

Mooring service cruise 2021 Cruise Report



Mooring service cruise 2021

Cruise 2021713

R/V Kronprins Haakon Longyearbyen - Tromsø November 06 -16, 2021

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Executive summary

The main objective of the joint Nansen Legacy and A-TWAIN/SIOS-InfraNor mooring service cruise was the recovery and deployment of the projects' moorings in the Barents Sea and north of Svalbard. Additionally, CTD stations with water sampling for both projects, a Seaglider deployment for Nansen Legacy, and mooring recoveries and deployments for partner projects were planned depending on sea ice conditions and time available. The cruise left from Longyearbyen 06.11.2021 heading first to the northern Barents Sea slope for A-TWAIN and partner mooring operations.

On the way to the main northern working area, two moorings were deployed at 22E. At 31E, the main A-TWAIN line, two moorings were recovered and five deployed. A short transect covering the upper slope (200-2000 m bottom depth) was made during the night between moorings operations.

After two days of work in the A-TWAIN area the ship moved south to start Nansen Legacy mooring operations. In the M1 inflow area, four moorings were recovered and two redeployed. A transect crossing the slope was done in between mooring operations. During night a transect from M1 to the Austfonna glacier was done, before steaming onwards to recover more moorings. The following ones were recovered in the following days: M2, M5-BioAc, M5, F3-1, F2. Inclement weather prevented recovery of moorings F3-2, C, S1, S2, S3-1 and S3-2.

Despite the very short duration of the cruise it was successful in the sense that many of the planned mooring recoveries were done. The number of redeployed moorings had to be reduced, and fewer CTD and L-ADCP casts and transects were made. The high efficiency would not have been possible without the capabilities of the vessel, the crew and the cruise participants, who all collaborated very well.

1 Background

This cruise is a joint venture between two main projects; Nansen Legacy (NLEG) and A-TWAIN/ SIOS-InfraNor. Nansen Legacy RF1 has mooring components in two sub-tasks; T1-1.2 (large scale advection) and T1-2.1 (ocean process studies). The NLEG moorings cover a) advection of water masses and sea ice into the northern Barents Sea (T1-1.2, T2-1.1, T3-2.2, T3-3.2, and T3-4.4) and b) processes controlling the stability of and exchange across the "Polar Front" area in the central Barents Sea (T1-2.1). The A-TWAIN project has had moorings over the continental slope north-east of Svalbard for several years. The overarching goal of this project is to detect seasonality, variability and longterm trends in the Fram Strait branch of the Atlantic Water inflow entering the Arctic Ocean. In addition to the extensive mooring operations, CTD and L-ADCP profiles and transects at selected locations were made to improve the vertical and geographical resolution of the mooring time series. In situ sea ice observations are made for comparison with satellite-derived sea ice products (T1-2.2 and RA-C). Water samples for analysis of nutrients, POC/PON, chl-a and carbonate chemistry, and for calibration of the CTD dissolved oxygen sensor were collected at selected locations, mostly near key moorings (NLEG T2-1.1, T3-1.2).

2 Survey area



Figure 1. Map of cruise track, mooring operations, glider and Argo float deployments and CTD stations.

3 Activity reports

3.1 Sampling program

Since this cruise was a collaborative effort between different projects, project name and, where relevant, Nansen Legacy sub-task numbers, are given in the tables in the different sub-sections.

3.1.1 Mooring recoveries and deployments

For the Fram Centre A-TWAIN/SIOS-Infranor project, two moorings were recovered and seven (including two for the partner institute IOPAN and one for CNRS-LOCEAN) were successfully deployed over the continental slope north-east of Svalbard. The moorings AT-800-BioAc-1 (A-TWAIN/SIOS) and AT200-5 could not be found and are considered lost.

For the Nansen Legacy project, nine moorings were recovered. Due to the short duration of the cruise only M1 and its neighbour M1-BioAc was redeployed. Moorings M1, M2 and M5 carried instruments also for T2-1.1, T3-2.2, T3-3.2, T3-4.4.

The following NLEG moorings were not recovered: M3, F1, M4-3, F3-2, C, S1, S2, S3-1, and S3-2. The two first were not found, neither on echosounder nor through acoustic pinging, and are considered lost. M4-3 clearly sent and received signals at the deployment location and is assumed to have been turned upside-down by a trawler before this cruise. The previously deployed and similarly upside down lying M4-2 also responded to acoustic pinging. Triangulation was done to confirm precise positions of both M4 bottom landers (Appendix VII) for later recovery. The C- and all S-mooring received and sent signals through acoustic pinging and are assumed to be in their original deployment location. Recovery was not possible due to strong winds and waves that did not allow operations on deck.

		Time					
Mooring ID	Date	[UTC]	Latitude	Longitude	Depth	Project	Mooring info
						SIOS-IN/	ADCPs, CTDs, sea ice,
AT800-6	2021-11-08	11:51	81.5498	30.8968	880	A-TWAIN	BGC & OA sensors
AT800-						INTAROS/	Bio-acoustics ADCP
BioAc-2	2021-11-08	13:45	81.5507	30.9286	875	A-TWAIN	
NLEG M1-							
2-BioAc	2021-11-10	07:40	79.5863	28.0829	256	NLEG	Bio-acoustics ADCP
							ADCPs, CTDs, BGC &
							OA, sediment trap, sea
NLEG M1-3	2021-11-10	08:09	79.5828	28.0591	264	NLEG	ice
							BPS and hydrography
NLEG M1-b	2021-11-10	12:23	79.5679	28.1138	298	NLEG	mooring
							BPS and hydrography
NLEG M1-a	2021-11-10	15:37	79.6730	27.8433	102	NLEG	mooring
							ADCPs, CTDs, BGC
NLEG M2-3	2021-11-11	12:18	79.6720	32.3158	355	NLEG	sensors, sea ice
NLEG M5							
BioAc	2021-11-12	05:34	77.0825	35.0578	144	NLEG	Bio-acoustics ADCP
NLEG M5	2021-11-12	06:15	77.0747	35.0368	140	NLEG	ADCP and CTDs
NLEG F3-1	2021-11-12	14:40	76.6169	31.0309	277	NLEG	CTDs
NLEG F2	2021-11-12	19:55	77.0488	31.0284	237	NLEG	ADCP and CTDs

Table 1. Mooring recoveries during cruise number 2021713.

