Kongsfjorden Cruise August 8-13, 2019

Katrine Husum and cruise scientists

Norwegian Polar Institute

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Introduction

Norwegian Polar Institute has since the mid-1990s carried out annual monitoring and research cruises to Kongsfjorden, Svalbard (Figure 1). This cruise has evolved including more parameters as technology and knowledge improved. Kongsfjorden is unique in that aspect that it, in addition to glacial influence, Atlantic Water, one of the prevailing water masses in the region, routinely enters Kongsfjorden on western Svalbard. Hence, Kongsfjorden is expected to record warm Atlantic conditions and glacial influence. This years' cruise was five days (August 8-13), and it was carried using the research vessel "Helmer Hanssen" from UiT – The Arctic University of Norway.

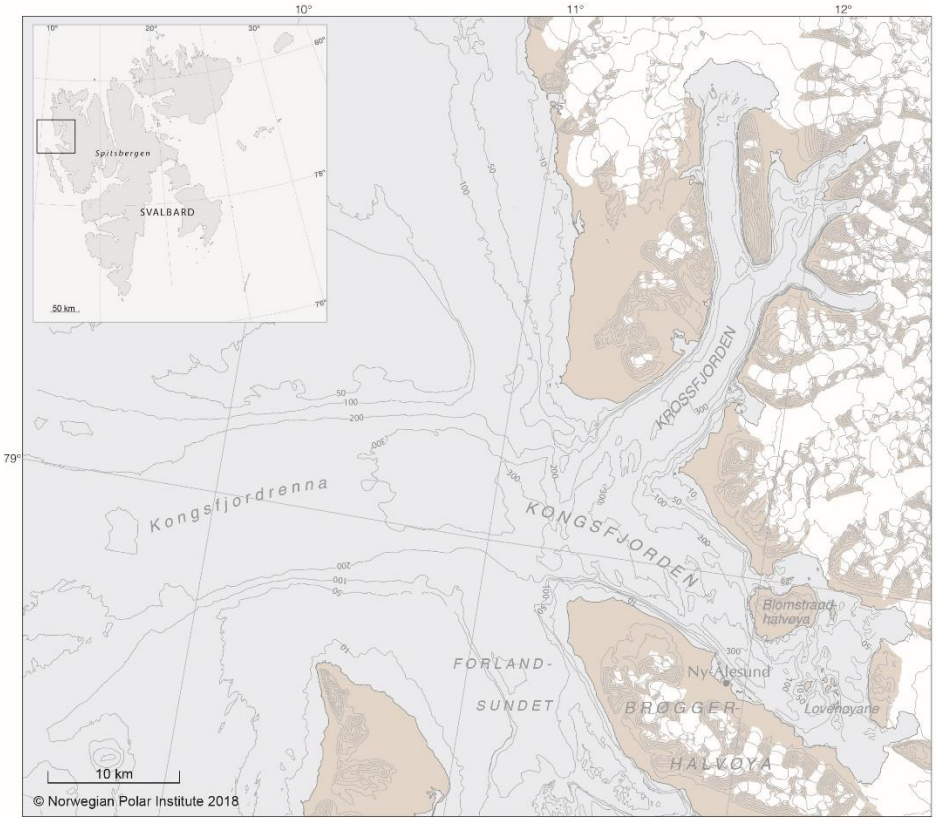


Figure 1. Index map showing Svalbard and bathymetric map showing Kongsfjorden and surroundings

Programmes and projects

MOSJ pelagic survey - Kongsfjorden

Responsible: Haakon Hop (NPI), Philipp Assmy (NPI) & Anette Wold (NPI)

MOSJ (Environmental monitoring – Svalbard and Jan Mayen) is a program to monitor changes in the Arctic Ecosystem at Svalbard and Jan Mayen. As a part of MOSJ, the survey in Kongsfjorden - Fram Strait (KongHau) is used by NPI to monitor long term changes in phytoplankton and zooplankton as well as trophic structure of this ecosystem. The survey in Kongsfjorden and Fram Strait which includes CTD, nutrients, phytoplankton, zooplankton and benthos is maintained through joint efforts by Akvaplan-niva (Apn), the University of Tromsø (UoT), the University Centre in Svalbard (UNIS), the Norwegian Polar Institute (NPI), the Polish Institute of Oceanology (IOPAS) and the Alfred Wegener Institute of Polar and Marine Science (AWI).

- The transect consists of 7 stations inside the fjord (Kb7, Kb6, Kb5, Kb3, Kb2, Kb2, Kb1, Kb0), 3 stations on the shelf (V12, V10, V6) and 3 stations off the shelf (KH, HG-I, HG-IV).
- The transect is sampled every year in July, additional seasonal studies was done in 2002, 2006 and 2007.
- CTD and zooplankton sampled since 1996.
- Chlorophyll, nutrient, phytoplankton, sampled since 2009

- Fatty acid and stable isotope of phytoplankton, zooplankton, fish, benthos and seabirds are also analysed but not on a regular basis.
- All phytoplankton and zooplankton data are analyzed to species level in cooperation with the Institute of Oceanology in Sopot, Poland.
- All data is stored in the Marinedatabase at NPI.

Ocean Acidification

Responsible: *Agneta Fransson (NPI), Melissa Chierichi (IMR) & Claire Mourgues (IMR)*

Investigate the natural calcium carbonate saturation state (Ω) in the area around Svalbard.
Influence of water mass composition (Atlantic, polar, fjordwater) and freshwater (glacier, sea-ice and river) on Ω. Distribution of *Calanus*, *Limacina helicina* will be related to Ω state.
Pterodpods should be collected from Multinet and MIK when present and stored 0n 95% alcohol.

Planktonic microbial communities (PMC)

Responsible: *Catarina Magalhães (CIIMAR, Portugal) & Pedro Duarte (NPI)*

Genomics

We aim to proceed with a comprehensive study on the diversity and functional aspects of planktonic microbial communities at the genomic and biogeochemical levels. The data generated will complement the sampling effort being performed by the NPI team on board. To accomplish our goals water samples that will be collected during Kongsfjorden Cruise 2019 will be processed on board by concentrating it through filtration and preserved on board for later DNA extraction, and genomic and metagenomic analysis. After successful filtration of 3-5L, sterivex filter units with concentrated microbial planktonic communities will be stored at -80°C, for latter sequence analysis at CIIMAR.

Marine geology and paleoceanography (MGP)

Responsible: *Katrine Husum (NPI), Arto Miettinen (NPI) & Stijn de Schepper (NORCE)*

Benthic foraminiferal monitoring in Kongsfjorden

This project aims to monitor and quantify the response of benthic foraminifera to different physical environmental forcing in the Arctic, e.g. regarding variations of the influence of Atlantic Water in Kongsfjorden. Benthic foraminifera are good monitors of environmental changes because they are very abundant in the surface sediments and very diverse even in Arctic coastal and fjord settings. Furthermore, they have a short life cycle enabling to respond quickly to changes. After death, the shells of the benthic foraminifera are preserved in the sediment enabling baseline studies of pre-impacted conditions back in time. A CTD cast/data will also be necessary on all these stations in order compare the modern foraminiferal data with the modern hydrographic data. The transect consists of five stations inside the fjord (Kb3, Kb2, Kb1, Kb0, FM).

Paleo-records – reconstructions of sea ice and water mass variability

In order to obtain data on temperature, salinity etc. in the water masses from the past when it was not possible to get instrumental measurements of these factors; we study fossil micro-fauna (foraminifera) and micro-flora (diatoms) in the sediments in addition to their chemical composition (biomarkers). Their composition and abundance depend on many environmental factors like temperature and salinity of the sea water, thus showing how the marine environment and water masses were back in time (paleo-oceanographic proxy data).The second aim of the project is to improve the proxies of ocean temperature and sea-ice and apply them to down core sediment samples from the multicores (fossil data). Hence, the monitoring data will also serve as modern analogue data for interpretation of fossil data. The modern analogue data will also be utilized when developing statistical models making quantitative reconstructions (transfer functions based on benthic foraminifera and diatoms). The paleo-records will be

established at selected stations in Kongsfjorden. During this year's cruise there will be collected sediment samples for analysis of environmental, sedimentary ancient DNA (*sed*aDNA). Preliminary results indicate that *seda*DNA may be used as sea ice proxy in natural archives. Hence there will be collected both modern surface sediment samples for calibration and paleo-samples for application of the method. This is part of the AGENSI project (A genetic view into past sea ice variability) led by Stijn de Schepper, NORCE.

Diving: collecting bivalves and calcareous algae

Responsible: *Haakon Hop (NPI)*

This project aims to 1) investigate and establish bivalves and calcareous algae as records of seawater conditions and 2) establish the extent of microplastic in bivalves. Three dives within Kongsfjorden were carried out during the cruise in order to collect samples from Kvadehuken and Gluudneset. These sites have been sampled before and are known to host bivalves and calcareous algae.

Work on board and results

Fourteen stations were visited in Kongsfjorden and adjoining shelf, and CTD profiles were obtained at each station (Table 1). A total of 740 water samples, 124 plankton net samples and 166 sediment samples were collected (Table 2). NB Every station has a station ID used from year to year. On the RV "Helmer Hanssen" every operation/sampling is assigned a new station number (Table 2).

