paper on bryozoan zooid size as an indicator of environmental variability. M36