Mooring ID	Date	Time	Latitude	Longitude	Depth	Project	Mooring info
IOPAS14	2021-11-07	21:04	81.4858	21.9436	860.4	INTAROS	ADCPs, MMP, CTD
CNRS24	2021-11-08	00:51	81.3807	22.2834	496.5	INTAROS	CTDs
IOPAS23	2021-11-09	01:28	81.5758	30.9988	1226	INTAROS	ADCP, CTDer, sea ice draft
						/A-TWAIN	
						SIOS-IN/	ADCPs, CTDs, sea ice, BGC
AT800-7	2021-11-09	11:20	81.5501	30.8777	889	A-TWAIN	& OA sensors
						INTAROS/	Bio-acoustics ADCP
AT800-BioAc-2-3	2021-11-09	13:51	81.5482	30.8893	872	A-TWAIN	
						SIOS-IN/	Bottom frame; ADCP, CTD
AT500-2	2021-11-09	16:38	81.4577	31.0753	488	A-TWAIN	
						SIOS-IN/	ADCPs, CTDs, sea ice
AT200-6	2021-11-09	19:39	81.4105	31.2433	205	A-TWAIN	
NLEG M1-2-BioAc	2021-11-10	17:29	79.5888	28.0879	259	NLEG	Bio-acoustics ADCP
							ADCPs, CTDs, BGC & OA,
NLEG M1-4	2021-11-10	20:05	79.5829	28.0717	263	NLEG	sediment trap, sea ice

Table 2. Mooring deployments during cruise number 2021713.

3.1.2 CTD measurements

A total of 31 CTD profiles were taken (see Appendix III). Some of these were individual profiles at mooring locations while others were transects covering topography near key moorings (NLEG M1, M2, M4, F1, F3, A-TWAIN) or towards Austfonna. CTD profiles 516-523 (evening of 09. Nov) were taken for A-TWAIN, profiles 524-545 for NLEG. For all casts, the big 24-bottle rosette was used and lowered through the moonpool.

An additional CTD cast (#546) was done en route to Tromsø for opportunistic fjord and coastal monitoring (IMR).

The CTD package mounted on the CTD frame was a SBE911plus with the following sensors:

- SBE 3P Temperature sensor, s/n 03-4535 (primary)
- SBE 4C Conductivity sensor, s/n 04-4386 (primary)
- SBE 5T submersible pump, s/n 05-9378 (primary)
- Digiquartz Temperature Compensated Pressure Sensor, s/n 141612
- SBE 3P Temperature sensor, s/n 03-4306 (secondary)
- SBE 4C Conductivity sensor, s/n 04-2799 (secondary)
- SBE 5T submersible pump, s/n 05-9379 (secondary)
- SBE 43 Oxygen sensor, s/n 3774 (primary)
- Benthos Altimeter, s/n 73084
- WET Labs C-Star Transmissometer, s/n CST-2003DR
- WET Labs ECO-AFL/FL Fluorometer, s/n FLRTD-6506
- WET Labs CDOM Fluorometer, s/n FLCDRTC-4885
- Biospherical/Licor PAR/Irradiance sensor, s/n 70736

Temperature, conductivity, and oxygen sensors were factory calibrated in January and February 2020. Data from the ship-mounted SPAR sensor (Biospherical/Licor, s/n 20568) was integrated in the CTD data stream.

The CTD was controlled by the instrument engineers through SBE Seasave software, version 7.26. GPS data (NMEA string) from the ship's navigation system was logged with every scan for later LADCP processing.

During a CTD cast, the CTD package was lowered to 10 m depth for a 1 minute soak before lowering to the bottom. Niskin bottles were fired on the upcast after a 1 minute stop at the desired bottle depth. All CTD sensors worked well throughout the cruise. Offset between primary and secondary T and S sensors were in acceptable range. The oxygen sensor was compared to dissolved oxygen from water samples measured onboard by Winkler titration (see section 3.1.7 Biological and chemical sampling). Error and drift in the sensor profiles was in acceptable range (<5%).

At CTD stations 517 and 526, CTD sensors from recovered moorings were attached to the rosette and lowered with the ship CTD for later calibration of the mooring sensors.

3.1.3 Lowered ADCP measurements

Dual Lowered ADCP measurements were made at all CTD casts; in total 30 dual profiles. Information on individual profiles is given in the cruise Sample Log. These data will be used in T1-1.2 and T1-2.1 for the same profiles as for CTDs (see above) and the remaining ones for A-TWAIN.

Two RD Instrument 300 kHz Workhorse ADCPs and an external battery package were mounted on the CTD rosette (s/n 24472 looking upward; s/n 24474 looking downward). The ADCPs were started and stopped by the instrument engineers using BBTalk on a laptop in the fine electronics workshop before and after each cast. The downward looker was set up as master and the upward looker as slave. The following configurations were used:

Master: CR1 WM15 RN M0517_ CF11101 EX00100 EZ0011101 TC2 WP1 TB 00:00:01.20 TE 00:00:00.80 TP 00:00.00 WN015 WS0800 WF0000 WV250 LZ30,220 LW1 SM1 SA011 SW05500 SI0 CK T? W? CS

15 bins with 8 m bin depth, 2.5 m s-1 ambiguity velocity, automatic ping cycling, narrowband, bottom detection.

Slave: CR1 WM15 RN S0517_ CF11101 EX00100 EZ0011101 TC2 WP1 TB 00:00:01.20 TE 00:00:00.80 TP 00:00.00 WN015 WS0800 WF0000 WV250 LZ30,220 LW1 SM2 SA011 SS0 ST0300 CK T? W? CS

15 bins with 8 m bin depth, 2.5 m s-1 ambiguity velocity, automatic ping cycling, narrowband

Further information on sensor configuration can be obtained from the IMR instrument engineers.

Processing of the data will take place on land using the latest available version of the LDEA LADCP processing routines.