Area	Station	Latitude	Longitude	Depth(m)	Sampling
Kongsfjorden	Kb7	78° 57.98'	12° 22.60'	64	Pelagic
	Kb6	78° 55.81'	12° 23.11'	83	Pelagic
	Kb5	78° 53.79'	12° 26.45'	96	Pelagic; Marine geology
	Kb3	78° 57.24'	11° 57.38'	329	Pelagic; Marine geology
	Kb2	78° 58.68'	11° 43.91'	330	Pelagic; Marine geology
	Kb1	79° 00.67'	11° 25.66'	352	Pelagic; Marine geology
	Kb0	79° 02.78'	11° 08.36'	315	Pelagic; Marine geology
	FM	79° 03.05'	11° 05.17'	328	Marine geology
	V12	78° 58.79'	09° 29.77'	224	Pelagic
	V10	78° 55.96'	08° 32.82'	291	Pelagic
	V6	78° 54.39'	07° 46.24'	1125	Pelagic
Hausgarten	KH	79° 03.00'	07° 00.00'	1200	Pelagic
	HG-I	79° 08.00'	06° 05.54'	1200	Pelagic
	HG-IV	79° 03.90'	04° 10.80'	2500	Pelagic

Table 1 List of stations in Kongsfjorden.

Table 2 List of stations in Kongsfjorden with their standard station ID, their station number and which type of equipment there was deployed (type of sampling).

Station ID	Station # on bridge	Type of sampling
Kb3	909	CTD cast 1
Kb3	910	Phytoplankton net
Kb3	911	CTD cast 2
Kb3	912	Multinet
Kb3	913	CTD cast 3
Kb3	914	MIK
Kb3	915	CTD cast 4
Kb3	916	WP2 cast 1
Kb3	917	WP2 cast 2
Kb3	918	WP2 cast 3
Kb7	919	CTD cast 1
Kb7	920	MIK
Kb7	921	Multinet
Kb7	922	CTD cast 2
Kb7	923	CTD cast 3
Kb6	924	CTD cast 1
Kb6	925	Multinet
Kb6	926	Multinet
Kb6	927	CTD cast 2
Kb6	928	MIK
Kb6	929	CTD cast 3
Kb6	930	CTD cast 4
Kb5	931	CTD cast 1
Kb5	932	MIK
Kb5	933	Phytoplankton net
Kb5	934	Multinet
Kb5	935	CTD cast 2
Kb5	936	CTD cast 3

Station ID	Station # on bridge	Type of sampling
Kb5	937	Multicorer
Kb3	938	Multicorer
	940	MIK net (diversity and microplastic) 5 casts
Kb2	941	CTD cast 1
Kb2	942	MIK
Kb2	943	CTD cast 2
Kb2	944	Multinet
Kb2	945	CTD cast 3
Kb1	946	CTD cast 1
Kb1	947	CTD cast 2
Kb1	948	Multinet
Kb1	949	CTD cast 3
Kb1	950	MIK
Kb0	951	CTD cast 1
Kb0	952	MIK
Kb0	953	Phytoplankton net
Kb0	954	CTD cast 2
Kb0	955	Multinet
Kb0	956	CTD cast 3
FM	957	CTD cast
Kb2	958	Multicorer
Kb1	959	Multicorer
Kb0	960	Multicorer
FM	961	Multicorer
V12	962	CTD cast 1
V12	963	Multinet
V12	964	Phytoplankton net
V12	965	CTD cast 2
V12	966	MIK
V12	967	CTD cast 3

Station ID	Station # on bridge	Type of sampling
V10	968	CTD cast 1
V10	969	MIK
V10	970	Phytoplankton net
V10	971	CTD cast 2
V10	972	Multinet
V10	973	CTD cast 3
V6	974	CTD cast 1
V6	975	Multinet
V6	976	CTD cast 2
V6	977	MIK
V6	978	CTD cast 3
V6	979	Multinet extra cast
KH	980	CTD cast 1
KH	981	Multinet
KH	983	CTD cast 2
KH	984	Multinet extra cast 1
KH	985	Multinet extra cast 2
KH	986	MIK
KH	987	CTD cast 3
HG-I	988	CTD cast 1
HG-I	989	MIK
HG-I	990	Phytoplankton net
HG-I	991	CTD cast 2
HG-I	992	Multinet
HG-I	993	CTD cast 3
HG-IV	994	CTD cast 1
HG-IV	995	Multinet
HG-IV	996	Phytoplankton net
HG-IV	997	CTD cast 2
HG-IV	998	MIK
HG-IV	999	CTD cast 3

Table 2 List of stations in Kongsfjorden with their standard station ID, their station number and which type of equipment there was deployed (type of sampling).

Hydrographic survey

Responsible: Olga Pavlova (NPI), Gary Griffith (NPI) & Marius Bratrein (NPI)

Data was collected using a range of instruments. The CTD rosette is used for collection of vertical profiles of conductivity (salinity), temperature, and associated parameters like chlorophyll, radiance etc. The CTD rosette is also equipped with water sampling bottles (Niskin bottles, volume 4 liters each). The used CTD is a SBE911+ unit. Niskin bottles were closed using the bottle fire command within the Sea-Bird acquisition software so that a .bl file was created for each deployment when bottles were fired. There was no direct NMEA feed for depth and surface PAR (SPAR) at any of the stations. Station depth and SPAR measurements from the ship based PAR sensor were manually entered in the header information for each CTD cast at the moment the CTD was deployed. Cast starting time, latitude and longitude were automatically added to the header of all data files.

A paper log sheet was completed at each CTD station. Log sheets list the depths at which bottles were fired and the samples taken from each bottle. Times and positions manually recorded on log sheets are indented as a backup in the case of a problem with the data acquisition, not a replacement for logged time and position data.

NB The CTD rosette on RV "Helmer Hanssen" is equipped with a fluorescence sensor that differs with the CTD rosette on RV "Lance". The CTD rosette on "Helmer Hanssen" has a Seapoint Chlorophyll Fluorometer and units of measurements are µg/l (see http://seapoint.com/scf.htm)

Station Locations

The transect consists of seven stations inside the fjord (Kb7, Kb6, Kb5, Kb3, Kb2, Kb1, Kb0) and six stations on the shelf (HGIV, HGI, KH, V12, V10, V6). A total of 13 CTD stations and 41 casts were carried out, see Figure 2 and Table 1 for an overview of the main stations.

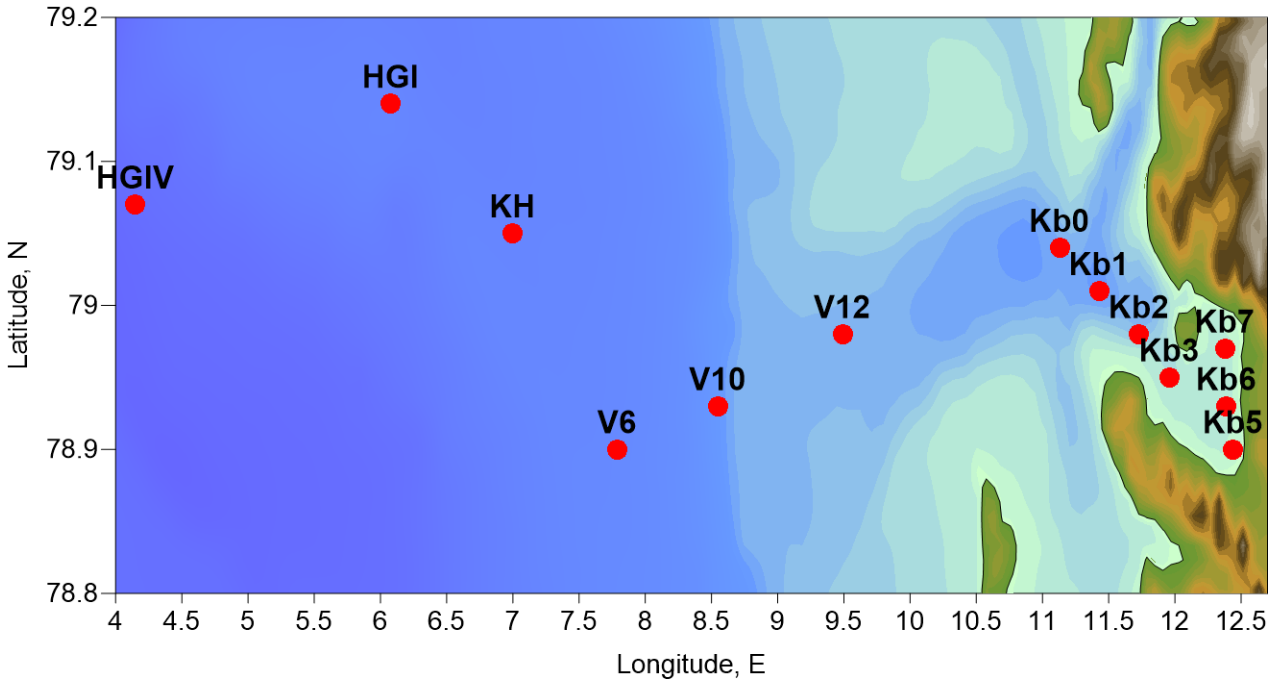


Figure 2. Transect location and stations position (red dots).

