INSTITUTE OF OCEANOLOGY
POLISH ACADEMY OF SCIENCES

REPORT
FROM THE RESEARCH CRUISE
AREX 2014
7.06 - 25.08.2014

Coordination

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1. Leg I and II, Gdansk-Oslofjord-Oslo, 7-12.06.2014

1.1. Scientific goals

- Evaluation of the bottom sediments in the Drammensfjord and Oslofjord, based on concentrations of organic carbon (Corg), pigments, trace elements and isotopes (TEI), polycyclic aromatic hydrocarbons (PAHs), organotin compounds, and nonylphenols. Evaluation of sedimentation rate and granulometry (project CLISED).
- Studies of biotoxins and phytoplankton producers of biotoxins in contemporary bottom sediments from Drammensfjord and Oslofjord (project CLISED).
- Determining the activity of bottom sediments in the Oslofjord and Drammensfjord: mutagenic , genotoxic and endocrine perturbation (project CLISED).
- Observations of the Baltic Sea outflow and mixing with the North Sea water masses in Danish Straits (project CDOM-HEAT).
- Determining the composition of CDOM in the Oslofjord and Danish Straits (project CDOM-HEAT).
- Determining the droplet emission, ocean-atmosphere fluxes of CO2, sensible and latent heat, characteristics of ocean aerosols, optical depth of atmosphere and ozone concentrations in the studied area.

1.2. Work at sea

- Collection of bottom sediment samples with the GEMAX corer in the Drammensfjord/Oslofjord (60 cores).
- Hydrographic measurements in the the Drammensfjord/Oslofjord (CTDO casts).
- Collection of water samples (underway between Gdansk and Oslo and on selected stations in the Drammensfjord/Oslofjord for measurements of the CDOM spectral absorption and fluorescence.
- Optical measurements of spectral coefficients of CDOM absorption and fluorescence and temperature and salinity measurements underway between Gdansk and Oslo and on selected stations in the Drammensfjord/Oslofjord. Collection of water samples for analyses of chla concentration, DOC concentration, absorption coefficients of suspended matter and CDOM, and CDOM fluorescence excitation-emission matrices. Collection of water samples for analysis of photosynthetic pigments concentrations by HPLC.
- Measurements of concentrations and size distributions of marine aerosols with PMS, CPC and LAS. Measurements of the optical depth of atmosphere.
- Measurements of wind components, and humidity and CO2 concentrations with CO2 LICOR.

2. Leg III, Oslofjord-Skagerrak-North Sea-Norwegian Sea, 12-16.06.2014

2.1. Scientific goals

- Observations of the Baltic Sea outflow and mixing with the North Sea water masses in Danish Straits (project CDOM-HEAT).
- Evaluation of spatial variability of the optical properties in the ocean surface layer (project SatBaltyk).
- Evaluation of spatial distribution of magnitudes and spectral characteristics of optical CDOM absorption and fluorescence on the North Sea and Norwegian Sea shelves in the Norwegian Coastal Current (project CDOM-HEAT).
- Evaluation of the DOM composition based on spectral characteristics of CDOM absorption and fluorescence on the North Sea and Norwegian Sea shelves in the Norwegian Coastal Current to validate the statistical multiparameter model PARAFAC (project CDOM-HEAT).
- Observations of inherent and apparent optical properties of different water masses to test their ranges of variability for improvement of satellite algorithms (project SatBaltyk).
- Determining the droplet emission, ocean-atmosphere fluxes of CO2, sensible and latent heat, characteristics of ocean aerosols, optical depth of atmosphere and ozone concentrations in the studied area.

2.2. Work at sea

- In-situ measurements of the apparent optical properties of sea water in the studied area and collection of samples for laboratory analyses.
- Collection of water samples for measurements of the CDOM spectral absorption and fluorescence.
- Optical measurements of spectral coefficients of CDOM absorption and fluorescence and temperature and salinity measurements underway in the Oslofjord and Norwegian Coastal Current. Collection of water samples for analyses of chla concentration, DOC concentration, absorption coefficients of suspended matter and CDOM, and CDOM fluorescence excitation-emission matrices. Collection of water samples for analysis of photosynthetic pigments concentrations by HPLC.
- Measurements of concentrations and size distributions of marine aerosols with PMS, CPC and LAS. Measurements of the optical depth of atmosphere.
- Measurements of wind components, and humidity and CO2 concentrations with CO2 LICOR.

3. Leg IV, Ullsfjorden, 17-19.06.2015

3.1. Scientific goals

- Studies of taxonomic and size structure of meio- and makrobenthos communities and Foraminifera in Ullsfjorden (projects DWARF and BIOSIZE).
- Determination of taxonomic and size structure and evaluation of functional role and productivity of plankton communities in epipelagial along the temperature gradient from boreal to polar zones (project DWARF).
- Evaluation of benthic productivity in the Ullsfjorden (projects DWARF and BIOSIZE).
- Determination of size structure of selected macrozoobenthos species and zooids of selected Bryozoa species project DWARF).
- Evaluation of environmental parameters (hydrographic conditions, organic matter concentration and granulometry), impacting the distribution of pelagial and benthic fauna in the Ullsfjorden (project DWARF).
- Evaluation of accumulation rates and bioturidity in sediments (project DWARF).
- Evaluation of the influence of changes in sea water chemistry on structure and abundance of marine invertebrates with calcareous skeleton (project PolNor).

3.2. Work at sea

- Collection of epibenthos samples with the epibenthic and box dredge at 4 stations in the eastern part of the Ullsfjorden.
- Collection of soft-bottom and plankton samples at 5 stations in the central part of of the Ullsfjorden with Nemisto corer (sedimentation samples) and van Veen grab and box corer (for biological samples).
- Collection of water samples for chla concentration, mesozooplankton samples with MPS net and microzooplankton samples with WP2/60 net at 5 stations in the central Ullsfjorden.
- Optical measurements of vertical profiles of size and distribution of planktonic organisms with laser optical particle counter (LOPC).

4. Leg Va (Norwegian Sea-southern Fram Strait, 21.06-7.07) and Vb (Fram Strait-northern Nansen Basin, 8-23.07.2015)

4.1. Scientific goals

Large oceanic exchanges between the North Atlantic and the Arctic Ocean result in the strong conversion of water masses when warm and salty Atlantic water (AW), transported through the Nordic Seas into the Arctic Ocean undergo cooling, freezing and melting. As a result it is transformed into freshened shelf waters over the shallow shelves, sea ice and dense (and highly saline) deep waters. Southward transport of the Arctic origin waters is one of main mechanisms of the global thermohaline circulation (THC). Better understanding of the variability of volume and heat transports between the North Atlantic and Arctic Ocean as well as processes of water mass conversion is necessary for improved qualitative and quantitative estimation of the large-scale meridional overturning circulation and its role in shaping the climate change in the northern hemisphere on inter-annual to decadal time scales.

Fram Strait is the only deep passage linking the Nordic Seas and the Arctic Ocean. The northward transport of warm and salty Atlantic water, carried by the Norwegian-Atlantic Current and farther by the West Spitsbergen Current, has a significant impact on conversion and circulation of water masses in the Arctic Ocean as well as on sea ice and atmospheric fluxes in the Arctic. The complex bottom topography of the northern Greenland Sea and Fram Strait results in splitting of both currents into several branches, located along the underwater ridges and the continental slope. Spatial extent and relative intensity of these branches to a great degree determine oceanic heat flux into the Arctic Ocean.

The Institute of Oceanology Polish Academy of Sciences (IO PAS) in Sopot has been carrying out the oceanographic, atmospheric, biogeochemical and ecological observations in the Nordic Seas and Fram Strait since 1987. The main aim is to recognize and describe processes of the ocean-atmosphere interactions and exchanges, ocean climate and ecosystem of the sub-Arctic and Arctic regions with the special focus on the European Arctic. Initially the long-term observations had been carried under national projects and later continued in the frame of international European projects VEINS (Variability of Exchanges in the Nordic Seas, 1997-2000), ASOF-N (Arctic and sub-Arctic Oceanic Fluxes - North, 2003-2005), DAMOCLES (Developing Arctic Modelling and Observing Capabilities for Long-term Environment Studies, 2006-2009). In recent years the annual measuring campaigns in the Nordic Seas, Fram Strait and in last 2 years in the northern Nansen Basin took place under the Polish-Norwegian projects (Polish-Norwegian Funds) AWAKE, AWAKE-2 and PAVE as well as under the statuory research programs of IO PAS the GAME project, funded by NCN.