3.1.4 Sea ice observations

(T1-1.2) Sea ice was first encountered near the IOPAN mooring northeast of Svalbard (thin first-year ice and cake ice). A consolidated ice cover was located just before the IOPAN mooring site, but the ATWAIN site was mostly ice-free. More consolidated ice was found near the M1 area, east of Svalbard. Water temperature was above freezing temperature until the M1 mooring site was reached. Here we encountered a large amount of thin first-year ice, but also slush and pancakes. When the ice was present, opportunistic ship-based sea ice observations were done following the ASSIST setup up to three times a day. Observations of ice concentration, type, thickness, topography, and meteorology were entered directly in the browser-based form. Observations were done to the best ability but were limited by complete darkness and thus limited visibility. The range of visibility was largely dictated by the range of the ship's beams and ambient light from the deck. Sea ice was assessed from the bridge, and photos were taken pointing port, ahead, and starboard. A total of 11 observations were done.

3.1.5 Glider deployment

A glider was deployed to further increase data coverage in the ice-free area near the Polar Front in the central Barents Sea (T1-2.1). The glider, operated by University of Bergen, was assembled, tested and deployed by Algot K. Peterson in collaboration with pilot on land, at University of Bergen. It was deployed 12. Nov 2021 at 13:19 UTC at 78.617 N, 31.033 E.

3.1.6 Argo float deployment

Two Argo floats were deployed by Terje Hovland for the NorArgo project (IMR) on 15. Nov 2021 at 73.7030N, 29.2725E.

3.1.7 Water samples Salt samples

Salt samples were taken by the IMR instrument engineers from the bottom Niskin at each CTD for calibration of the conductivity sensors on the CTD. The samples will be sent to IMR Bergen for analysis and calculation of a calibration coefficient.

Biological and chemical sampling

T2-1-1: Current variability and drivers of ocean acidification / IMR Ocean Acidification Monitoring / A-TWAIN repeat section

Seawater samples for assessment of ocean acidification state (OA)/ carbonate chemistry (Total Alkalinity (AT) and Dissolved Inorganic Carbon (DIC)), nutrients, and oxygen isotopes (δ^{18} O) were taken from the Niskin bottles mounted on the large 24-bottle CTD rosette at 5-15 depths throughout the water column at X stations, including NL mooring location M1 and stations on the A-TWAIN transect line (Table 3). A total of 103 AT/DIC, 63 δ^{18} O and 103+79 nutrient samples (following IMR and Nansen Legacy Sampling protocols, respectively) were taken and stored in the cold room, in the fridge or in the freezer.

The CTD was deployed through the moonpool at all stations, which meant that surface/5 m and 10 m samples could not be taken. Due to the problems with the underway system, surface samples could not be obtained from the seawater intake either. The following depths were sampled:

- a) shallow stations (up to around 350 m): 20, 30, 40, 50, 60, 90, 120, 150, 200 m and bottom depth. In addition, water from seawater intake was taken to get sample from around 5m depth.
- b) deep stations: 20, 30, 60, 90, 120, 150, 200, 300, 500 m and bottom depth.

Samples for carbonate chemistry from the Niskin bottles were taken before any other samples. They were filled into 250ml borosilicate bottles which were rinsed with at least one bottle volume, filled to the rim, and closed with tight plastic screw caps. 50 μ l HgCl₂ was added after the sampling. Sampling and analysis followed the protocol described in *Nansen Legacy Sampling Protocol version 9, chapter 7.2,* and Dickson et al., 2007. The TA/DIC samples will be shipped to IMR Tromsø for analysis after the cruise.

Oxygen isotopes δ^{18} O samples were filled into plastic vials, which were rinsed three times and then filled to the rim. The bottles were additionally sealed with parafilm (*Nansen Legacy Sampling Protocol version 9, chapter 7.3*).

Dissolved oxygen concentration in sea water was analysed on board following the Winkler procedure (Dickson 1995) on four selected stations (see Table 3; 37 samples in total), to estimate the drift of the CTD oxygen sensor.

The average of the offset between the CTD Oxygen and the Winkler method is -3,0%. If the drift is inside \pm 5%, the oxygen value from the CTD oxygen sensor do not need any correction.



Figure 2: percentage offset between the CTD oxygen sensor and the Dissolved Oxygen concentration determinate by the Winkler method function of the measurement count

Nutrient samples (following IMR sampling protocol/ Nansen Legacy Sampling Protocol version 9, chapter 7.12) were filled into plastic vials, which were rinsed three times, and 200 μ l Chloroform were added. The samples will be analysed at IMR Bergen. For continuation of the A-TWAIN biological time series and a method comparison, nutrient samples were also taken following UiT sampling protocol at A-TWAIN transect stations and at M1; the samples were stored frozen in 100 ml bottles and will be send to UiT for analysis.

Samples for chlorophyll a total (GF/F filters) and POC/PON (pre-burned GF/F filters; *Nansen Legacy Sampling Protocol version 9, chapters 7.4 and 7.13*) were taken at the A-TWAIN transect for A-TWAIN long-term monitoring, at M1 for NLEG T3.1-2 and at F3-2 for glider sensor calibration (NLEG T1-2.1). 200 ml of water for each sample (three replicates) was filtrated for chl a total and 500ml for POC/PON samples. Filters were stored frozen and will be processed further at UiT.

Table 3: Overview of sampling depths for biological and chemical sampling from the CTD.