CTD data acquisition

In order to obtain 'round the clock' CTD data the scientific personnel was divided into two groups. Team 1 (Olga Pavlova with the two persons from the crew) ran the 02-08 (AM, PM) shift whilst Team 2 (Gary Griffith with the two persons from the crew) performed the 08 to 02 (AM, PM) shift. NP's engineer Marius Bratrein assisted with CTD measurements along with providing support for other measurements.

Once in the water the logging was initiated using SeaSave the Seabird data acquisition software (Software Version Seasave V 7.26.7.121). The salinity and temperature values were monitored until they were stable and then the CTD was lowered at about 1m/s. Water samples were 'fired' on the upcast.

At the end of a station the CTD was taken back on deck, wheeled into the shelter where it could be fastened to the ship before "Helmer Hanssen" headed to the next station. After which the data was downloaded, changed to ASCII using Data Conversion (DatConv) on the SBE data processing software (SBE Data Processing 7.26.7). The resulting .cnv files were used for plotting of TS vertical profiles and transects. At this stage no other processing was performed to the data. After visual checking (using paper log sheet) the raw data was modified where required (e.g. adding in depth and correcting station names).

Hydrographic structure - vertical transects

The positions of the CTD stations and transects for Kongsfjorden (KF) are presented in Figure 2 and Table 3. Figures 3 and 4 show temperature and salinity distribution at the KF transect. The major physical features found in the section include the area of high water temperature and low salinity (especially in the eastern part of KF) in the surface layer. The high water temperature in the surface layer (T>7.7°C) was formed due to spreading of the Atlantic waters (AW) from west and summer warming (Fig. 3). The salinities in the western part in the transect at the stations KH, V6 have typical values for AW in the surface layer S>35 psu (Fig. 4). Thickness of AW at the stations KH and V6 is about 270-380 m.

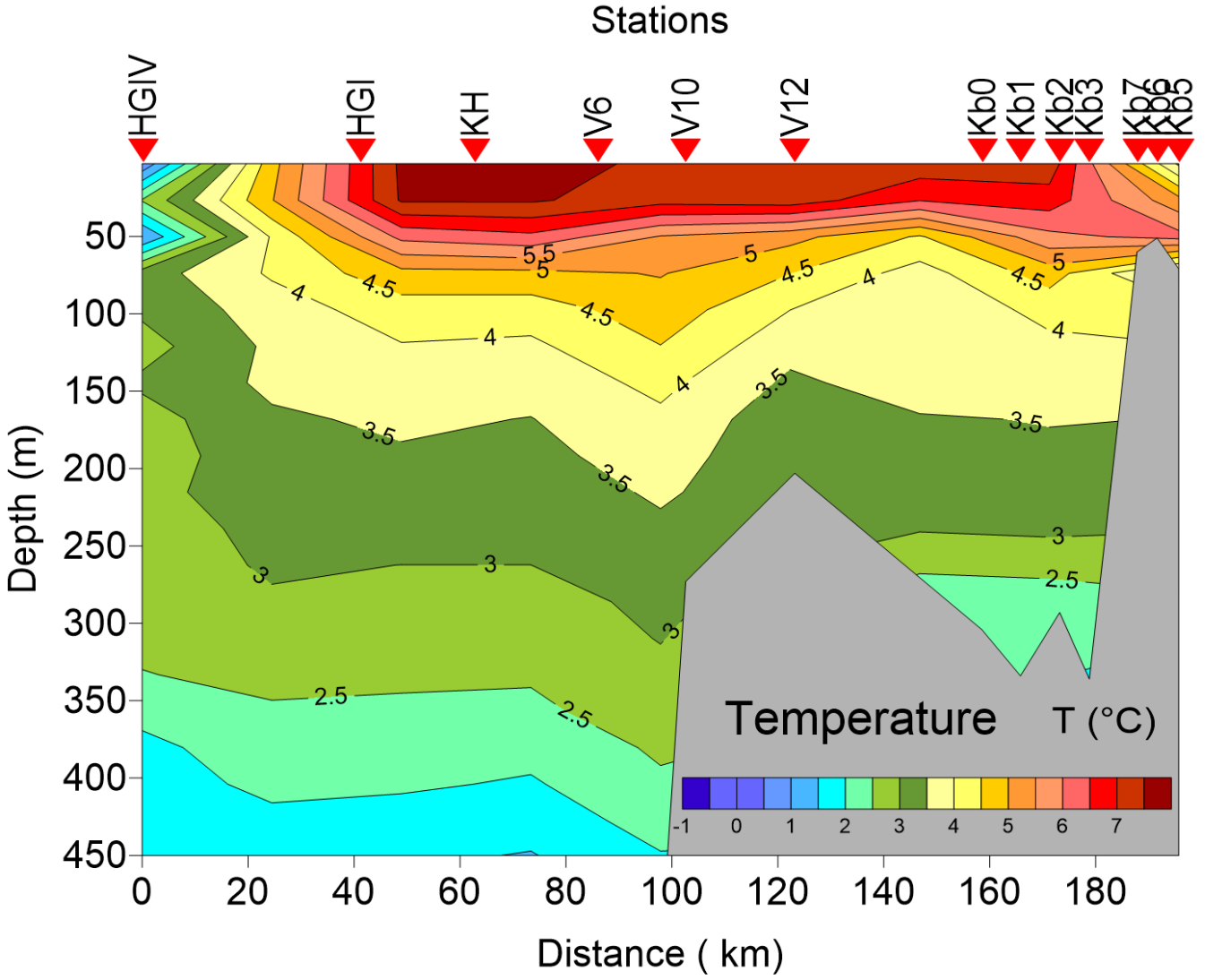


Figure 3. Temperature distribution at the transect in Kongsfjorden (profiles HGIV, HGI, KH, V6, V10, V12, Kb0, Kb1, Kb2, Kb3, Kb7, Kb6, Kb5). Station positions are shown in Figure 2 and Table 3.

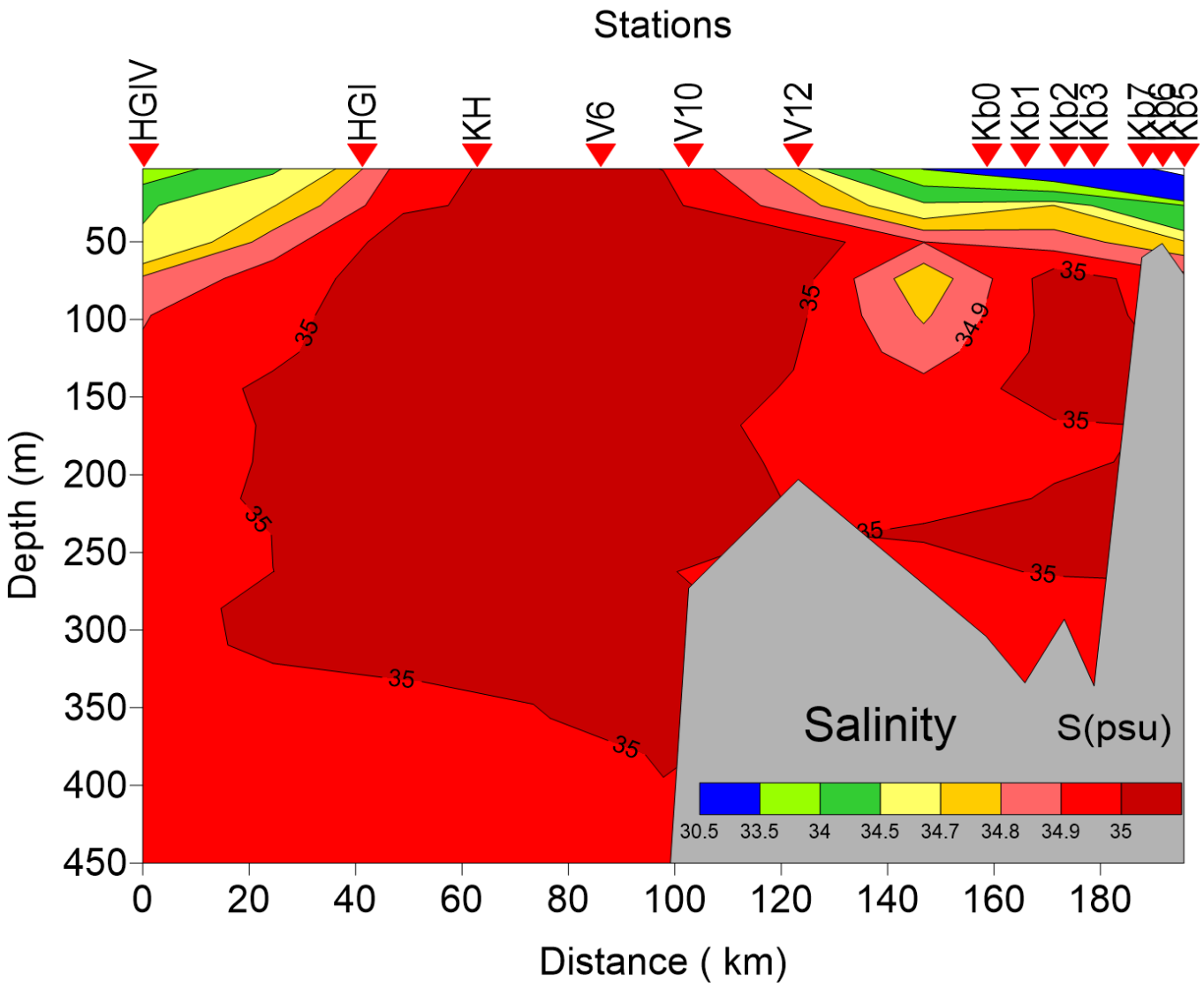


Figure 4. Salinity distribution at the transect in Kongsfjorden (profiles HGIV, HGI, KH, V6, V10, V12, Kb0, Kb1, Kb2, Kb3, Kb7, Kb6, Kb5). Station positions are shown in Figure 2 and Table 3.