During the Va and Vb legs of the research expedition AREX2014 the following scientific tasks and questions were addressed:

- Structure and dynamics of the Norwegian-Atlantic and West Spitsbergen Currents (projects PAVE and AWAKE-2).

- Variability of temperature, salinity and sea currents over the shelf and continental slope west and north of Svalbard (projects PAVE and AWAKE-2).
- Estimation of the volume and heat transport by the West Spitsbergen Current (projects PAVE and AWAKE-2).
- Variability of water masses and circulation in the Horsund fjord (projects AWAKE-2, GAME, GLAERE).
- Overflow of dense brine waters in the Storfjordrenna (project MIXAR).
- Distribution of water masses and mixing processes in the frontal zones from distributions of temperature, salinity and nutrients (projects PAVE, AWAKE-2, MIXAR).
- Spatial distribution of magnitudes and spectral characteristics of optical CDOM absorption and fluorescence on the west Spitsbergen shelf and in the north-eastern Fram Strait and Barents Sea Opening (project CDOM-HEAT).
- DOM composition based on spectral characteristics of CDOM absorption and fluorescence on the west Spitsberhen shelf and in the north-eastern Fram Strait and Barents Sea Opening to validate the statistical multiparameter model PARAFAC (project CDOM-HEAT).
- Solar radiation transmission in the water column on the west Spitsbergen shelf and in the north-eastern Fram Strait and Barents Sea Opening (project CDOM-HEAT).
- Inherent and apparent optical properties of different water masses to test their ranges of variability for improvement of satellite algorithms (project SatBaltyk).
- Estimation of the droplet flux from the sea surface and their impact on ocean-atmosphere mass and energy exchanges;
- Estimation of the vertical CO_2 fluxes in the atmospheric boundary layer;
- Estimation of latent and sensible heat fluxes between ocean and atmosphere;
- Description of marine aerosols in the Arctic region, aerosol optical thickness and ozone concentration in atmosphere;
- Observations of the spectral characteristics of light transmission in the euphotic zone and outgoing radiation in the West Spitsbergen fjords;
- Description of the spatial distributions and quantitative-qualitative composition of zooplankton communities in the epi- and mesopelagic zones in the Norwegian-Atlantic and West Spitsbergen Current (project PAVE).
- Genetic diversity in zooplankton population of Calanus species in the Norwegian-Atlantic and West Spitsbergen Current.
- Observations of spatial distribution and quantitative-qualitative composition of zooplankton communities in Isfjorden with with laser optical particle counter (LOPC) validated against net sampling (project UniPlankton).

4.2. Work at sea - oceanography

During the AREX2014 expedition (legs Va and Vb) all oceanographic measurements were conducted on the station grid consisting of standard sections repeated annually since 2000, and along new sections located north of Svalbard. Location of oceanographic sections s shown on Fig. 1. During the fifth leg of the cruise 213 full-depth CTD stations were measured (96 stations during the leg Va and 117 stations during the leg Vb), providing profiles of temperature, salinity, dissolved oxygen and

fluorescence (as proxy for chla). The standard CTD system Seabird 9/11+ was equipped with double pairs of temperature and conductivity sensors (primary temperature SBE3 SN4670, primary conductivity SBE4 SN3342, secondary temperature SBE3 SN2937, secondary conductivity SBE4 SN2971) and pressure sensor Digiquartz 410K-105 SN100967. Additionally CTD system carried two oxygen sensors (one standard SeaBird sensor SBE43 SN1620 and Rinko optode SN72, connected directly to the CTD registration system), fluorescence sensor SeaPoint SN2935 and altimeter Benthos PSA-916 SN51308. The CTD system was mounted on the SeaBird bathymetric rosette (carousel) equipped with 9 large Nansen bottles (12 l each and 3 small bottles (1.75 l each). Originally the rosette is designed to carry 12 large bottles but due to the mounting system for LADCP only 9 bottles can be use in the current configuration. RDI Teledyne Workhorse 300 kHz SN21589 was used as Lowered Acoustical Doppler Profiler (LADCP), mounted in downward-looking configuration. The collected CTD data were registered on the PC hard drive with a second back-up on the same unit and third one on the external drive. The preliminary data processing was done in the near-real time while the final data set will be available after the post-cruise calibration of sensors. The LADCP data were read out after each station and stored in single files for each cast.

All sensors of the CTD system have been working properly during the Va and Vb legs of the cruise. Due to difficult weather conditions (high sea state, followed by strong swell) a part of stations at the section EB2 was measured without the carousel, only with lower frame carrying the CTD probe without altimeter. The rest of stations were measured and sampled with the full system.

28 water samples were collected from a deep layer of small vertical gradients of hydrographic properties at 11 stations for calibration of conductivity sensor. Additionally 244 water samples at 46 stations were collected and frozen at -5°C for post-cruise lab analysis of nutrients and $_{16}O$ and $_{18}O$ tracers.

During the entire cruise the underway measurements of sea currents in the upper ocean of approx. 300m depth were collected with the Vessel Mounted Acoustic Doppler Current Profiler (RDI VM-ADCP 150 Hz).

CTD casts were distributed along 14 hydrographic sections in total, 6 section during the Va leg and 8 sections during the Vb leg of the cruise. The standard sections EB along 78°50'N, EX and WB had to be shortened due to unfavorable ice conditions (ice edge at 2°E). Section Y was shifted to run along the ice edge and extended by section YY. The detailed list and schedule of CTD casts is given in the station list (Att. 1) and cruise itinerary (Att. 2).

During the Va leg one high resolution hydrographic section with a towed CTD scanfish system was measured in vicinity of the Horsung outlet across the shelf break and shelf. Due to unplanned shift of the section N from the leg Va to the leg Vb and resulting lack of ship time, none of planned high resolution scanfish sections north of Svalbard were measured.

For the quasi-continuous year-long oceanographic observations, two moorings were recovered and one mooring was deployed during the Va leg of the AREX2014 cruise. The mooring MIXAR-1, equipped with CTD sensor Seabird SBE37 and 5 thermistors TinyTag, deployed in 2013 next to the section N, could not be recovered (lack of

contact). Mooring AWAKE-2 deployed in 2013 in the Horsund outlet was recovered on July 5, 2014. The current meter RDCP600 was displaced from the bottom frame and tilted during entire deployment, therefore it recorded no valid data. CTD sensor Seabird SBE37 at this mooring was lost. Mooring AWAKE-3, deployed in the central part of Horsund in 2013 and equipped with RDCP600 and a string of TinyTag temperature sensors (owned by NPI), was successfully recovered on July 5, 2014. Mooring AWAKE-3 was deployed at the position 76°59.069'N 016°10.932'E at the depth of 76 m on July 6, 2014. Additionally, during the leg Va, a few hours were used to search for the earlier mooring AWAKE-2, located next to the Hans glacier and lost in 2013.

4.3. Work at sea - plankton sampling

During the 2nd leg of AREX2013 the zoo- and phytoplankton samples were collected at the selected stations in the Norwegian, Barents and Greenland Seas for post-cruise analysis.

Standard AREX2014 stations

Zooplankton samples were collected with use of the WP2 nets (180µm) at the stations: H4, H10, H13, H19, V15, V27, V31, K4, K7, K10, K16, O-5, O-7, O-11, O4, O-4. A few planned stations (K16 and M4) were skipped due to unfavourable weather and sea state conditions. Stations at the section O were adjusted to the changed on the fly measurement schedule (skipped stations O-13 and O-9). Collected zooplankton samples were treated with formaldehyde (4%) with addition of borax.

Based on the CTD profiles, three layers were identified during each sample collection: deep layer (DL), intermediate layer with thermocline (IL) and mixed surface layer (ML). Except station O-11 where technical problems with premature closing of the net during rough sea conditions occurred, all other stations reflect stratification in the water column.

Stations of the PAVE project

At the PAVE project's stations the samples were collected with Hydrobios WP2/60 net, hand net, bathometers at the CTD carousel and Multi-Net (Multi Plankton Sampler). Additionally light transmission depth was measured with Secchi disk. Samples were collected at all planned stations: V8, V9 and V13. Samples were treated according to standard procedures.