Date, time	CTD	Station	Latitude	Longitude	Bottom	Sampling depths	Samples taken
(UTC)	stn #	description	(N)	(E)	depth (m)	(db)	
07/11/2021, 21:12	516	IOPAS14	81.4853	21.9043	877	869, 500, 300, 200, 120, 60, 11	DO
09/11/2021, 01:55	518	IOPAS14 / ATWAIN transect	81.5723	30.9791	1206	1215, 500, 300, 200, 150, 120, 90, 60, 30, 20	DO, AT/DIC/pH, nutrients (IMR & UiT), chl a, POC/PON
09/11/2021, 04:03	519	ATWAIN transect	81.6100	30.6762	1854	1915, 500, 300, 200, 150, 120, 90, 60, 30, 20	AT/DIC/pH, nutrients (IMR & UiT), chl a, POC/PON
09/11/2021, 06:39	520	ATWAIN transect	81.6318	30.6519	2049	2107, 500, 300, 200, 150, 120, 90, 60, 30, 20	AT/DIC/pH, nutrients (IMR & UiT), chl a, POC/PON, δ^{18} O
09/11/2021, 11:42	521	ATWAIN 800	81.5483	30.8654	880	885, 500, 300, 200, 150, 120, 90, 60, 30, 20	AT/DIC/pH, nutrients (IMR & UiT), chl a, POC/PON
09/11/2021, 15:04	522	ATWAIN 500	81.4577	31.0754	488	478, 300, 200, 150, 120, 90, 60, 30, 20	AT/DIC/pH, nutrients (IMR & UiT), chl a, POC/PON
09/11/2021, 19:48	523	ATWAIN 200	81.4105	31.2373	208	203, 150, 120, 90, 60, 50, 40, 30, 20	AT/DIC/pH, nutrients (IMR & UiT), chl a, POC/PON
10/11/2021, 20:20	530	M1	79.5837	28.0740	263	258, 200, 150, 120, 90, 60, 50, 40, 30, 20	DO, AT/DIC/pH, nutrients (IMR & UiT), chl a, POC/PON, δ^{18} O
10/11/2021, 23:17	531	Glacier front transect	79.5280	25.7198	113	105, 90, 60, 50, 40, 30, 20	AT/DIC/pH, nutrients (IMR), δ ¹⁸ O
11/11/2021, 00:44	532	Glacier front transect	79.5765	26.1682	147	140, 120, 90, 60, 50, 40, 30, 20	AT/DIC/pH, nutrients (IMR), δ ¹⁸ O
11/11/2021, 02:09	533	Glacier front transect	79.6293	26.6477	193	189, 150, 120, 90, 60, 50, 40, 30, 20	AT/DIC/pH, nutrients (IMR), δ ¹⁸ O
11/11/2021, 03:35	534	Glacier front transect	79.6449	27.2240	215	209, 150, 120, 90, 60, 50, 40, 30, 20	AT/DIC/pH, nutrients (IMR), δ ¹⁸ O
12/11/2021	536	Glider deployment at F3-2	76.6173	31.0337	278	274, 200, 150, 120, 90, 60, 50, 40, 30, 20	DO, chl a, POC/PON

3.1.8 Underway sampling

METEOROLOGICAL MEASUREMENTS FROM VAISALA AWS430 WEATHER STATION Meteorological parameters including air temperature, wind speed and direction, air pressure, and humidity were measured continuously by the Vaisala AWS430 weather station mounted atop the uppermost deck.

THERMOSALINOGRAPH

The sea water intake for underway measurements was opened directly after leaving Longyearbyen, using the intake at 4 m depth. Close to the intake, a SBE38 temperature sensor records the temperature before the water is heated up as it continues towards the Clean Seawater Lab. There, a SBE21 SeaCAT thermosalinograph monitors temperature, salinity, and fluorescence (WET Labs WET star fluorometer). Due to sea ice, the intake had to be closed 08. November. No dedicated log was kept of times of starting and stopping the intake pump, and the record therefore has to be processed carefully. Additional problems occurred due to water leakage in the pump system for the sea water intake and at the thermosalinograph which led to loss of data after 09. November.

OCEAN CURRENT MEASUREMENTS FROM 38KHZ and 150 KHZ VM ADCPs

Vessel mounted ADCPs (38 kHz and 150 kHz) measured continuously from shortly after leaving port until the end of the cruise. Standard configuration was used throughout the cruise:

38 kHz ADCP: CR1 CB611 WP00000 NP00001 NN128 NS800 NF1600 CX 1,0 BP000 BX17000 ND111100000 TP000300 TE00000300 EZ1020001 EX00000 EA004688 EJ-009 EI001 ED00084 ES35 CK

(narrowband profiling, 128 bins with 8 m bin depth, 16 m blanking distance, no bottom track, synchronised pinging with K-Sync, transducer misalignment of 46.88 degrees, transducer depth 8.4 m)

150kHz ADCP: CR1 CB611 WP00000 NP00001 NN065 NS0800 NF0800 CX 1,0 BP000 BX08000 ND111100000 TP000100 TE00000200 EZ1020001 EX00000 EA004642 EJ0008 EI-017 ED00084 ES35 CK

(narrowband profiling, 65 bins with 08 m bin depth, 8 m blanking distance, no bottom track, synchronised pinging with K-Sync, transducer misalignment of 46.42 degrees, transducer depth 8.4 m)

Final processing of the data will be done after the cruise.

PCO2 MEASUREMENTS

T2.1.1

The underway instrumentation for autonomous high-frequency surface water measurements of partial pressure of CO₂, pCO₂, (General Oceanics), dissolved oxygen (DO) (Aanderaa sensor), salinity, temperature, CDOM and chlorophyll a fluorescence are used to investigate the variability in these parameters in the surface water along the cruise track. The atmospheric CO2 is also measured from the same pCO2 system. The main objectives are 1) estimate the air-sea CO2 flux and the role of polar ocean's CO2 uptake, 2) major drivers of pCO2 variability such as primary production, temperature and influence of freshwater (sea ice, river, glacial runoff). The pCO2 instrument and data contributes to global carbon projects such as the Integrated Carbon Observatory Systems (ICOS) aiming to estimate the ocean's role in the carbon budget and estimates of anthropogenic CO2 uptake.

As described above, the seawater intake was closed during large parts of the cruise due to heavy sea ice, and leakages in the system further reduced data recording.

Annual maintenance and upgrade of the pCO2 system was done toward the end of the cruise by Ceslav Czyz.

POSITION LOG

GPS-based position logs for each day are available through the toktlogger.

3.2 Data set and sample log

All activities and samples were logged and labelled following Nansen Legacy procedures (*Nansen Legacy Sampling Protocol version 9, chapter 2*). The metadata will be published on <u>https://sios-svalbard.org/aen/tools</u>.

3.3 Communication and Outreach

Several posts for the Nansen Legacy blog on forskning.no / sciencenorway.no and social media (Facebook, Instagram, Twitter) were written by the cruise participants and published by the project office. See Appendix VII for an overview of submitted and published posts.