Low salinities in the surface layer of the eastern part of the fjord are result of glacier melting. Well pronounced salinity frontal zone is presented near the station V12. This front separates low salinity melting waters and waters of the ocean origin with relatively high salinities. Figure 5 shows fluorescence distribution at the KF transect. Largest values of the fluorescence here are in the western part of the KF transect (stns. HGI, KH and V10), in the layer from 10 to 40 m, with the maximum (up to 1.67 µg/l) near the station KH. Deeper 80 m fluorescence practically is equal zero.

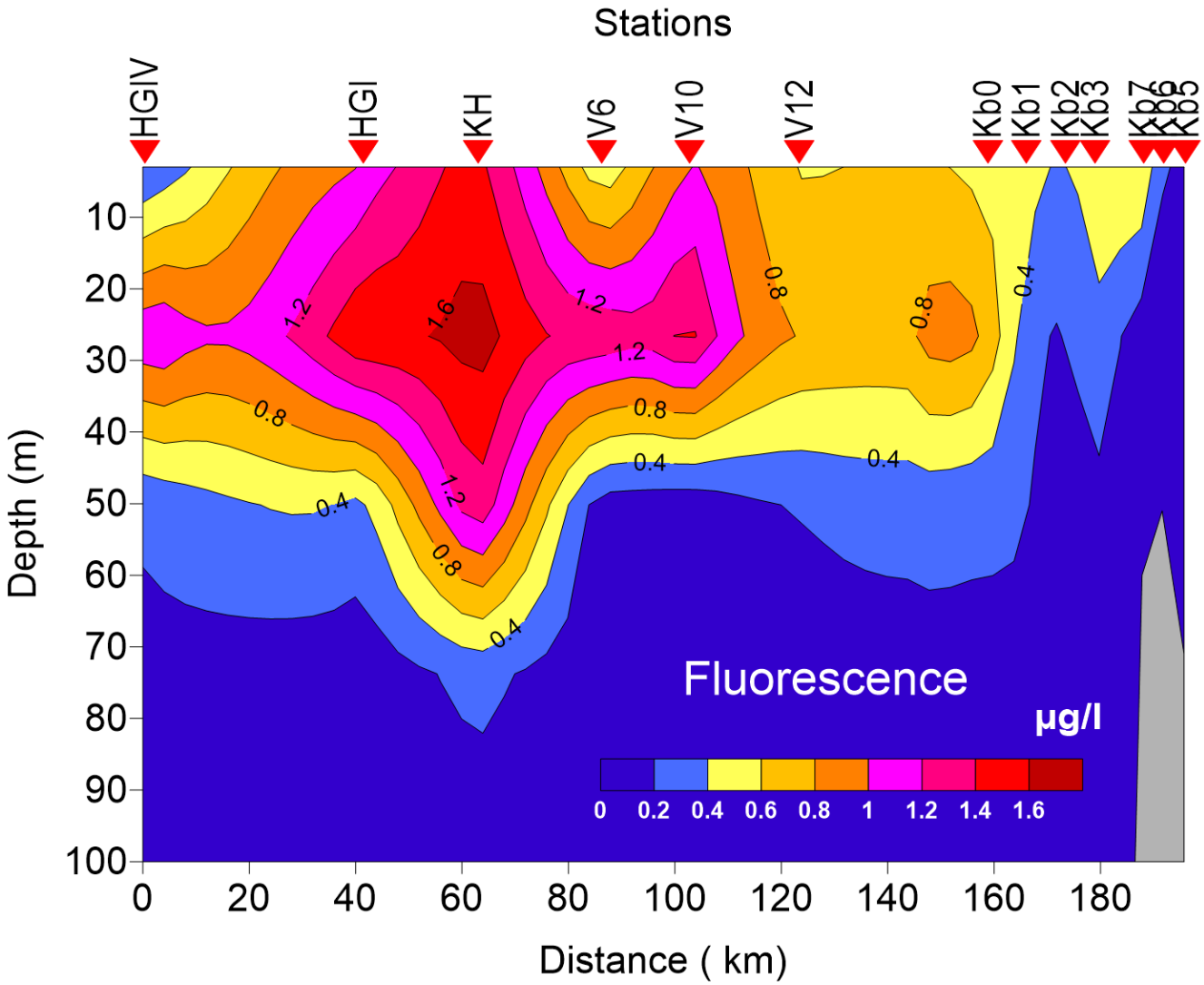


Figure 5. Fluorescence distribution at the transect in Kongsfjorden (profiles HGIV, HGI, KH, V6, V10, V12, Kb0, Kb1, Kb2, Kb3, Kb7, Kb6, Kb5). Station positions are shown in Figure 2 and Table 3.

Table 3. Station meta data and water sampling information. CTD stations, Kongsfjorden 2019 R/V «Helmer Hanssen».

#	Station Name	Ship Stn Name	CTD File name	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Depth of Samples (m)
1	Kb3_1_909	909	Kb3_1_909	09/08/19	07:20	78 57.28 N	011 57.52 E	341.1	300 (1 bottle) 200 (1 bottle) 150 (1 bottle) 100 (1 bottle) 50 (1 bottle) 25 (1 bottle) 14 (1 bottle) Near surface (1 b) see cnv

2	Kb3_2_910	910	Kb3_2_910	09/08/19	08:33	78 57.27 N	011 57.56 E	341.3	25 (4 bottles) 14 ((4 bottles) 5 (4 bottles)
3	Kb3_3_913	913	Kb3_3_913	09/08/19	09:55	78 57.28 N	011 57.36 E	341.8	300 (4 bottles) 15 (4 bottles) 5 (4 bottles)
4	Kb3_4_915	915	Kb3_4_915	09/08/19	11:22	78 57.27 N	011 57.68 E	342.2	300 (1 bottle) 150 (1 bottle) 50 (1 bottle) 25 (1 bottle) 15 (1 bottle) 5 (1 bottle)
5	Kb7_1_919	919	Kb7_1_919	09/08/19	14:15	78 57.91 N	012 22.86 E	69.5	60 (2 bottles) 50 (2 bottles) 25 (2 bottles) 10 (2 bottles) 7 (2 bottles)
6	Kb7_2_922	922	Kb7_2_922	09/08/19	15:37	78 57.80 N	012 23.61 E	64.1	25 (4 bottles) 7 (4 bottles) 5 (4 bottles)
7	Kb7_3_923	923	Kb7_3_923	09/08/19	16:21	78 57.70 N	012 23.72 E	65.0	60 (4 bottles) 50 (4 bottles) 3.5 (4 bottles)
8	Kb6_1_924	924	Kb6_1_924	09/08/19	17:10	78 55.87 N	012 23.11 E	55.8	50 (2 bottles) 25 (2 bottles) 10 (2 bottles) 7 (2 bottles) 5 (2 bottles)
9	Kb6_2_927	927	Kb6_2_927	09/08/19	18:45	78 56.01 N	012 23.38 E	52.3	25 (4 bottles) 7 (4 bottles) 5 (4 bottles)
10	Kb6_3_930	930	Kb6_3_930	09/08/19	20:45	78 55.93 N	012 23.53 E	54.47	50 (4 bottles) 7 (4 bottles) 1 (4 bottles) see cnv

11	Kb5_1_931	931	Kb5_1_931	09/08/19	21:29	78 53.75 N	012 26.39 E	81.0	70 (2 bottles) 50 (2 bottles) 25 (2 bottles) 10 (2 bottles) 5 (2 bottles)
12	Kb5_2_935	935	Kb5_2_935	09/08/19	22:41	78 53.78 N	012 25.87 E	78.95	50 (4 bottles) 25 (4 bottles) 5 (4 bottles)
13	Kb5_3_936	936	Kb5_3_936	09/08/19	23:23	78 53.86 N	012 25.32 E	85.15	70 (4 bottles) 12 (4 bottles) 1 (4 bottles)see cnv
14	Kb2_1_941	941	Kb2_1_941	10/08/19	12:11	78 58.70 N	011 43.74 E	304.0	Bott: 290.0 (1 bottle) 200 (1 bottle) 100 (1 bottle) 50 (1 bottle) 25 (1 bottle) 13 (1 bottle) 10 (1 bottle)
15	Kb2_2_943	943	Kb2_2_943	10/08/19	13:17	78 58.74 N	011 44.06 E	293.0	25 (4 bottles) 13 (4 bottles) 5 (4 bottles)
16	Kb2_3_945	945	Kb2_3_945	10/08/19	14:08	78 58.81 N	011 43.34 E	302.0	260 (4 bottles) 13 (4 bottles) 3 (4 bottles)
17	Kb1_1_946	946	Kb1_1_946	10/08/19	15:15	79 00.71 N	011 25.64 E	345.0	Bott: 330.0 (1 bottle) 200 (1 bottle) 100 (1 bottle) 50 (1 bottle) 25 (1 bottle) 14 (1 bottle) 5 (1 bottle)
18	Kb1_2_947	947	Kb1_2_947	10/08/19	16:10	79 00.51 N	011 25.40 E	363.0	25 (4 bottles)