4.4. Work at sea - meteorological and aerosol measurements

Atmospheric measurements during Va and Vb legs of the AREX2014 cruise were aimed in studying variability of the vertical structure of the marine aerosols physical and optical properties in the polar region and their impact on solar radiation (direct climatic impact). The measurements included:

- Measurements of the vertical concentration of marine aerosols with laser particle counter (PMS) and condensation particles counter (CPC).
- Parallel infrared measurements of CO_2 and H_2O in atmosphere with the analyser LI-7500A.
- Measurements of aerosol optical properties with photometer Microtops II.

- Estimation of spatial and temporal variability of physical properties of marine aerosol.

Collected data will be applied for description of the direct aerosol effect thus they will contribute to improvement of climate models. This study is carried on under the frameworks of international projects POLAR-AOD (www.nadc.isti.cnr.it:8080/PolarAOD/jsp/home/) and ASTAR-Arctic Study of Tropospheric Aerosols, Clouds and Radiation (http://www.awi-bremerhaven.de/www-pot/astar/index.html).

Additionally the meteorological observations 'SHIP' were collected 8 times per day during the entire cruise except the fjord leg. Collected meteo data will be used for validation and calibration of the ship automatic meteorological station 'Observator'. Data will be archived in and accessible from the IOPAS database.

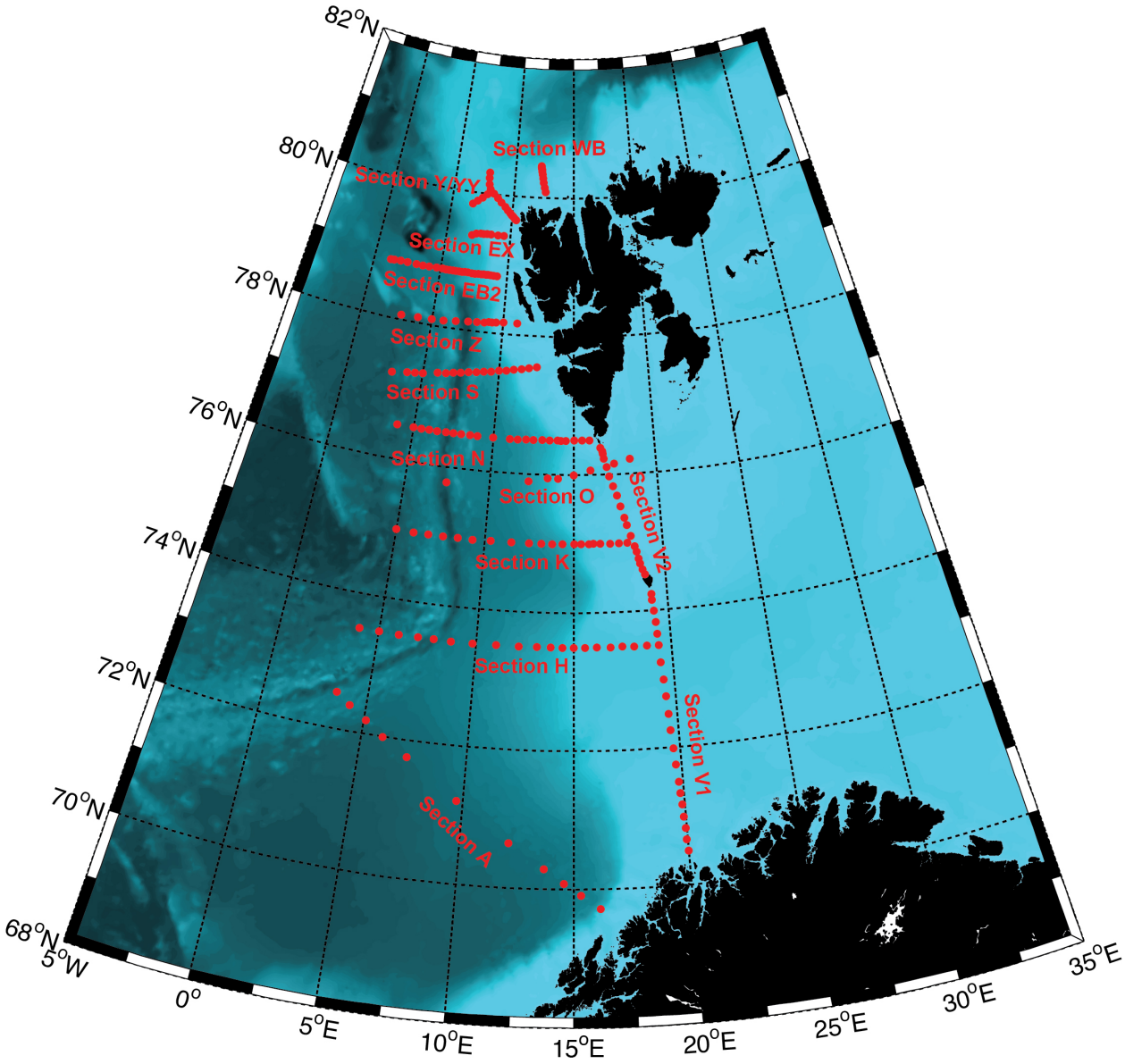

Fig. 1 Distribution of CTD stations during the open ocean part (legs Va and Vb) of the AREX 2014 cruise (21.06 - 23.07.2014).

Attachment 1 List of stations measured during the open ocean part of the AREX2014 cruise in the Norwegian Sea, Barents Sea Opening and Fram Strait.

File	Station	Latitude	Longitude	Water depth	Max pressure	Day	Month	Year	Hour	Minute
AREX2014 Leg Va										
ar14_001	H1	73.500	18.752	431	430	23	6	2014	11	0
ar14_002	H2	73.499	18.096	413	410	23	6	2014	13	22
ar14_003	H3	73.501	17.487	427	426	23	6	2014	15	24
ar14_004	H4	73.500	16.870	445	442	23	6	2014	16	52
ar14_005	H6	73.500	16.167	461	459	23	6	2014	18	29
ar14_006	H7	73.500	15.583	482	480	23	6	2014	19	49
ar14_007	H4	73.500	15.002	687	689	23	6	2014	21	16
ar14_008	H8	73.500	14.418	1016	1020	23	6	2014	23	19
ar14_009	H9	73.500	13.833	1298	1308	24	6	2014	1	1
ar14_010	H10	73.500	13.108	1578	1593	24	6	2014	3	4
ar14_011	H11	73.500	12.198	1806	1799	24	6	2014	6	9
ar14_012	H12	73.500	11.036	2065	2089	24	6	2014	9	1
ar14_013	H13	73.500	9.833	2294	2323	24	6	2014	12	24
ar14_014	H14	73.499	8.723	2486	2519	24	6	2014	15	26
ar14_015	H15	73.504	7.826	3019	3066	24	6	2014	19	25
ar14_016	H16	73.504	7.028	2296	2325	24	6	2014	22	46
ar14_017	H17	73.501	6.029	1923	1946	25	6	2014	2	5
ar14_018	H18	73.502	5.027	2739	2779	25	6	2014	5	4
ar14_019	H19	73.500	3.999	2806	2847	25	6	2014	8	36
ar14_020	A17	72.533	3.496	2203	2232	25	6	2014	16	55
ar14_021	A16	72.376	4.209	2395	2427	25	6	2014	20	48
ar14_022	A15	72.202	5.104	2786	2826	26	6	2014	0	8
ar14_023	A14	72.000	5.994	2854	2896	26	6	2014	3	59
ar14_024	A13	71.758	7.250	2814	2856	26	6	2014	8	7
ar14_025	A11	71.207	9.713	2633	2669	26	6	2014	14	40
ar14_026	A9	70.649	12.149	2617	2654	26	6	2014	21	43
ar14_027	A7	70.292	13.722	2620	2655	27	6	2014	3	20
ar14_028	A5	70.084	14.585	2517	2553	27	6	2014	7	25
ar14_029	A3	69.912	15.313	2296	2325	27	6	2014	10	56
ar14_030	A1	69.715	16.125	1178	1187	27	6	2014	14	6
ar14_031	V1	70.496	19.993	133	128	27	6	2014	23	48
ar14_032	V2	70.662	19.936	163	156	28	6	2014	1	15
ar14_033	V3	70.823	19.933	184	178	28	6	2014	2	29
ar14_034	V4	70.989	19.902	188	183	28	6	2014	3	57
ar14_035	V5	71.167	19.873	212	213	28	6	2014	6	1
ar14_036	V6	71.332	19.837	282	211	28	6	2014	8	18
ar14_037	V7	71.496	19.801	243	238	28	6	2014	10	37
ar14_038	V8	71.751	19.742	271	267	28	6	2014	12	37
ar14_039	V9	71.987	19.688	313	308	28	6	2014	15	55
ar14_040	V10	72.253	19.609	322	318	28	6	2014	19	38
ar14_041	V11	72.492	19.568	390	387	28	6	2014	21	23
ar14_042	V12	72.749	19.513	399	397	28	6	2014	23	12