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Name	Institute	Task
Angelika Renner	IMR	Cruise leader/oceanography
Arild Sundfjord	NPI	Cruise leader/oceanography
Kristen Fossan	NPI	Mooring engineer
Ceslav Czyz	NPI	Mooring engineer
Morven Muilwijk	NPI	Oceanography, sea ice observations
Terje Hovland	IMR	Mooring engineer
Claire Mourgues	IMR	Water/chemical samples/chemical
		sensors
Marcos Porcires	UNIS	Mooring engineer
Kjersti Kalhagen	UNIS	NLEG PhD fellow, oceanography
Frank Nilsen	UNIS	Oceanography
Algot K. Peterson	UiB	Mooring engineer
Agnieszka Beszczynska-Möller	IOPAN	Oceanography, mooring operations
Piotr Wieczorek	IOPAN	Mooring engineer
Clement Bensimon	Seatech/IMR	MSc student, water sampling
Clea Pavillon	Seatech/IMR	MSc student, water sampling

Appendix I: List of participants



Appendix II: Cruise program

Cruise timeline - for more details please refer to Sample log. All times in UTC.

06 Nov

Started loading at 0730, left port at 1330

Steaming north, mooring preparations

07 Nov

Steaming to 22E, preparing instruments

Meetings to plan mooring operations

Encountered first sea ice at approx. 81° 20N, 20° 48E; pretty thin, snow-covered grey ice

Deployed IOPAS14, CTD w/water samples - in open water surrounded by sea ice

08 Nov

Deployed CNRS24 - in open water surrounded by sea ice

Steaming to 31 E

Recovery of AT800-5 and AT800-BioAc (ATWAIN/INTAROS) in 16m/s northerly wind, snow and sea fog

Searched for ATWAIN/SIOS BioAc; no response through acoustic pinging, potentially weak sign of the releaser on the EK80 but very uncertain. Likely lost

Searched for AT-200-5; no sign on echo sounder or through releaser system; considered lost

09 Nov

Deployment of IOPAS23 at night, in open water just off the ice edge

CTD transect from N to S over slope

Deployment of AT800-6, AT800-BioAc-2-2, AT500-2 and AT200-6, followed by CTDs w/water samples at each site

Steaming to M1 area

10 Nov

CTD at M1 main site

Recovery of NLEG M1-2-BioAc, M1-3, M1-b, M1-a

Up-slope CTD transect in-between recovery operations with lots of pancake ice

Deployment of NLEG M1-3-BioAc and M1-4

CTD at M1 site w/water samples

CTD transect towards glacier front during night and morning

Steaming to M2 area

11 Nov

Steaming to M2

CTD at M2

Recovered M2-3 in newly frozen pancake slush – KPH had to clear a recovery hole first; still windy, drifting at ~1knot during mooring recovery

Steaming to M3, leaving the ice

12 Nov

M3 not found on echosounder or through acoustic pinging; considered lost

Steaming to M5 area

Recovered M5-BioAc and M5; surrounded by birds

Steaming to F3

Glider deployment in windy and wavey conditions, followed by CTD w/water samples

Recovered F3-1; F3-2 was seen on echosounder but did not respond to acoustics

Recovered F2

Searched for F1 – not found on echosounder, no response to acoustic pinging; considered lost

13 Nov

Steaming to M4

M4 responded to acoustic pinging and release but did not surface. Assumed to be turned upside-down by trawler. Triangulated accurately for future ROV recovery.

N-S CTD transect at M4

Steaming for F3-2 second attempt with different releaser number & codes

14 Nov

Successful acoustic pinging for F3-2 (through the moonpool), but no recovery due to weather; 21m/s wind with gusts, no work on deck possible

Steaming to C and S moorings; successful pinging of all of the C and S moorings through moonpool, but wind (30 knots), waves (~6m) and snow showers not cooperative

Decision to return to Tromsø made at 23:00 when wind picked up again and sufficient weather improvement for mooring operations could not be expected before turning around was necessary to arrive in Tromsø on the agreed time.

15 Nov

Argo deployments followed by CTD during a short weather window.

Steaming to Tromsø through the next low pressure system with strong headwinds.

16 Nov

Steaming to Tromsø

Opportunistic CTD at Kvænangen for fjord and coastal monitoring

Arrived in Tromsø at 20:00

Date	Time	Latitude	Longitude	Bottom	Ship CTD station	Comments
	(UTC)	(N)	(E)	depth (m)	number	
07/11/21	21:12	81.4853	21.9043	877	516	At IOPAS14
08/11/21	17:21	81.4133	31.2370	208	517	At AT-200
09/11/21	01:55	81.5723	30.9791	1206	518	At IOPAS23
09/11/21	04:03	81.6100	30.6762	1854	519	ATWAIN transect
09/11/21	06:39	81.6318	30.6519	2049	520	ATWAIN transect
09/11/21	11:42	81.5483	30.8654	880	521	At AT-800-6
09/11/2021	15:04	81.4577	31.0754	488	522	At AT-500-2
09/11/2021	19:48	81.4105	31.2373	208	523	At AT-200-6
10/11/2021	06:47	79.5886	28.0892	262	524	At M1-3
10/11/2021	09:20	79.5601	28.2861	320	525	M1 transect
10/11/2021	10:03	79.5694	28.1593	306	526	At M1b
10/11/2021	12:51	79.5886	28.0891	258	527	M1 transect
10/11/2021	13:57	79.6480	27.9672	141	528	M1 transect
10/11/2021	14:41	79.6736	27.8343	98	529	At M1a
10/11/2021	20:20	79.5837	28.0740	263	530	At M1-4
10/11/2021	23:17	79.5280	25.7198	114	531	Glacier front transect
11/11/2021	00:44	79.5765	26.1682	148	532	Glacier front transect
11/11/2021	02:09	79.6293	26.6477	193	533	Glacier front transect
11/11/2021	03:35	79.6449	27.2240	215	534	Glacier front transect
11/11/2021	09:37	79.6772	32.3101	355	535	At M2-3
12/11/2021	13:27	76.6173	31.0337	278	536	At F3
12/11/2021	22:33	77.3592	31.0270	194	537	At F1
13/11/2021	09:24	77.2686	24.4079	68	538	At M4
13/11/2021	13:33	77.4198	24.3262	46	539	M4 transect
13/11/2021	14:35	77.3448	24.3764	62	540	M4 transect
13/11/2021	15:29	77.2688	24.4024	72	541	M4 transect
13/11/2021	16:28	77.1963	24.6511	72	542	M4 transect
13/11/2021	17:15	77.1346	24.5915	64	543	M4 transect
13/11/2021	19:49	77.1668	26.1832	109	544	M4 transect
15/11/2021	10:26	73.7067	29.2666	373	545	At Argo deployment
16/11/2021	14:50	70.1702	21.0676	351	546	Kvænangen