									14 (4 bottles) 5 (4 bottles)
19	Kb1_3_948	948	Kb1_3_948	10/08/19	17:09	79 00.70 N	011 26.24 E	326.0	320 (4 bottles) 14 (4 bottles) 4 (4 bottles)
20	Kb0_1_951	951	Kb0_1_951	10/08/19	19:34	79 02.66 N	011 07.59 E	324.6	300 (1 bottle) 200 (1 bottle) 100 (1 bottle) 50 (1 bottle) 22 (1 bottle) 10 (1 bottle) 5 (1 bottle)
21	Kb0_2_954	954	Kb0_2_954	10/08/19	20:47	79 02.87 N	011 07.62 E	328.0	50 (4 bottles) 22 (4 bottles) 10 (4 bottles)
22	Kb0_3_956	956	Kb0_3_956	10/08/19	21:45	79 02.95 N	011 07.75 E	315.0	300 (4 bottles) 14 (4 bottles) 5 (3 bottles)
23	FM_1_957	957	FM_1_957	10/08/19	22:38	79 03.02 N	011 04.83 E	331.0	No water samples
24	V12_1_962	962	V12_1_962	11/08/19	06:16	78 58.76 N	009 29.43 E	323.6	200 (1 bottle) 100 (1 bottle) 50 (1 bottle) 33 (1 bottle) 25 (1 bottle) 10 (1 bottle) 5 (1 bottle)
25	V12_2_965	965	V12_2_965	11/08/19	07:12	78 58.91 N	009 29.55 E	324.7	50 (4 bottles) 33 (4 bottles) 10 (4 bottles)
26	V12_3_967	967	V12_3_967	11/08/19	08:00	78 58.82 N	009 29.21 E	322.8	210 (4 bottles) 28 (4 bottles) 5 (4 bottles)
27	V10_1_968	968	V10_1_968	11/08/19	09:23	78 55.97 N	008 33.20 E	270.0	270 (1 bottle)? 200 (1 bottle) 100 (1 bottle)

									50 (1 bottle) 25 (1 bottle) 10 (1 bottle) 5 (1 bottle)
28	V10_2_971	971	V10_2_971	11/08/19	10:18	78 55.95 N	008 33.04 E	284.0	50 (4 bottles) 25 (4 bottles) 10 (4 bottles)
29	V10_3_973	973	V10_3_973	11/08/19	11:11	78 55.96 N	008 33.15 E	279.0	260 (4 bottles) 25 (4 bottles) 5 (4 bottles)
30	V6_1_974	974	V6_1_974	11/08/19	12:29	78 54.29 N	007 47.51 E	1126.2	1100 (1 bottle) 1000 (1 bottle) 500 (1 bottle) 200 (1 bottle) 100 (1 bottle) 50 (1 bottle) 25 (1 bottle) 10 (1 bottle) 5 (1 bottle)
31	V6_2_976	976	V6_2_976	11/08/19	15:15	78 54.62 N	007 49.90 E	1114.2	50 (4 bottles) 25 (4 bottles) 10 (4 bottles)
32	V6_3_978	978	V6_3_978	11/08/19	17:44	78 54.18 N	007 50.64 E	1109.5	1100 (4 bottles) 25 (4 bottles) 5 (3 bottles)
33	KH_1_980	980	KH_1_980	11/08/19	21:41	79 02.97 N	007 00.00 E	1317.0	1200 (1 bottle) 1000 (1 bottle) 500 (1 bottle) 200 (1 bottle) 100 (1 bottle) 50 (1 bottle) 25 (1 bottle) 10 (1 bottle) 5 (1 bottle)

34	KH_2_983	983	KH_2_983	12/08/19	00:59	79 03.60 N	007 01.12 E	1333.0	50 (4 bottles) 25 (4 bottles) 10 (4 bottles)
35	KH_3_987	987	KH_3_987	12/08/19	06:44	79 03.13 N	006 58.06 E	1300	1200 (4 bottles) 25 (4 bottles) 5 (4 bottles)
36	HG1_1_988	988	HG1_1_988	12/08/19	08:41	79 08.18 N	006 04.95 E	1256.0	1200 (1 bottle) 1000 (1 bottle) 500 (1 bottle) 200 (1 bottle) 100 (1 bottle) 50 (1 bottle) 25 (1 bottle) 10 (1 bottle) 5 (1 bottle)
37	HG1_2_991	991	HG1_2_991	12/08/19	12:15	79 08.41 N	005 59.06 E	1255.2	50 (4 bottles) 25 (4 bottles) 10 (4 bottles)
38	HG1_3_993	993	HG1_3_993	12/08/19	14:40	79 08.33 N	006 04.69 E	1240.7	1230 (4 bottles) 25 (4 bottles) 5 (4 bottles)
39	HGIV_1_994	994	HGIV_1_994	12/08/19	17:57	79 04.05 N	004 09.26 E	2392.0	2300 (1 bottle) 2000 (1 bottle) 1500 (1 bottle) 1000 (1 bottle) 500 (1 bottle) 200 (1 bottle) 100 (1 bottle) 50 (1 bottle) 25 (1 bottle) 18 (1 bottle) 10 (1 bottle) 5 (1 bottle)
40	HGIV_2_997	997	HGIV_2_997	12/08/19	22:50	79 03.93 N	004 08.70 E	2489.0	50 (4 bottles)

									28 (4 bottles) 10 (4 bottles)
41	HGIV_3_999	999	HGIV_3_999	13/08/19	01:48	79 04.51 N	004 08.53 E	2392.7	2300 (4 bottles) 18 (4 bottles) 5 (4 bottles)

Table 3. Station meta data and water sampling information. CTD stations, Kongsfjorden 2019 R/V «Helmer Hanssen».

Biogeocehmical variables and phytoplankton

Responsible: *Jozeph Wictor (IOPAS), Agnieska Tatarek (IOPAS) & Anette Wold (NPI)*

Water samples were collected from Niskin bottles from the CTD rosette.

Zooplankton

Responsible: *Amalia Keck (NPI) & Haakon Hop (NPI)*

Mesozooplankton was sampled with multiple plankton sampler (MPS, Hydro-Bios Kiel), consisting of five closing nets with 0.25 m^2 opening and 200 µm mesh size. Macrozooplankton was sampled with a Midwater Isaak Kit Trawls (MIK) with 3.14 m^2 opening and 1500 µm mesh from the total water column. The standard depths for MPS samples was as follows:

Bottom depth <600m; bottom-200m, 200-100m, 100-50m, 50-20m, 20-0m

Bottom depth >600m; bottom-600m, 600-200m, 200-50m, 50-20m, 20-0m

All MPS samples were preserved immediately after sampling and stored on 4% formaldehyde solution buffered with hexamintetrahydrat. The MIK samples were splitted in two, half of the samples were frozen and half were stored on 4% formaldehyde solution. The frozen samples will be sent to Padmini Dalpadado, IMR for examination of gonad status of krill while the taxonomical sampled will be analysed either at NP or at IMR.

The zooplankton community in the inner part of Kongsfjorden was dominated by krill while the *Calanus* was dominating from Kb3 and further out.

Long-term environmental monitoring using benthic foraminifera in Kongsfjorden (MGP)

Responsible: *Katrine Husum (NPI)*

Surface sediment samples were collected at 5 stations in Kongsfjorden (Kb3, Kb2, Kb1, Kb0, FM) as part of the annual monitoring of Kongsfjorden using benthic foraminifera. The samples were preserved in ethanol with Rosa Bengal stain and will be analyzed at NPI.

Reconstructions of natural sea-ice and water mass variability (MGP)

Responsible: Katrine Husum (NPI), Arto Miettinen (NPI) & Stijn de Schepper (NORCE)

Two multicores (MC C) from stations Kb5 and Kb0 were sampled for dating/reference from top of the core, 0 cm, to the bottom. These samples were stored cold (maximum 5-10° C). Further processing and analysis will be carried out onshore at NPI.

Three multicores from stations Kb5, Kb3 and Kb0 were sampled for ancient DNA, biomarkers and palynology from top of the core to the bottom. Core from station Kb5 was sampled using a push up method, whereas cores from Kb3 and Kb0 were split using the Fein-saw tool and klorin-washed fish wire into a working half and an archive half.

Surface sediment samples (0-1 cm) were sampled at stations Kb5, Kb3, Kb2, Kb1, Kb0 and FM for ancient DNA from the same stations for proxy development.

Further processing and analysis (ancient DNA and palynology) will be carried out onshore at NORCE. Biomarkers will be analyzed by NPI. Archive halves from stations Kb3 and Kb0 were wrapped in cling film and aluminium foil and frozen at -20°C, and further processing and analysis will be carried out onshore at NPI.