ar14_043	V13	72.992	19.457	416	413	29	6	2014	1	2
ar14_044	V14	73.242	19.385	451	450	29	6	2014	4	35
ar14_045	V15	73.496	19.333	479	477	29	6	2014	7	19
ar14_0456	V16	73.663	19.301	350	348	29	6	2014	9	11
ar14_046	V16	73.663	19.301	350	348	29	6	2014	9	11
ar14_047	V17	73.834	19.267	234	229	29	6	2014	11	12
ar14_048	V18	74.001	19.218	141	138	29	6	2014	12	33
ar14_049	V19	74.156	19.167	70	64	29	6	2014	14	16
ar14_050	V20	74.245	19.147	60	57	29	6	2014	15	14
ar14_051	V21	74.534	18.883	27	21	29	6	2014	18	53
ar14_052	V22	74.609	18.752	71	64	29	6	2014	20	6
ar14_053	V23	74.693	18.655	100	94	29	6	2014	20	53
ar14_054	V24	74.769	18.572	233	226	29	6	2014	21	38
ar14_055	V25	74.865	18.492	206	201	29	6	2014	22	44
ar14_056	V26	74.947	18.408	74	67	29	6	2014	23	45
ar14_057	V27	75.100	18.212	71	65	30	6	2014	0	55
ar14_058	V28	75.257	18.036	66	59	30	6	2014	2	35
ar14_059	V29	75.372	17.907	108	103	30	6	2014	3	35
ar14_060	V30	75.533	17.703	134	128	30	6	2014	5	47
ar14_061	V31	75.696	17.543	214	208	30	6	2014	7	10
ar14_062	V32	75.833	17.323	292	289	30	6	2014	8	57
ar14_063	V33	75.979	17.130	322	318	30	6	2014	10	16
ar14_064	V34	76.113	16.992	288	284	30	6	2014	12	20
ar14_065	V35	76.238	16.837	218	213	30	6	2014	14	5
ar14_066	V36	76.305	16.787	109	103	30	6	2014	15	31
ar14_067	V37	76.344	16.744	57	50	30	6	2014	16	6
ar14_068	V38	76.392	16.644	32	26	30	6	2014	17	17
ar14_069	K-3	75.005	17.994	157	151	1	7	2014	1	27
ar14_070	K-2	75.000	17.527	120	113	1	7	2014	2	31
ar14_071	K-1	75.001	17.026	132	127	1	7	2014	3	34
ar14_072	K0	75.002	16.500	225	219	1	7	2014	4	42
ar14_073	K1	75.003	16.101	217	211	1	7	2014	5	43
ar14_074	K2	75.002	15.858	329	326	1	7	2014	6	27
ar14_075	K3	75.001	15.424	804	807	1	7	2014	7	38
ar14_076	K4	75.001	15.022	1108	1116	1	7	2014	8	50
ar14_077	K5	75.000	14.368	1522	1537	1	7	2014	11	2
ar14_078	K6	75.000	13.775	1799	1819	1	7	2014	12	48
ar14_079	K7	75.002	13.180	1986	2011	1	7	2014	14	50
ar14_080	K8	75.001	12.495	2155	2186	1	7	2014	17	24
ar14_081	K9	75.001	11.499	2371	2402	1	7	2014	20	57
ar14_082	K10	75.002	10.329	2505	2538	2	7	2014	0	20
ar14_083	K11	74.999	9.330	2557	2592	2	7	2014	3	42
ar14_084	K12	75.000	8.500	2818	2861	2	7	2014	6	39
ar14_085	K13	75.001	7.668	2124	2148	2	7	2014	10	16
ar14_086	K14	74.997	6.823	2021	2044	2	7	2014	14	21
ar14_087	K15	74.999	6.001	2831	2873	2	7	2014	18	51
ar14_088	K16	75.002	4.999	3042	3088	3	7	2014	0	13

ar14_089	O-11	75.783	7.467	2518	2553	3	7	2014	9	25
ar14_090	O-7	75.900	12.294	1786	1806	3	7	2014	19	22
ar14_091	O-5	75.950	13.434	1163	1171	3	7	2014	23	17
ar14_092	O-3	75.948	14.059	620	621	4	7	2014	1	23
ar14_093	M4	75.998	15.001	341	338	4	7	2014	4	6
ar14_094	O2	76.067	16.000	386	383	4	7	2014	6	23
ar14_095	O5	76.157	17.432	309	306	4	7	2014	9	34
ar14_096	O7	76.216	18.410	252	248	4	7	2014	12	0
AREX2014 Leg Vb										
ar14_097	N5	76.503	15.986	49	42	9	7	2014	1	20
ar14_098	N4P	76.504	15.513	140	136	9	7	2014	3	24
ar14_099	N4	76.503	15.020	163	158	9	7	2014	4	34
ar14_100	N3P	76.500	14.497	225	226	9	7	2014	7	13
ar14_101	N3PP	76.500	14.199	402	400	9	7	2014	9	13
ar14_102	N3	76.500	14.000	738	741	9	7	2014	10	16
ar14_103	N2P	76.503	13.495	1240	1250	9	7	2014	12	31
ar14_104	N2	76.508	13.033	1498	1512	9	7	2014	18	5
ar14_105	N1P	76.500	12.498	1736	1756	9	7	2014	20	37
ar14_106	N1	76.501	12.026	1887	1909	9	7	2014	22	32
ar14_107	N0P	76.499	11.520	1094	1017	10	7	2014	1	25
ar14_108	N0	76.496	11.015	2093	2119	10	7	2014	3	8
ar14_109	N-1	76.500	9.999	2239	2270	10	7	2014	6	22
ar14_110	N-2	76.500	8.999	2259	2288	10	7	2014	9	52
ar14_111	N-3	76.500	8.532	2265	2295	10	7	2014	13	41
ar14_112	N-4	76.501	8.005	1911	1933	10	7	2014	16	42
ar14_113	N-5	76.500	7.499	2549	2584	10	7	2014	19	4
ar14_114	N-6	76.502	7.037	3058	3105	10	7	2014	22	4
ar14_115	N-7	76.501	6.497	2528	2568	11	7	2014	1	57
ar14_116	N-8	76.500	5.991	2552	2493	11	7	2014	4	47
ar14_117	N-9	76.499	5.499	2552	2592	11	7	2014	8	36
ar14_118	N-10	76.500	5.001	2353	2384	11	7	2014	11	43
ar14_119	N-11	76.502	3.992	2617	2651	11	7	2014	16	48
ar14_120	S16	77.233	3.000	2940	2852	12	7	2014	0	45
ar14_121	S15	77.269	3.992	2572	2508	12	7	2014	5	3
ar14_122	S14	77.284	4.499	1099	1017	12	7	2014	8	31
ar14_123	S13	77.299	5.007	2455	2486	12	7	2014	11	2
ar14_124	S12	77.335	5.975	2565	2601	12	7	2014	14	31
ar14_125	S11	77.350	6.507	1105	1019	12	7	2014	18	21
ar14_126	S10	77.368	6.998	2676	2714	12	7	2014	20	36
ar14_127	S9P	77.384	7.493	3610	3672	13	7	2014	0	28
ar14_128	S9	77.403	7.984	2294	2324	13	7	2014	4	1
ar14_129	S8P	77.417	8.500	1307	1319	13	7	2014	7	1
ar14_130	S8	77.434	9.003	2044	2069	13	7	2014	8	40
ar14_131	S7P	77.445	9.495	1053	1017	13	7	2014	11	37
ar14_132	S7	77.469	10.004	1596	1612	13	7	2014	13	9
ar14_133	S6	77.483	10.504	1246	1258	13	7	2014	15	16
ar14_134	S5	77.500	10.980	701	704	13	7	2014	17	29