Appendix III: CTD stations

Appendix IV: Recovered Nansen Legacy and A-TWAIN moorings

Rigg ATWAIN800-6 Satt ut 27.09.20 , kl 14:40	81 33,00 030 52,7	00N 761E		Dyp:	Fra bunn:	Ned i vann:
Signature 250 m batter	i SNR			30	850	15:13
e 2 glasskuler						
SEAPHOX	SNR. PHS203	35		38	842	15:13
IXUS 5 m Kevlar	SNR.			41	839	15:13
RBR Concerto+cl+pa	rSNR. 66091			45	835	15:13
0,5 m Kjetting Galv.						
50 m Kevlar						
4 glasskuler				97	783	15:13
0,5 m Kjetting Galv.						
RBR Concerto	SNR. 60594			99	781	15:05
100 m Kevlar RBR Concerto	SNR. 60597			151	729	15:03
RBR Concerto	SNR.60598			201	679	15:03
0,5 m Kjetting Galv.						
50 + 50(51)m Kevlar						
RBR Concerto ADCP150	SNR.60596 SNR: 24636			302 304	578 576	15:00 15:00
1 m Kjetting Galv.						
100 (102) m Kevlar						
RBR Solo	SNR.102491			408	472	14:52
200 (207)m Kevlar						
RBR Solo	SNR.102489			615	265	14:48
50(51) m Kevlar						
100+100(104) m Key	lar					
RBR Concerto SBE37/SEAFET	SNR.204987 SNR. 2004			867	13	14:42
4 Glasskuler						
4 m Kjetting Galv.						
Svivel AR861B2S	SNR. 2426	Arm: Release:	1BDF 1B55			
5 m Kevlar						
2 m Kjetting ANKER 1000 kg				880	0	

Mooring AT800-6

Institute of Marine Research Mooring Instruments



												<u> </u>
Shi	p plat orm:	KPH					$\left \right\rangle$	\sim	\sim	~~~~~~	\sim	- 0 m
Sta	t on name:	Atwain	-Ateros	BIOAC-0	2		Weight	Vol	Length			
Lat	tude:	N 81° 3	2.892	Longitu	de:	E 30°53.358	[kg]	[1]	[m]	Material / Object		
Bot	t om depth [m] 872m		Total he	ight [m]							
Ou	tgoing date:	09.NO	V.2021	Outgoir	ig t me:	13:51utc						
Inc	oming date:			Incomin	ng t me:							0 m
Are	705			S/N:		154						
PT	TID:	29532		Hex:		10.						
Ace	oust c Release	Ixblue										
Typ	be:	R5		S/N:		21350036						
Bat	type:	Alk, original		Bat exc):	Aprox. june2025						
Rar	nge code:	3525		Release	code:	3555						
Coi	mments for de	ployment ope	rat ons:									
Ins	trument start :	10.11.21 kl12ı	utc									
Co	mments for rea	overy operat	ons:									
	rone from ND	should be sho		with 200	200							
Blir	nking light star	t blinking app	rox 10m	in af er su	rfacing							
Bat	t ery on release	e must be cha	nged ne	xt recover	У							
		Inst	rument	s / sensors	;							
#	Brand	Туре		S/N	Depth	Comment						
1	Nortek	Signature 10	00	101598	395	2års utset						
2	Novatech	Blinkelys		F10-061	395	New bat						
3	SIS	ArgoTx		154	395	New saf LS20						
4	t											
5	t											
6	t											
/	t											
		Inst	ruments	s conf g inf	o							
#	Type/sn	Ping/	Recor	d Bat	ery	Comment						
1	Ci=100- day	Time/cell	interv	al info		Dulitabilities		110	2	Singature100		395 m
1	Sig100adcp	180s/10m	2t	IIIII	um	2xiitnium				U		
2	+		ZUSEK			400mmange		25	2	Vitrovex glass sphere		
4	t									w;		399 m
5	t											
6	t											
			Diget	r nort-					460	(np tau360+40+20)+(40hi rope)		
	Tune		Rigging	gparts		Ohi		50	2			
#	Shackle celus	nizod stool				QIY		50	2	vitrovex glass sphere		859 m
1	Shackle stain	ess steel 2.25	т							O		
2	Kevlar tau	ess steer 5.25							2 21	stran		
4	Strope											
5	Ring (plast c/	metal)					22		0.8	Acoust c release		
6	Strope											
7	Ring (plast c/	metal))	
_		,							6 2t	trap		864 m
Res	sponsible for d	eployment or	recover	y operat o	ns:							
							500		2	railway wheel and chain 🛔		972 m
							1-1-1-	 /-/-/-,			,	
							r///		////			

Mooring AT800-BioAc-2 (ATWAIN/INTAROS BioAc; same setup as outgoing)