Ocean Acidification

Responsible: *Agneta Fransson (NPI), Melissa Chierichi (IMR)* & *Claire Mourgues (IMR),*

Investigate the natural calcium carbonate saturation state (Ω) in the area around Svalbard. Influence of water mass composition (Atlantic, polar, fjordwater) and freshwater (glacier, sea-ice and river) on Ω. Distribution of *Calanus*, *Limacina helicina* will be related to Ω state. Pterodpods should be collected from Multinet and MIK when present and stored in 95% alcohol

Appendix 1

Participants

Function	Name	Affiliation	Email	#
Cruise leader/chief scientist	Katrine Husum	NPI	Katrine.husum@npolar.no	1
Engineer	Marius Bratrein	NPI	Marius.Bratrein@npolar.no	2
Marine geology	Arto Miettinen	NPI	arto.miettinen@npolar.no	3
Marine geology	Anna Pienkowski	NPI	Anna.pienkowski@npolar.no	4
Marine geology	Stijn de Schepper	NORCE	stde@norceresearch.no	5
Marine geology	Vårin Eilertsen	UiT	varin.t.eilertsen@uit.no	6
Marine geology	Viviana Gamboa Sojo	Uni Pisa	vi_gs1283@hotmail.com	7
Genomics	Catarina Magalhães	CIIMAR	cmagalhaes@ciimar.up.pt	8
Genomics	Maria Paola Tomasino	CIIMAR	Maripa.tomasino@gmail.com	9
Oceanography, CTD	Olga Pavlova	NPI	olga.pavlova@npolar.no	10
Oceanography, CTD	Gary Griffith	NPI	Gary.Griffith@npolar.no	11
Phytoplankton	Józef Wiktor	IOPAS	wiktor@iopan.gda.pl	12
Phytoplankton	Agnieszka Tatarek	IOPAS	derianna@iopan.gda.pl	13
Water chemistry (ocean acidification)	Claire Mourgues	IMR	claire.mourgues@hi.no	14
Zooplankton	Amalia Keck	NPI	amalia.keck@npolar.no	15
Zooplankton & diving	Haakon Hop	NPI	haakon.hop@npolar.no	16
Zooplankton & diving	Piotr Kuklinski	IOPAS	kuki@iopan.pl	17
Zooplankton & diving	Peter Leopold	NPI	peter.leopold1@gmail.com	18
Zooplankton & diving	Mikko Vihtakari	NPI	mikko.juhani.vihtakari@hi.no	19

NPI: Norwegian Polar Institute. NORCE: Norwegian Centre of Research. UiT: UiT – The Arctic University of Norway. CIIMAR: Center of Environment and Marine Research, Portugal. IOPAS: Institute of Oceanology, Polish Academy of Sciences, Poland. IMR: Institute of Marine Research.

Appendix 2

Sampling procedures

A sample-log on an excel sheet will be used during cruise to register each sample
A unique sample ID will be provided to label each sample
UTC time and date will be used in the sample log
Excel sheet will be uploaded to database after cruise

CTD

- 11 x 8L Niskin bottles (bottle #1 is from the deepest depth)
- Sensors: Chl, O_2, transmissometer 660 nm, PAR, sPAR
- One cast whole water column for biology & chemistry
- One extra cast for microplankton >20 µm
- One hand-net (20 µm) 25-0m

Order of sampling from ship CTD

1. **Methane** 160 ml serum bottles (OA team)
2. **DIC/AT** 250 ml glass bottle (OA team)
3. **$\delta^{18}O$** 15 ml DDPE vials (OA team/ Phytoplankton team)
4. **Nutrients** 20 ml acid washed vials (Phytoplankton team)
5. **Chlorophyll and phaeopigments** 50 -1000 ml al. covered bottles (Phytoplankton team)
6. **POC/PON** 200 -1000 ml plastic bottles (Phytoplankton team)
7. **Stable isotopes of carbon and nitrogen Isotopes** xxx ml bottles (ARISE team)
8. **Phytoplankton taxonomy** 250 ml brown glass bottles (Phytoplankton team)
9. **Microplankton (separate CTD cast)** 100 ml bottles (Phytoplankton team)

SAMPLING DEPTHS BIOLOGY (Chl, Part. absorption, POC/PON, BSi, Phytoplankton)
Upper 100m: 100, 50, 25, 10, 5m + Chl max

SAMPLING DEPTHS CHEMISTRY (Methane, DIC/AT, $\delta^{18}O$, Nutrients, Ammonium)
Entire water column: Bottom, intermediate layers (e.g. 200, 500, 1000m), 100, 50, 25, 10, 5m

SAMPLING DEPTHS STABLE ISOTOPES ARISE (carbon, nitrogen)
Upper 100m: 100, 50, 25, 10, 5, 0m

SAMPLING DEPTHS MICROPLANKTON (filter through) 20 µm
Below Chl max, Chl max, above Chl max

Methane

Responsible: Agneta Fransson (NPI) & Melissa Chierichi (IMR)

Methane is a volatile and relatively insoluble trace gas and so it is concentration in the seawater sample will be affected by prolonged contact with a headspace of air. It should therefore be sampled after SF6/CFCs and before dissolved oxygen and DIC/Alkalinity, or first if no SF6/CFC samples are drawn.

Sampling equipment
Silicone sampling tube (about 30 cm long)
160 mL serum bottles
Butyl rubber septa and metal crimp seals (best to assemble before sampling)

Crimping pliers
Eppendorf dispensing pipette (set to dispense 50 µL) and spare tips,
Gloves
☠ Saturated solution of mercuric chloride ☠

Sampling procedure

- Attach the flexible tubing to the Niskin bottle spigot and flush the tube with seawater to expel all air bubbles.
- Rinse a 160 mL serum bottle with the sample water then place the end of the tube in the bottom of the bottle and allow it to fill and then overflow by at least 2 volumes (as for dissolved oxygen samples) Slowly withdraw the tubing from the bottle, pinching it to reduce flow as the end reaches the neck of the bottle. The aim is to have a completely full bottle free of bubbles with a slight convex meniscus over the opening.
- Immediately add 50 µL (2 drops) of saturated mercuric chloride solution then seal the bottle with a metal seal and butyl rubber septum using the crimping tool.
- Store samples in a refrigerator at 4 ºC. Do not allow the samples to warm up to room temperature before analysis.
- Please rinse crimping pliers in fresh water after sampling.

Caution

Saturated mercuric chloride solution is highly toxic. Wear gloves during the sampling/poisoning procedure and wash hands afterwards

Dissolved Inorganic Carbon (DIC) and total alkalinity (AT)

Responsible: Agneta Fransson (NPI) & Melissa Chierichi (IMR)

- Samples for DIC and total alkalinity should be sampled right after the dissolved oxygen samples to avoid contamination from air.
- Fill the 250 ml Duran glass bottle from the bottom to the top and squeeze the tubing as to enable a **bubble free and controlled filling of sample**.
- Overfill the bottle with at least twice the bottle volume (keep the tubing to the bottom of the bottle). Fill up the bottle, and towards the end of the filling, slowly move the tubing out of the bottle. Close the cap.
- After all bottles have been filled, add 60 µL saturated mercuric chloride ($HgCl_2$) to each sample by submerging the pipette tip into the sample. Close the bottle with the blue cap. Do not shake or mix. Some headspace in the bottle (a few mL) is OK.
- Store the samples well marked, in cold and dark place. However, make sure they do not freeze. Best place is a cooling room at 4-6°C.

Nutrients

Responsible: Philipp Assmy (NPI), Jozef Wiktor (IOPAS) & Agnieszka Tatarek (IOPAS)

- Samples should be filled right from the Niskin-bottle into acid-washed 20 ml scintillation vials. Rinse the vial with water from Niskin.
- Allow some head space for the addition of chloroform.
- Add 0.2 ml (200 µl) of chloroform with the dispenser
- Close the cap tight (chloroform is very volatile) and do not shake or turn the vial.
- Put the sample in the fridge inside the tray they were delivered. Keep the trays because they are used to ship the samples to IMR in Bergen.

Figure 3 Acid washed 20 ml plastic scintillation vials used for nutrient samples.

Chlorophyll & Phaeopigments

Responsible: Philipp Assmy (NPI), Joseph Wiktor (IOPAS) & Agnieszka Tatarek (IOPAS)

Filtration

- Filter ca. 50-2000 ml (depending on biomass – a light colour on the filter is enough) from each depth through 25 mm GF/F filters.
- Use plastic sampling bottles wrapped in aluminium foil because Chl *a* is sensitive to light.
- **If no time for extraction**: Filters are placed in extraction tubes (10 ml PP-tubes) and frozen as cold as possible (liquid nitrogen, dry shipper or -80°C) immediately after filtering (if immediate analysis on board is impossible). Wrap samples in aluminium foil.