ar14_135	S4	77.516	11.500	276	276	13	7	2014	18	55
ar14_136	S2	77.534	12.006	176	173	13	7	2014	20	36
ar14_137	S2	77.552	12.509	98	94	13	7	2014	22	8
ar14_138	Z1	78.176	11.003	261	259	14	7	2014	2	32
ar14_139	Z2	78.169	10.024	263	260	14	7	2014	4	4
ar14_140	Z3	78.166	9.514	267	264	14	7	2014	5	33
ar14_141	Z4	78.160	9.248	680	684	14	7	2014	6	26
ar14_142	Z5	78.156	8.998	1092	1099	14	7	2014	7	52
ar14_143	Z6	78.147	8.666	1550	1565	14	7	2014	9	12
ar14_144	Z7	78.141	8.173	2148	2175	14	7	2014	10	58
ar14_145	Z8	78.130	7.537	3434	3492	14	7	2014	13	28
ar14_146	Z9	78.118	6.676	2156	2187	14	7	2014	16	51
ar14_147	Z10	78.100	5.830	2487	2520	14	7	2014	19	16
ar14_148	Z11	78.091	5.003	2478	2511	14	7	2014	22	24
ar14_149	Z12	78.085	4.011	2786	2829	15	7	2014	1	44
ar14_150	Z13	78.070	2.847	3008	3054	15	7	2014	4	59
ar14_151	EB2-1	78.831	9.267	204	203	15	7	2014	17	24
ar14_152	EB2-1P	78.834	9.013	214	211	15	7	2014	18	27
ar14_153	EB2-2	78.833	8.767	218	215	15	7	2014	19	19
ar14_154	EB2-2P	78.834	8.589	393	392	15	7	2014	19	56
ar14_155	EB2-3	78.834	8.433	663	667	15	7	2014	20	54
ar14_156	EB2-3P	78.837	8.266	852	857	15	7	2014	23	36
ar14_157	EB2-4	78.834	8.089	973	981	16	7	2014	1	14
ar14_158	EB2-4P	78.834	7.847	1077	1086	16	7	2014	3	29
ar14_159	EB2-5	78.833	7.605	1098	1105	17	7	2014	9	4
ar14_160	EB2-5P	78.832	7.367	1192	1202	17	7	2014	11	2
ar14_161	EB2-6	78.835	7.097	1339	1349	17	7	2014	12	58
ar14_162	EB2-6P	78.836	6.873	1539	1553	17	7	2014	15	3
ar14_163	EB2-7	78.833	6.649	1737	1756	17	7	2014	17	36
ar14_164	EB2-7P	78.833	6.417	2026	2051	17	7	2014	19	37
ar14_165	EB2-8	78.833	6.168	2308	2337	17	7	2014	21	55
ar14_166	EB2-8P	78.835	5.930	1300	1220	18	7	2014	0	43
ar14_167	EB2-9	78.835	5.658	2526	2561	18	7	2014	2	24
ar14_168	EB2-9P	78.832	5.415	1335	1252	18	7	2014	5	52
ar14_169	EB2-10	78.836	5.157	2616	2655	18	7	2014	7	58
ar14_170	EB2-10P	78.836	4.687	1296	1220	18	7	2014	13	12
ar14_171	EB2-11	78.832	4.160	2365	2396	18	7	2014	14	59
ar14_172	EB2-11P	78.833	3.656	1610	1532	18	7	2014	17	49
ar14_173	EB2-12	78.832	3.168	2373	2406	18	7	2014	20	7
ar14_174	EB2-12P	78.837	2.509	1624	1525	18	7	2014	23	58
ar14_175	EB2-13	78.834	1.987	2500	2535	19	7	2014	2	34
ar14_176	EB2-14	78.832	1.502	2494	2528	19	7	2014	6	12
ar14_177	EB2-14P	78.822	1.234	2476	2510	19	7	2014	9	35
ar14_178	EX1	79.416	9.492	128	123	19	7	2014	21	18
ar14_179	EX2	79.415	9.042	131	126	19	7	2014	22	40
ar14_180	EX3	79.419	8.502	195	190	19	7	2014	23	38
ar14_181	EX3P	79.419	8.165	288	284	20	7	2014	0	35

ar14_182	EX4	79.418	7.909	494	494	20	7	2014	1	35
ar14_183	EX4P	79.418	7.654	772	777	20	7	2014	3	17
ar14_184	EX5	79.413	7.329	1009	1016	20	7	2014	4	53
ar14_185	EX6	79.383	6.992	1219	1229	20	7	2014	6	54
ar14_186	WB1	80.091	12.634	186	181	20	7	2014	15	5
ar14_187	WB2	80.156	12.544	180	177	20	7	2014	16	24
ar14_188	WB3	80.221	12.471	196	195	20	7	2014	17	22
ar14_189	WB4	80.286	12.404	184	179	21	7	2014	10	5
ar14_190	WB5	80.345	12.350	171	166	21	7	2014	11	2
ar14_191	WB6	80.384	12.290	182	177	21	7	2014	11	46
ar14_192	WB7	80.412	12.267	231	226	21	7	2014	12	21
ar14_193	WB8	80.433	12.235	357	354	21	7	2014	13	2
ar14_194	WB9	80.449	12.209	462	460	21	7	2014	13	43
ar14_195	WB10	80.463	12.197	566	565	21	7	2014	16	1
ar14_196	Y1	79.659	10.363	36	31	21	7	2014	21	43
ar14_197	Y2	79.681	10.242	88	81	21	7	2014	22	6
ar14_198	Y3	79.706	10.106	137	131	21	7	2014	22	43
ar14_199	Y4	79.727	9.990	309	305	21	7	2014	23	18
ar14_200	Y5	79.754	9.841	371	369	22	7	2014	0	8
ar14_201	Y6	79.795	9.612	427	425	22	7	2014	1	15
ar14_202	Y7	79.838	9.381	454	451	22	7	2014	2	14
ar14_203	Y8	79.895	9.030	456	454	22	7	2014	3	21
ar14_204	Y9	79.951	8.705	481	479	22	7	2014	4	29
ar14_205	Y10	80.012	8.367	498	498	22	7	2014	5	41
ar14_206	Y11	80.073	8.034	511	511	22	7	2014	7	7
ar14_207	Y12	80.140	7.883	540	540	22	7	2014	8	15
ar14_208	Y13	80.227	7.851	586	587	22	7	2014	9	19
ar14_209	Y14	80.308	7.839	647	648	22	7	2014	11	2
ar14_210	YY1	79.992	7.852	513	511	22	7	2014	14	20
ar14_211	YY2	79.938	7.481	648	649	22	7	2014	15	32
ar14_212	YY3	79.885	7.102	769	772	22	7	2014	16	49
ar14_213	YY4	79.835	6.717	866	870	22	7	2014	18	19