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Shi	p plat orm:	KPH	1						~~~	\sim	~~~~~	~	0 m
Sta	t on name:	M1	-BIOAC					Mainh t	Val	Length			
Lat	tude:	N 7	'9° 35.178	3 L	ongitude:		E 28° 24.974	[kg]	[1]	[m]	Material / Object		
Bot	t om depth [m	n] 265	5	Т	otal height (m]				1			
Ou	tgoing date:	10.	11.21	0	utgoing t me:		07:40utc						
Inc	oming date :			Ir	ncoming t me:								0 m
_													
Arg	jos	4577		5	/N:	18	1						
	IID:	15//		F	lex:								
Aco	oust c Release	lxblue											
Typ	e:	R5		S	/N:	21	350035						
Bat	type:	Alk. origi	nal	B	lat exp:	Ар	prox june2025						
Rar	nge code:	3524		R	lelease code:	35	55						
Со	mments for de	eployment	operat on	IS:									
Sta	rt recording 1	1novkl180	Outc										
	-												
Со	mments for re	covery ope	erat ons:										
Bat	ery on next r	elease mu	st be chan	ige d a	f er next reco	very							
			Instrume	nts/s	ensors								
#	Brand	Type	morumer	S/N	Den	oth	Comment						
1	Nortek	Signatur	e 100	101	764 244		2års utset						
2	Novatech	Blinkelvs	5	F10	-062 244		New bat						
3	SIS	ArgoTx		181	244		New saf LS20						
4	t	0											
5	t												
6	t												
7	t												
_						_			110	·····	cignatura 100		57 m
	- 1	D (Instrumer	nts co	nt g into				110	2	signature 100		57 m
#	lype/sn	Ping/ Time/ce	ell inte	ord rval	Bat ery info	Co	omment						
1	Sig100adcp	180s/10	Om 2t		lithium	2×	dithium						
2	Sig100echo		20se	ek		40	00m range	L		+	Y		
3	t									2	21 strap		
4	t												
5	t									ļ			
6	t										*		
			Riggi	ng pa	rts								
#	Туре			0 - 2		Qt	v	15		1	aqoust c release		
1	Shackle galva	anized stee	el				,						
2	Shackle stain	less steel 3	3.25 T										
3	Kevlar tau							11111111111			Υ		
4	Strope												
5	Ring (plast c/	(metal)								2	2T strap		
6	Strope												
7	Ring (plast c/	(metal)								+	1		
P -	nonsiki- f-	de placeres	+ or r		anat accord						X		
Kes	sponsible for a	aepioymen	t or recov	ery op	perations:			270		1	ų į		
								5/0		1		2	65 m
								777	////	777.	///////////////////////////////////////		777

Mooring NLEG M1-2-BioAc (same setup as outgoing)

Rigg M1-3	1-1 10:00:		79 35.034 N 028 03 937 F	Dyp:	Fra bunn:	Ut:
	, KI 19.00.		028 03.937 E			
	Nortek S500	SNR. 812		19	233	20:00
Ę	RBR Concerto	NR.201415	5	20	232	
	SeaFET 2033, u	CAT 22418		22	230	
	2 Glasskuler i 1	m Kjetting ga	ılv.			
	Sedimenteksperi	iment Nadjejo	la Espinel	24	228	
	Concerto 20498	5 + ECO 5804	4	25	227	
D	0,5 m Kjetting g 20 m Kevlar 10 m Kevlar RBR SoloT	alv. SNR. 10294	19	55	197	
	HF36			56	196	
Ţ	Svivel					
	2 m Kevlar Aural Hvallyd	SNR. 288		60	192	
	2 m Kjetting ga	lv				
	1 m Kjetting gal	v.				
	4 Glasskuler i 2	m Kjetting ga	ılv.			
	0,5 m Kjetting g 20 m Kevlar	alv.				
	McLane Sedim.	SNR. 14449	9-02	88	164	
1.	RBR Concerto	SNR. 20498	32	89	163	
_0	50 (51) m Kevla RBR SOLO 20 (21) + 10 m H	r SNR. 10249 Kevlar	00	149	113	
₽ _	RBR Concerto	SNR. 20497	79	170		
j	AU (41) m Kevla RBR SOLO	r SNR. 1024	76	209	82 43	
<u> </u>	20 + 10 (11) m ADCP150	Kevlar SNR. 16493	3	240	12	
	2 m Kevlar SeaPhox	SNR. 2017	2/2004	241	11	19:00
	RBR Concerto	SNR. 2049	86			
8			242	10	19:05	
	AR861B2S	SNR. 2632	Ping on: Release:	2B47 2B55		
Ĩ	2 m Kjetting.		Arm:	2BEB		
S. S	2 m Kjetting ga	lv.				
	ANKER	700/(600)kg	g	252	0	

Mooring NLEG M1-3

					1
			Name: M1b Depth: 299	Location: N79 34,4040' E028 9,2220' Date:20.02.2021	
		McLane 37" 31	m 10 kg		
		SBE37 #10964	l	35m	
	•	Vemco minilog	#358950	55m	
262 m dyne		SBE37 #20169)	165m	
ema .		Vemco minilog	#355571	180m *	
10 mm		Vemco minilog	#358946	205m	
2		Vemco minilog	#355570	250m *	
		SBE37 #20170)	295m	
		Vitrovex 2 x 25	ō kg		
		IXBLUE AR #1 ARM 0ABB / R	1697 Rel OA55	298m	
		SBE26 #1366		299m	
		Weight 650 kg	I		

Mooring NLEG M1-b



Mooring NLEG M1-a

Rigg M2-3	79 4	0.536 N		Dyp:	Fra bunn:	Ut:
Satt ut 24.SEP	2020, kl 13:00 032	18.884 E				
—	Nortek S500	SNR. 809		30	330	13:18
ŧ	RBR Concerto	NR.60599		30	330	13:18
	2 Glasskuler i	1 m Kjetting galv.				
le l	ISUS	NR.232		32	328	13:14
1	RBR Concerto	+cl+par66090		33	327	13:08
₿ • ¶	0,5 m Kjetting 20 m Kevlar 10 m Kevlar BBB SeleT	galv.		62	207	12.06
<u> </u>	KDK 50101	SNR. 102485		05	297	15.00
	HF36			64	296	
	Svivel 2 m Kevlar Aural Hvallyd	SNR.		67	293	13:04
	2 m Kevlar					
8	0,5 m Kjetting	galv.				
	40 (41)m Kevl	lar				
	RBR Concerto	SNR. 60601		95	265	12:53
Ľ	100 (104) m K	evlar				
ļ	RBR SOLO	SNR. 102483		165	195	12:51
F.	RBR Concerto	SNR. 60593		215	145	12:49
D	100 (107) m k RBR SOLO	Kevlar SNR. 102479		277	83	12:46
•	20 m Kevlar					
	ADCP150	SNR. 24637		347	13	12:42
	RBR Concerto	o SNR. 60590		350	10	12:42
	AR861B28	SNR. 2425	Ping on: Release:	1B47 1B55		
Ī	5 m Kevlar.		Arm:	1BDE		
8	2 m Kjetting g	galv.				
	ANKER	760/(670)kg		360	0	