Extraction

- Work as dark as possible.
- Fold the filter once and place it in Chl *an* extraction vial.
- Add 5 ml methanol to the vial using a dispenser, put a lid on the vial and cover with aluminium foil.
- Extract it "over night" (12 hours) in a refrigerator. NB: Note the start and end time of extraction.
- Turn on Turner Design fluorometer at least 10 min before taking the first measurement.
- Vortex the tube for a few sec and let the sample adjust to room temperature before fluorometer reading.
- Transfer the sample to a clean borosilicate cuvette and dry the cuvette on the outside.
- Place the cuvette in the cuvette holder of the fluorometer and wait until readings have stabilized. Press ***** button on fluorometer (see picture below), it will first show **Delay**, then **Average** and finally **Done** on the fluorometer display. Read the value on the fluorometer. This is the Rb value (Reading before acid addition) to get the total chlorophyll.
- Take the cuvette out of the cuvette holder and add 2 drops of 5% HCl, cover the cuvette with parafilm and mix it gently 3 times. Read the value on the fluorometer. This is the Ra value (Reading after acid addition) to get the phaeopigment concentration.
- Wash cuvette with clean methanol between every sample and let it dry.
- Before start, and in between, use a methanol blank to check that the cuvette is clean and that the fluorometer is zero for methanol.

Calculations

- Concentrations are calculated based on calibrating data (see xls-file Chlorophyll_N-ICE_2015)
- In the same xls-file under the measurement spread sheet, type in the methanol and filtered volumes and the Rb and Ra values. This will give you the chlorophyll and phaeopigment concentrations.

Particulate organic carbon and nitrogen (POC/PON)

Responsible: Philip Assmy (NPI), Joseph Wiktor (IOPAS) & Agnieszka Tatarek (IOPAS)

- Filter 200 - 2000 ml, depending on particle concentration, on pre-combusted 25 mm GF/F filters (the filters were combusted at 450°C for 12 hours and are stored in aluminium foil).
- After filtration, each GF/F filter should be directly placed into Pall filter slides and dried at 60°C in a drying oven and thereafter stored at room temperature. Wrap filter slides from one station in aluminium foil and keep them in a labelled Ziploc bag.
- For each sampling day or event, prepare a reference filter by filtering MilliQ water through a filter (similar volume than sea water for the samples) and treating it the same way than the samples. The reference filters get normal sample running number (but make an additional note "MilliQ" on the sample label/analysis slide) and are noted in the filtering protocol and log sheet. Make also a note on CTD log sheet to avoid confusion with numbering on following casts.

Phytoplankton

Phytoplankton taxonomy - CTD

Responsible: Philipp Assmy (NPI), Joseph Wiktor (IOPAS) & Agnieszka Tatarek (IOPAS)

- 190 ml of seawater from each depth are filled into 200 ml brown glass bottles. Fill 200 ml measuring cylinder up to 190 ml mark directly from Niskin bottle and decant into brown glass bottle.
- Under the fume hood, phytoplankton samples are fixed with an aldehyde mixture: First add 0.8 ml of 25% glutaraldehyde and fix for approx. 5 min. Thereafter add 10 ml of 20% hexamine-buffered formaldehyde (to achieve a final concentration of 0.1% and 1%, respectively).
- Store the samples dark and cold, **do not freeze**!

Microplankton (>10µm) CTD extra cast

Responsible: Philipp Assmy (NPI), Joseph Wiktor, Agnieszka Tatarek

- One extra CTD cast is sampled for microplankton >10 µm at three depths in the upper 50 m (5, 25 and 50 m).
- Three Niskin bottles (24 L) are closed per depth and the entire contents from each depth drained into 25 L carboys. Note the volume in the carboy.
- The contents of the 25 L carboys are then filtered over 10 µm mesh
- Samples are concentrated to 90 ml (measure with 100 ml cylinder) and filled into 100 ml brown glass bottles.
- Under the fume hood, samples are first fixed with 3 ml strontium chloride stock solution and then 10ml of 20% hexamine-buffered formaldehyde (final concentration of 2%).
- Store the samples dark and cold, **do not freeze**!

Rare taxa 20 µm hand-net

Responsible: Philipp Assmy (NPI), Joseph Wiktor (IOPAS) & Agnieszka Tatarek (IOPAS)

Vertical hauls (upper 20 m) with a 20 µm hand-net for taxonomy of rare taxa, biomass measurements, SEM/TEM material and HBIs' material. **Never** tow hand-net with the winch!

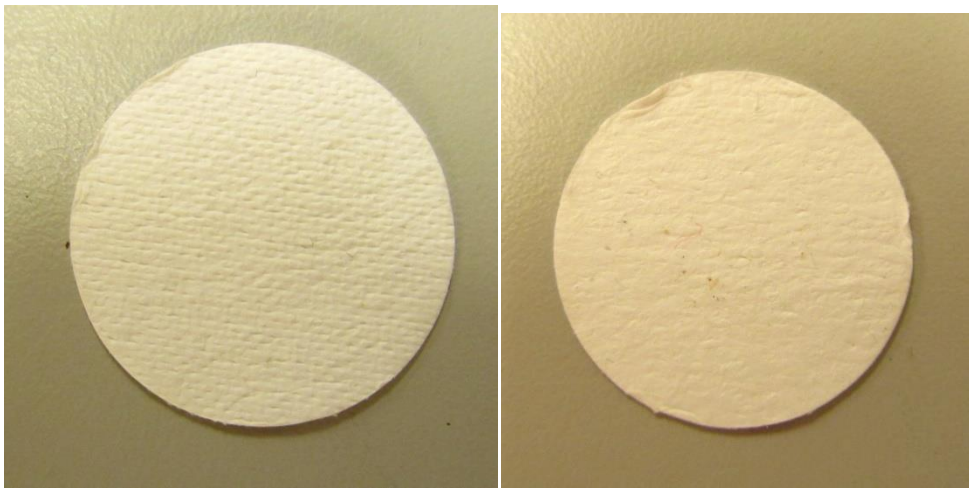
Figure 4 Phytoplankton hand net 20 µm

- Connect the hand-net to the provided blue rope and attach a 1-2 kg shackle (ask crew) below the cod end.
- Make sure that the valve of the cod end is closed when lowering the hand-net.
- Wait until <90 ml is left in the cod end (less than half of the cod end volume), open valve and drain hand-net sample into 100 ml measuring cylinder. Fill up measuring cylinder to 90 ml by flushing the mesh of the cod end with squeeze bottle. Fill content of the measuring cylinder into 100 ml brown glass bottle.
- Under the fume hood, fix hand-net samples first with 3 ml strontium chloride stock solution and then 10 ml of 20% hexamine-buffered formaldehyde (final concentration of 2%).
- Store samples dark and cold, **do not freeze**!

Figure 5 Brown glass bottles 200 ml (phytoplankton taxonomy) and 100 ml (microplankton >20µm & hand-net taxonomy).

General filtration guideline for particulates

- Collect seawater from the Niskin bottles from standard depths down to 100 m. Rinse the plastic bottle with sample water (~100 ml) before collecting the sample.
- Remember to **gently** mix the bottle (turn upside down for a couple of times) before filtering to ensure that no particles settle down (results in uneven concentration if subsampling the sampling bottle).
- Be sure to have placed the filter in the middle of the filter holder and that the funnel is thoroughly placed on top of it (if something is leaking the exact volume filtered or the filtration area on the filter is not known – these are needed for the calculations later).
- The two sides of the GF/F filter are not identical – for particulate absorption it is important to place it the right way (see photos below) – to make it simple use the same orientation for all parameters.
- Use low vacuum pressure (about -30 kPa). Always have the valve of the filtering funnel closed before turning the pump on or off.
- Cover the funnels with aluminium foil when filtering. If you expect to filter 1 L or 2 L, you can place the respective plastic bottle into the funnel and let it run. Please also note that the 0.5 and 1 L mark are indicated on the plastic sampling bottles.
- Rinse the funnel with filtered seawater (collect filtered sea water from previous filtrations) once the sample has been filtered. Do not let the filters dry out, close the valve.
- Use forceps to lift filters onto the sample containers (analysis slides (POC/N), petri dishes (BSi), cryovials (HPLC), white dishes/petri slides (particle absorption), plastic tubes (Chl)). Note that some filters are folded before placing them into the containers, whereas others remain flat.
- Rinse the filtration equipment with MilliQ before the next sample. Cover filtration funnel with aluminium foil when not used.



Mesh side – PARTICLES ON THIS SIDE. Soft “wave” side – back side.

Figure 6 Showing the different sides of the filters.

Zooplankton

Mesozooplankton- Multinet

Responsible: Anette Wold (NPI) & Haakon Hop (NPI)

Zooplankton is sampled with the Multinet from 5 standard depths:
Bottom depth <600m: bottom-200-100-50-20-0 m
Bottom depth >600m: bottom-600-200-50-20-0 m

Prepare Multinet:

- Check that the small pin on the rotating cylinder is in the right position (if not see instructions below).

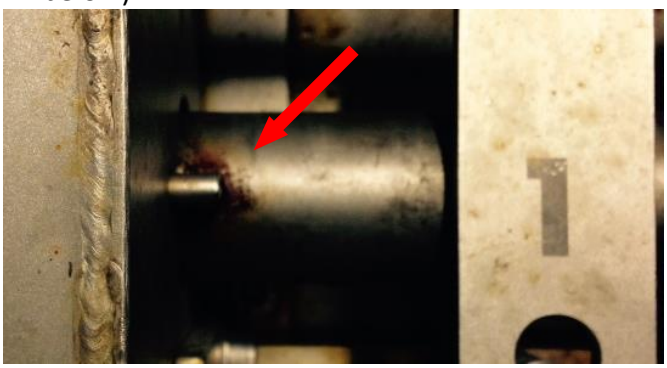


Figure 7 There is a small pin on the rotating cylinder which should point straight at the pin seen here.