Attachment 2 Cruise iterinary

20 June	Embarking of scientists. Bad weather forecast, 607B, high waves. Departure delayed to the next day.
21 June	Departure at 1800 LT. Weather improved but high waves (2-2.5m). Transit northward
22 June	Transit to section H. High waves.
23 June	Beginning of measurements at section H after the midday and training fire alarm.
24 June	Continuation of measurements at section H.
25 June	End of section H and transit to section A. First stations all measured, later every second station.
26 June	Continuation of section A.
27 June	End of section A. Transit to section V1.
28 June	Beginning of section V1. Calm weather.
29 June	End of section V1 at 1500 LT. Transit to section V2 and start at 1900 LT.
30 June	End of section V2 at station V38 at 1730 LT. Transit to section K.
1 July	Beginning of section K at station K-3 at 0130 LT. Deployment of the Argo float at station K8 at 75˚00.01'N 012˚29.61'E. Waiting 2 hours for submerging of the float. Continuation of section K. technical problems with LADCP, exchange of batteries without compass calibration.
2 July	Continuation of section K. Strong swell. Technical problems with cable on the oceanographic winch. Disassembling of the carousel and continuation only with CTD probe in the frame.
3 July	End of section K at station K16. Technical problems with cable on the oceanographic winch. Transit to section O and beginning of measurements at station O-11. Strong swell. Skipping deep water stations and plankton sampling.
4 July	Continuation of measurements at section O to station O7. Attempts to recover mooring MIXAR-1. Beginning of CTD scanfish section towards Horsund.
5 July	Continuation of CTD scanfish section. Recovery of AWAKE-2 mooring and AWAKE-3 mooring in Hornsund.
6 July	Deployment of AWAKE-3 mooring in Horsund. Search for old AWAKE-2 mooring at the front of Hans glacier. Departure from Horsund to Longyearbyen at 2300 LT.
7 July	Stay in Longyearbyen. Exchange of scientists.
8 July	Embarking of the scientific team for the leg Vb. Departure at 1500 LT. Transit to section N. Info meeting.
9 July	Beginning of measurements at section N at 0130 LT. Stations N5 to N1. Wind 3-4B, fog.
10 July	CTD stations from N0P to N-6.
11 July	CTD stations N-6 to N-11. Moderate wind, in the afternoon wave height up to 1.5m. Technical problems with the CTD cable. Transit to section S.
12 July	After midnight beginning of measurements at section S. After station S15 repetitive

	problems with CTD cable. Switch to the old cable on the small winch. Wind 3-4B, waves 0.5-1m, light swell. All stations shallower than 2600m measured from the small winch. Continuation of measurements to station S10.
13 July	Continuation of measurements to station S9P. Except station S9P, all other stations measured from the small winch. Some problems with the fairlead sheave train, removed after tuning. Wind 2B, waves under 1m, drizzle. End of section S at station S2. Transit to section Z.
14 July	Beginning of measurements at section Z at 0230 LT. Wind 1-2B, waves below 0.5m, sunny. Continuation to station Z11.
15 July	Measurements at section Z (stations Z11-Z13). Transit to section EB2, coastward. Beginning of measurements at EB2 at 1724 LT. Wind forecast for the next day 6-7B. Continuation of measurements to station EB2-3. During the night waves increasing from 2 to 3m. Wind 30-36 knots, increasing.
16 July	Continuation at section Eb2. After station EB2-4P (at 0900 LT) measurements cancelled and transit to the coastal sheltered area. Wind 36-40 knots, increasing. Wave height over 3m. Resting at anchor for the rest of the day and the whole night.
17 July	Leaving from the anchor place at 0400LT and transit to station EB2-5. Arrival at 0900 LT but measurements not possible due to high waves. Waiting for 2 hours, in the meantime disassembling the carousel. Continuation of measurements with the CTD frame only from station EB2-5. In the evening improved weather, reinstalling the carousel from station EB2-7. Skipping Multinet sampling at EB2-4 due to high waves.
18 July	Continuation at section EB2 from station EB2-8P on. Station EB2-10 measured with full program, including Multinet and plankton nets. Weather conditions hard but workable.
19 July	Continuation at section EB2 from station EB2-13 to the ice edge at station EB2-14P. Transit to section EX coastward (due to ice edge at the western part of EX). Stations EX1 to EX3.
20 July	Continuation at section EX to station EX6 at the ice edge. Due to the weather forecast for 6-7B at section Y, transit to section WB located farther east. Measurements at stations WB1 to WB3. Weather worsened quickly, wave height over 3m. Cancelling of measurements and transit to sheltered area. Rest at anchor in the night.
21 July	Departure from anchor at 0400 LT. Transit to station WB4. Waiting until 1200LT for improving of the weather. Continuation of measurements to station WB11 at the ice edge. Transit to section Y coastward.
22 July	Beginning of measurements at section Y. Continuation to station Y11, shifted due to the ice cover. Continuation of measurements at stations Y12-Y14 northward along the ice edge. Return to station between Y10 and Y11 and continuation at stations YY11 to YY14 across the bottom contours. Continuation of stations to the ice edge. End of measurements at 2240 LT and return to Longyearbyen. Spare time needed due to bad weather forecast (6B, southerly winds).
23 July	Transit to Longyearbyen. Entering Adventsfjord at 0600LT. Lie at anchor in LYR. End of the cruise leg at 2200 LT.

5. Leg VI, West Spitsbergen fjords, 26.07-11.08.2014

5.1. Scientific goals

- Multidisciplinary studies of plankton and benthos in the West Spitsbergen fjords with main study areas in Horsund, Kongsfjorden and shelf waters in vicinity of both fjords. Collection of samples and in situ hydrographic and biological measurements will contribute to long-term observations of plankton and benthos in the Arctic fjords by IOPAN Marine Ecology Group. Observations and biological sampling will be also part of different national and international projects, including Polish-Norwegian projects PicMac, DWARF, GLAERE, POL-NOR, and MareIncognitum, and three PhD projects.
- Description of physical environment of Svalbard fjords based on hydrographic measurements (temperature, salinity, dissolved oxygen), acoustical and optical measurements, and collection of water and sediment samples.
- Description of the spatial distributions and quantitative-qualitative composition of protozoan plankton and zooplankton communities in Horsund and Kongsfjorden.
- Evaluation of zooplankton abundance in the feeding grounds of the planktivorous little auks in the vicinity of the Horsund outlet.
- Estimation of the droplet flux from the sea surface and their impact on ocean-atmosphere mass and energy exchanges;
- Estimation of the vertical CO_2 fluxes in the atmospheric boundary layer;
- Estimation of latent and sensible heat fluxes between ocean and atmosphere;
- Description of marine aerosols in the Arctic region, aerosol optical thickness and ozone concentration in atmosphere;

5.2. Work at sea

Horsund fjord and its outlet (26.07-3.08.2014)

- Hydrographic measurements in Horsund on 34 stations measured with CTD probe SBE19+, measured parameters: temperature, salinity, dissolved oxygen. Additionally 23 CTD stations occupied on the shelf in vicinity of the Horsund outlet, measurements with CTD probe SBE9+, measured parameters: temperature, salinity, dissolved oxygen, fluorescence.
- Collection of the phyto- and zooplankton samples for long-term monitoring and projects DWARF and GLAERE at 4 standard stations (H1, H2, H3, H4). Temperature, salinity and euphotic depth profiles measured at each station. Phytoplankton samples collected from 6 depths with a Nansen bottle. Collection of mezzo-zooplankton from 5 depths with a net MPS 180um. Additionally measurements on 4 stations of the GLAERE projects, two at each glacier, one of them close to the glacier wall (at the safe distance), one at the distance of 1000m from the glacier. Sampling with nets and with horizontal Tacker Trawl below the surface mixed layer (with 2 knots for 10 minutes each).
- Collection of benthic samples for the projects GLAERE, DWARF and POLNOR at 3 standard stations (HB1, HB2 and HB3). At each station 3 samples of macro-zoobenthos collected with the van Veen grab, 3 samples of meio-zoobenthos

collected from one core (from box corer), one sample for analysis of photosynyhetic pigments concentration (2cm core), POC and PON (2 cm core) and granulometry (5 cm core), all later with box corer. Samples were treated according to standard procedures.

For the DWARF project samples were collected at 5 stations, including one macro-zoobenthos sample (van Veen grab), one meio-zoobenthos and surface sediment sample (box corer) and one sample of surface sediments with Nemisto. For the POLNOR project benthos samples were collected at 6 stations with epibenthic sledge at the depths 50, 100 and 150m. Additionally water samples were collected at each stations for chemical analyses. For the GLAERE project benthos samples were collected from 4 stations with van Venn grab and epibenthic sledge at the glacier front. Baited trap samples were deployed for short time but without success.

For the GAME and one PhD projects benthos samples were collected at the grid of stations (shown on Fig. 2) for evaluation of spatial variability of species composition and biodiversity of macro-zoobenthos in Horsund. At each station one sample of macro-zoobenthos was collected with the van Veen grab, one sample for analysis of photosynyhetic pigments concentration (2cm core), POC and PON (2 cm core) and granulometry (5 cm core), all later with box corer.

Location of plankton and benthos sampling stations is shown on Fig. 2 and Fig. 3 and list of sampling methods in Tab. 1 and Tab. 2.

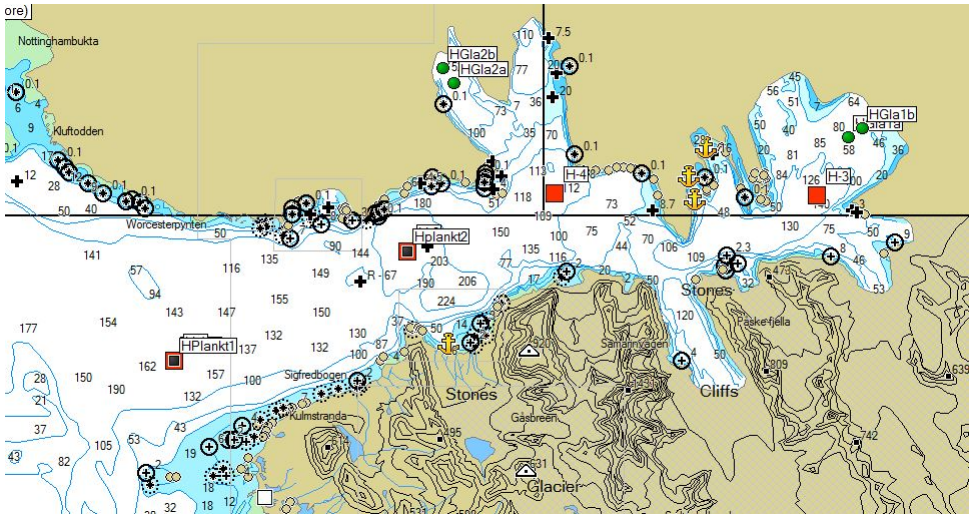

Fig. 2 Zooplankton sampling stations in Horsund during the leg VI of AREX 2014.

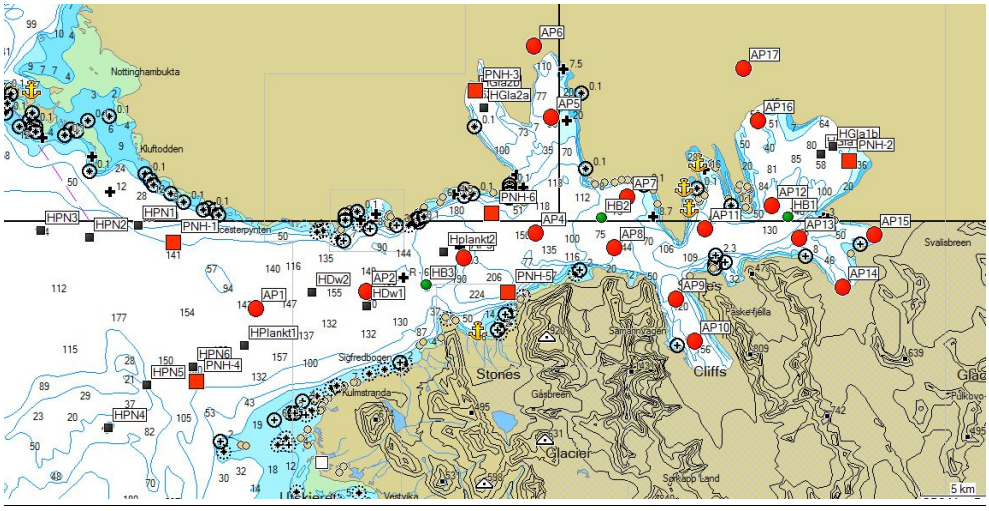

Fig. 3 Benthos and sediment sampling stations in Horsund during the leg VI of AREX 2014.

Table 1. Zooplankton sampling in Horsund during the leg VI of AREX 2014.

Station	WP2/500	WP2/60	MPS	Nansen bottle	Tucker Trawl	CTD
HGla1a	x				x	x
HGla1b	x				x	x
H3		x	x	x		x
H4		x	x	x		x
HGla2a	x				x	x
HGla2b	x				x	x
HB3		x	x	x		x
HDW1		x	x	x		x
HDW2		x	x	x		x
H2, Hplankt2		x	x	x		x
H1, Hplankt1		x	x	x		x

Table 2. Benthos and sediment sampling in Horsund during the leg VI of AREX 2014.

Station	Van Veen	Boxcore	Nemisto	Epibenthic sledge	Triangular dredge	Foto	Traps	CTD	Nansen bottle
HPN3					x			x	
HPN2					x			x	
HPN1					x			x	
PNH1					x			x	x
HPN4					x			x	
HPN5					x			x	
HPN6					x			x	
PNH4					x			x	x
HPlankt1	x	x	x					x	
AP1	x	x						x	
HDw2	x	x	x					x	
HDw1	x	x	x					x	
AP2	x	x						x	
HB3	x	x	x					x	
Hplankt2	x	x	x					x	
AP3	x	x						x	
AP4	x	x						x	

PNH6					x			x	x
PNH5					x			x	x
HGla2b	x			x		x	x	x	
PNH3					x			x	x
HGla2a	x			x		x	x	x	
AP6	x	x						x	
AP5	x	x						x	
HB2	x	x						x	
AP7	x	x						x	
AP8	x	x						x	
AP9	x	x						x	
AP10	x	x						x	
AP11	x	x						x	
AP12	x	x						x	
HB1	x	x						x	
AP13	x	x						x	
AP14	x	x						x	
AP15	x	x						x	
HGla1b	x			x		x	x	x	
PNH2					x			x	x
HGla1a	x			x		x	x	x	
AP16	x	x						x	
AP17	x	x						x	

Collection of meso-zooplankton samples in the shelf waters in vicinity of the Horsund outlet as potential feeding grounds of the little auk. Samples were collected at 22 stations from the subsurface layer of 50 m with the net WP2 500µm. At 17 sections between stations concentration and size distribution of meso-zooplankton was measured with the towed laser optical particle counter (LOPC). At three long-term monitoring stations (H7, H6, H5) samples were collected with MPS net 180µm from five layers decided from the temperature and salinity profiles and phytoplankton samples were collected from six layers based on the depth of euphotic zone (Secchi disk). Station grid on the shelf in vicinity of the Horsund outlet is shown on Fig. 4.

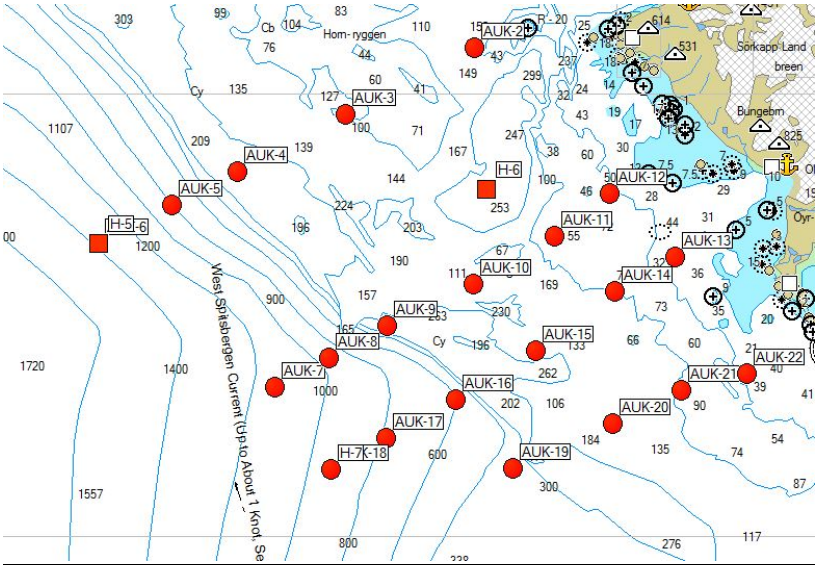

Fig. 4 Grid of stations in the shelf waters in vicinity of the Horsund outlet in 2014.

Kongsfjorden and its outlet (5-11.08.2014)

- Hydrographic measurements in Kongsfjorden and its forefront on 19 stations measured with CTD probe SBE19+, measured parameters: temperature, salinity, dissolved oxygen.
- Collection of samples at the long-term monitoring stations overlapping with the statuons of the project PicMac. Sections with towed system of integrated LOPC-CTD-fluorymeter between the long-term stations in Kongsfjorden (Fig. 5).
- For the better efficiency, the plankton and benthos sampling, and hydrographic measurements done in two steps, first along the fjord axis and next along the perpendicular sections.