- Turn on the Multinet
- Connect Multinet to the Toughbook, open program "OceanLab3" from desktop.
- Check the battery status (should be >7)
  - Connect to Multinet using *connect symbol* (1st from left in menu bar)

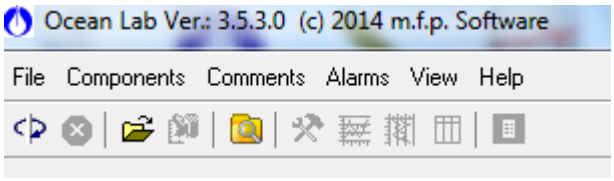


Figure 8 Menu bar of the Ocean Lab software

  - Open the *control mode* (6th from left in menu bar)
  - Choose *Pressure programming* to program the releasing depth. Remember that the Unlock depth must be minimum 1 m below the depth of the 1st net. The nets do not open if the Multinet has not been set below the unlock depth. Always go at least 10 m below to make sure it opens (if not the cast needs to be repeated).
  - Send to Multinet.

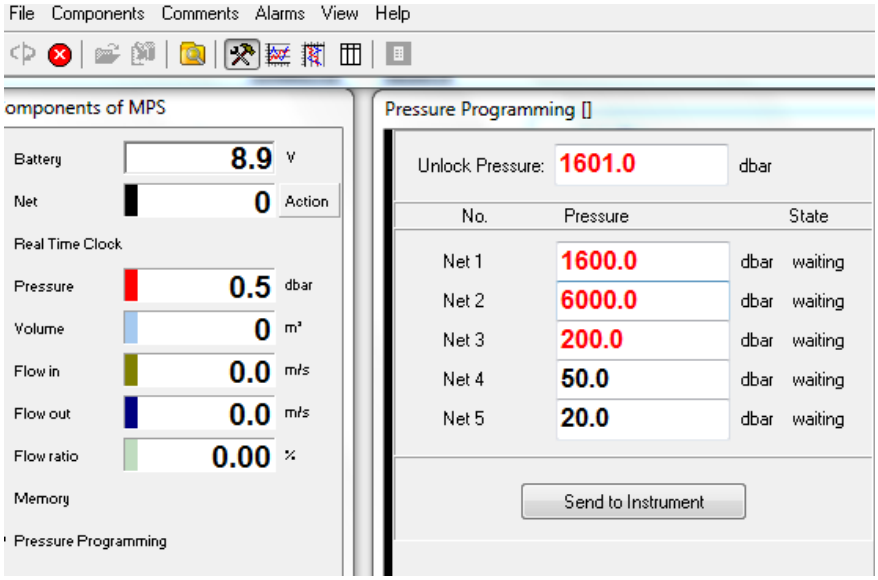


Figure 9 Pressure programming. Unlock pressure needs to be deeper than opening depth of Net 1 (depth of Net 2 is wrong in this picture, should be 600m).

- Disconnect Multinet. **Remember to put dummy plug back on.**

If not all the net opened during the previous deployment, check that the small pin of the rotating cylinder that controls the opening of the nets, is in the right position, pointing straight up towards the pin at the net (see picture above). If not mark *Net* and reset the rotating cylinder either by using *reset counter* or *half step*.

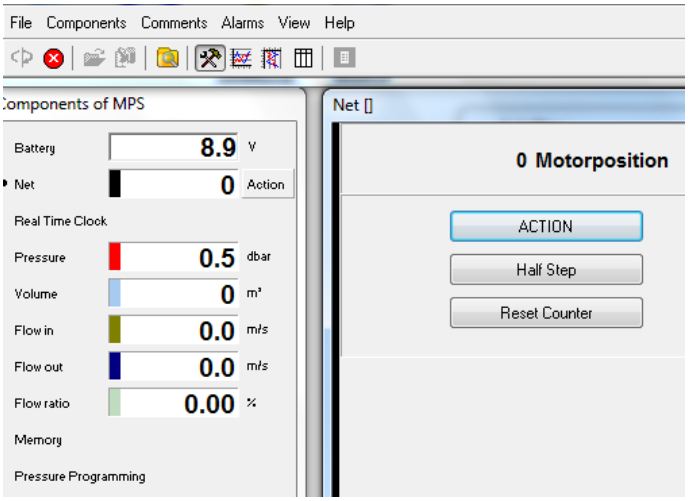


Figure 10 Mark *Net* in the right menu and use *Half step* to reset rotating cylinder

- Prepare the nets (strain the spring by using the bar to lift them into position).

- Net #1 samples the deepest layer, Net# 5 the surface layer.
- Make sure that cod ends are placed at the right net (check numbers)!
- Make sure that the nets are not twisted before the Multinet is lowered into the water.
- The weight of the lower part of the Multinet should be entirely supported by the ropes and not by the nets! (The nets have to hang loose; the ropes should be straight).

Depth sensor /Scanmar

The Scanmar must be mounted to the frame of the net and the receiver must hang overboard. They are attached to the nets using solid rubber cords.
The Scanmar works down to approx. 1500 m. When deeper use the Ek 60 to check the depth of the Multinet.

Receiving net:

- Flush net with water hose when it comes on deck.
- Before removing the cod end, make sure that water level is low enough (can been seen through the mesh of the cod end), otherwise part of the sample will spill over when cod end is removed! (This may be a problem when nets are clogged by high abundance of phytoplankton in the water).

Sample treatment Abundance samples:

- Filter contents of cod end through a sieve (mesh size 200 µm) placed over a white plastic tray (in case something gets spilled). Flush cod end with wash bottles filled with sea water.
- Larger jellies (ctenophores and cnidarians) should be removed prior to preservation (as they disintegrate in formalin, which makes enumeration of other zooplankton species, especially small ones, much more difficult). The removed species names and abundances should be recorded in the sample-log.

- The sample is then transferred from the sieve into 125 ml bottles (or larger if samples are dense).
- Fill bottles to the neck with sea water (red arrow)
- Add 10 ml formalin and a bit of hexamine
- Label bottles from the outside and place label

Macrozooplankton - MIK net

Responsible: Anette Wold (NPI) & Haakon Hop (NPI)

Samples are taken from bottom to surface

Equipment & fixatives:

- 250- or 500-ml bottles
- Zip bags
- 37% formaldehyde solution buffered with hexamintetrahydrat

Sampling:

- Flush the net with the hose before removing the cod end.
- Transfer sample into large bucket.
- Split sample in two using a plankton splitter.
- 1 part is fixed in formalin (same as for Multinet).
- 1 part is frozen at -80^{o}C.
- Label bottles from the outside and place label inside.

Miljøprøvebanken mix zooplankton sampling– MIK net

Responsible: Ingeborg Halanger (NPI)

Collection and handling of samples and material should be carried out in order to avoid contamination of potential environmental pollutants and protect the samples from any kind of impact that will affect their usages as research and reference materials.

Mix marine zooplankton should be collected using a MIK (Method Isaac Kid) (mesh size 1000 µm and 500 µm at the end, 3.14 m^2 opening). Samples should be taken from the whole water column, hauling speed ~1 ms^{-1}. All specimen of jellyfish, krill (Euphasiids) and *Themisto abyssorum* and *T. libellula* should be removed from the mix samples. These species are removed from the mix since they are relatively easy to sort out, and due to size have the potential to distort and misrepresent the mix sample. The mix marine zooplankton is sieved through stainless steel sieves to easier sort out the mentioned unwanted species. All equipment should be washed in lab grade ethanol before sampling and between replicates. Mix zooplankton samples are stored in pre burned brown glass vials (50 ml) with pre burned aluminium foil covering the inside of the screw on cap. The bottle cap is then sealed with parafilm before storage at -20 ˚C.

Each mix zooplankton sample should be at least 10 g. As long as the plankton hauls give enough material, 10 samples should be collected for each year and they should be as similar as possible with regards to mix of species.

Sediment sampling

Surface sediment sampling and paleo sampling – multi corer

Responsible: Katrine Husum (NPI), Arto Miettinen (NPI) & Stijn de Schepper (NORCE)

The upper 0-1 and 1-2 cm will be sampled immediately (100 ml of sediments). The foraminiferal samples will be preserved with ethanol and Rosa Bengal stain and kept in small plastic sediment containers/bottles. All samples should be stored cold (maximum 5-10° C). Further processing and analysis will be carried out onshore at NPI. Selected cores were also sampled for reconstructing paleo records of sea ice and ocean temperatures. Those cores were sampled for every cm, and the samples will be processed onshore at NPI and NORCE.

Diving

Collection of benthos species and coralline algae

Responsible: Haakon Hop (NPI)

Diving will be carried out using a boat (Polarsirkel) from Sverdrup Station in Ny-Ålesund. Divers will be transported to Ny-Ålesund by zodiac/polarsirkel onboard from "Helmer Hanssen" or will embark from the research vessel for one day at Ny-Ålesund. There will be two dives: one on the southern side of Kongsfjorden near Ny-Ålesund and one at the fjord mouth on the northern side of Kongsfjorden (Kvadehuken). Samples of predatory snail, clams and tunicates will be collected for an ongoing NPI-project on microplastic in species with different affiliation to the sediments (e.g. rock bottom, on sediment, buried).