Due to worsening ice situations, in the first step all sampling stations in the inner part of the fjord, close to tidal glaciers, were visited. Next the plankton samples were collected and finally benthic sampling took place for the projects DWARF, GLAERE and POLNOR. Plankton sampling stations are shown on Fig. 5 and benthos sampling stations are presented on Fig. 6 while the sampling scheme for plankton and benthos are listed in Tables 3 and 4.

For long-term monitoring stations, measurements of the euphotic depth, temperature and salinity were done first at each station. Phytoplankton samples and water samples for analysis of nutrients were collected from six depths. Meso-zooplankton samples were collected with the net MPS 180µm from 5 depth levels. For the monitoring stations overlapping with stations of the PicMac project samples were collected on 9 stations together with PAR measurements and collection of water samples for nutrient and chla analyses. On 4 stations macro-zooplankton samples were collected with the Tucker Trawl.

Benthos samples for long-term monitoring were collected on 3 stations. On each station 3 samples for macro-zoobenthos were taken (with van Veen grab), 3 samples for meio-zoobenthos (5 cm core from the box corer), one sample for photosynyhetic pigments (core 2 cm), PON and POC concentrations (core 2 cm) and granulometry (core 5 cm). For the latter 3 samples the box corer was used. Samples were teated according to standard procedures.

For the GLAERE project four stations were selected, two at each chosen glacier. Of these two stations, one was close to the glacier wall (at a safe distance), an one at a distance of 1000 m. Plankton samples were collected with the net WP2 from 2 layers and with the Tacker Trawl below the mixed layer. Benthos samples were collected with the van Veen grab and at the glacier front with the epibenthic sledge.

For the DWARF project samples were collected on 5 stations, one macro-zoobenthos sample (with the van Veen grab), one meio-zoobenthos and sediment sample (with the box corer) and one sediment sample (with the Nemisto grab) at each station. Additionally at 2 stations in the fjord mouth samples were collected with the triangle dredge from 3 bottom depths.

For the POLNOR project benthos samples were collected on 6 stationsfrom 3 different depth (50, 100, 150 m) with the epibenthic sledge. At the glacier front samples were collected only from one depth. Water samples for chemical analysis were collected from 5 depths.

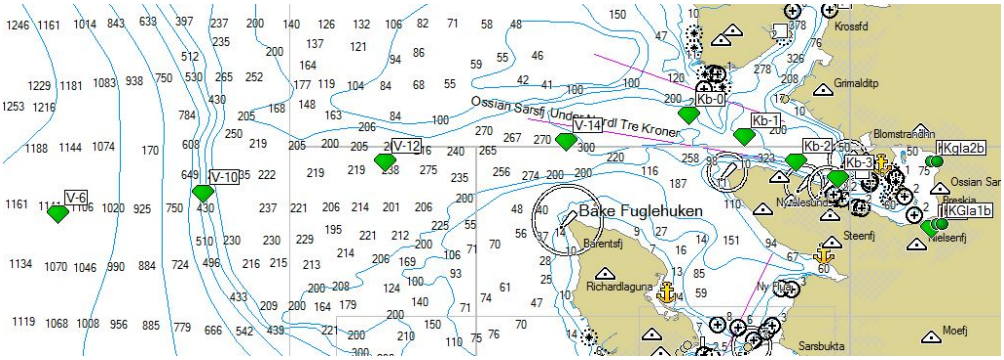

Fig. 5 Zooplankton sampling stations in Kongsfjorden during the leg VI of AREX 2014.

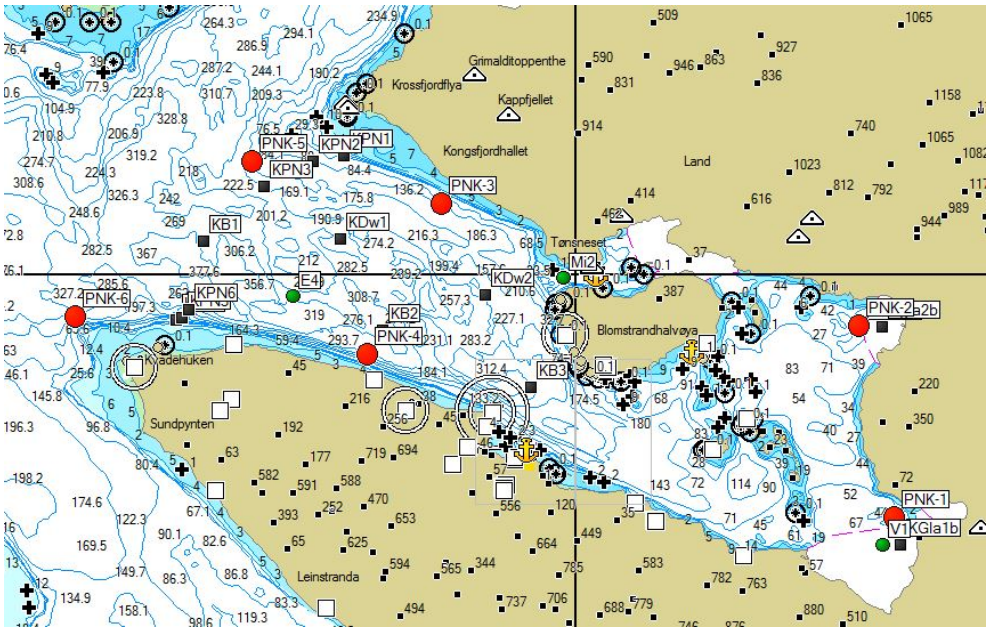

Fig. 6 Benthos and sediment sampling stations in Kongsfjorden during AREX 2014.

Table 3. Zooplankton sampling in Kongsfjorden during the leg VI of AREX 2014.

Station	WP2/500	WP2/60	MPS	Batometr	LOPC	Tucker Trawl	CTD
V6		x	x	x			x
V6 - V10					x		
V10	x	x	x	x		x	x
V10 - V12					x		
V12		x	x	x			x
V12 - V14					x		
V14		x	x	x			x
V14 - Kb0					x		
Kb0	x	x	x	x		x	x
Kb0-Kb1					x		
Kb1	x	x	x	x			x
Kb1 - Kb2					x		
Kb2	x	x	x	x		x	x
Kb2 - Kb3					x		
Kb3		x	x	x			x
Kb3 - Kb5					x		

Kb5	x	x	x	x		x	x
KDW2		x	x	x			x
KDW1		x	x	x			x
KGla1a	x					x	x
KGla1b	x					x	x
KGla2a	x					x	x
KGla2b	x					x	x

Table 4. Benthos and sediment sampling in Kongsfjorden during AREX 2014.

Station	Van Veen	Boxcore	Nemisto	Epibenthic sledge	Traps	CTD	Batometr
PNK6				x		x	x
KPN4				x		x	
KPN5				x		x	
KPN6				x		x	
KB1	x	x	x			x	
PNK5				x		x	x
KPN1				x		x	
KPN2				x		x	
KPN3				x		x	
KDw1	x	x	x			x	
E4	x	x				x	
KB2	x	x	x			x	
PNK4				x		x	x
PNK3				x		x	x
KDw2	x	x	x			x	
Mi2	x	x				x	
KB3	x	x	x			x	
V1, KGla1b	x	x		x	x	x	
KGla1b	x	x		x	x	x	
PNK1				x		x	x
KGla2a	x	x		x	x	x	
Kgla2b	x	x		x	x	x	
PNK2				x		x	x

6. Leg VII, Horsund - Storfjorden - Bear Island - transit to Gdansk, 12 - 25.08.2014.

6.1. Scientific goals

Studies of the Atlantic waters impact on less saline and fresher environment, dominated by the Arctic waters originating from the Barents Sea, focused on processes and features on time scales from the last glaciation to recent.

6.2. Work at sea

- Collection of sediment samples on 10 stations (4 times at each stations) with the box corer.
- Measurements of the sedimentation rates in the water column on 4 stations with use of sediment traps.
- Collection of the sediment core in Storfjorden.
- Hydrographic measurements, including sedimentation rate and turbidity.
- Collection of benthos samples at 3 stations from 3 depths with the epibenthic sledge.