Mooring M2-3



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Location: M5-BIOAC Lattude: N 77* 04.947 Longitude: E 035* 03.47 Instruments / Sensors Itel If Material / Object 1 Instruments / Sensors Itel Itel Itel Itel 1 Nortek Signature 100 101121 Itel
Latitude: N 77° 04.947 Longitude: E 035° 03.47 Instruments / Sensors # Brand Type Signature 100 101121 2 1 3 1 4 1 5 1 6 1 7 1 8 1 9 10 11 1 12 1 8 1 9 1 10 1 11 1 12 1 8 1 9 1 11 1 12 1 13 1 14 1 15 1 16 1 17 1 18 1 19 1 11 1 12 1 13 1 14 1 15 1 16 1 17 1 18 1 19 1 10 1 11 1 12 1
Longitude: E 035° 03.47 Instruments / Sensors Filter Serial No. Depth Comments 1 Nortek Signature 100 101121 2 0 101121 0 3 0 0 0 4 0 0 0 5 0 0 0 6 0 0 0 7 0 0 0 10 0 0 0 11 0 0 0 12 0 0 0 13 0 0 0 14 0 0 0 15 0 0 0 0utgoing date: 2020.10.12 0 Outgoing time (UTC): 25:52 0 0 Incoming date: 2021.11.12 0 Incoming time (UTC): 05:34 0 0
Instruments / Sensors # Brand Type Serial No. Depth Comments 1 Nortek Signature 100 101121 1 1 2 1 1 1 1 1 3 1 1 1 1 1 4 1 1 1 1 1 5 1 1 1 1 1 1 6 1
Image: Second
1 Nortek Signature 100 101121 2 1 1 3 1 1 4 1 1 5 1 1 6 1 1 7 1 1 8 1 1 9 1 1 10 1 1 11 1 1 12 1 1 13 1 1 14 1 1 15 1 1 16 1 1 Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 1 Incoming time (UTC): 05:34 1 Comments: 1
1 Index 3 2 1 3 1 4 1 5 1 6 1 7 1 8 9 9 1 10 1 11 1 12 1 13 1 16 1 Bottom depth: 14 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments: 1
3
4 1 5 1 6 1 7 1 8 1 9 1 10 1 12 1 13 1 14 1 15 1 16 1 Bottom depth: 144 m 0utgoing date: 2020.10.12 Outgoing time (UTC): 22:52 1 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 1 Comments: 1
S Image: S 6 Image: Im
6 0 7 0 8 0 9 0 10 0 11 0 12 0 13 0 14 0 15 0 16 0
7 0 8 0 9 0 10 0 11 0 12 0 13 0 14 0 15 0 16 0
8 9 10 11 12 13 13 14 14 15 16 16
9 10 11 12 13 14 14 15 16 16
10 11 12 13 13 14 15 16 Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments:
11 12 13 14 15 16 Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments:
12 13 13 14 15 16 Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments:
13 14 14 15 15 16 Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments:
14 15 15 16 Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments:
15 16 Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments:
16 Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments: Image: Comment to the second to th
Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34
Bottom depth: 144 m Outgoing date: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments: Incoming time (UTC):
Outgoing Gate: 2020.10.12 Outgoing time (UTC): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34
Outgoing time (01C): 22:52 Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments:
Incoming date: 2021.11.12 Incoming time (UTC): 05:34 Comments:
Comments:
Comments:
Responsible: Terje Hovland
ARGOS
PTTID:
ACOUSTIC Freedes: IASCA ARADI Sadal nos: 2122 Battanuaraira: 2024.01.10
Senia no. 2125 battery expire. 2024.01.19
Nalige Code: ObAA
Station Name INF-DOAC
Sum weight (acd anchor): [kg]
Sum volume: [1]
Buoyancy (anchor on): [kg]
Buoyancy (anchor off): [kg]
Shackle Stainless Steel
Shackle Galvanized Steel
Thimble Stainless Steel
Thimble Galvanized Steel
Description Score No. 1.0 Steel Stainless / Nortek Signature 100
Sharkle Stainless Stael
Shackle Stainless Steel 2.50
Shackle Galvanized Steel 0.50 0.8 Steel Dunley / Iroga Argustic Belgare
Shackle Galvanized Steel 2.00 1
Shackle Galvanized Steel 3.25 4
Shackle Galvanized Steel 4.75
Shackle Galvanized Steel 6.50
Thimble Stainless Steel
Thimble Stainless Steel 8.0 Danine Rope 16 mm
Thimble Galvanized Steel
Thimble Galvanized Steel 1.0 Steel Galvanized / Chain Longlink 19 mm 0 1.0
Thimble Galvanized Steel 1.0 Steel Galvanized / Chain Longlink 19 mm 0 Thimble Galvanized Steel 1.0 Steel Galvanized / Chain Longlink 19 mm 0 Thimble Galvanized Steel 1.0 Steel Galvanized / Chain Longlink 19 mm 0

Mooring M5 BioAc



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								`	\sim	_ / _ / _ / _ / _ / _ / _ / _ / _ / _ /	
Jac		ME					Weight	· Vol	Length	Material / Object	
LOC	ation:	IVI5					[kg]	. voi	[m]	Wateriary Object	
Lati	tude:	N //~ 04.48						1	1	L. C.	
Lon	gitude:	E 035° 02.20	08								
		Instrum	ients / Ser	isors							
ŧ	Brand	Туре		Serial No.	Depth	Comments					
1		CDE 27 CMAD		27 20254		With exhaust					
1	Sea Bird	SDE S7-SIVIP		57-20554	47	new batt					
2	-	SeapHOx pH		PHS-2068		Max 50 m					
3	Sea Bird	SBE 37-SMP		37-20179	126	New batt					
4	Nortek	Signature 25	0	100562	127	Lith.Batt					
5		0	-								44 m
6											
7											
0								150	2	Steel Galvanized / Vitrovex	
0									2	Glass Sphere x 6	
9											46 m
.U								+		a	4-
.1										Stainless Steel/Seabird SBE 37-SMP SeaPHox 👖 🖡	4/m
2						L				14 D	
3											
4									20	Kevlar Rope 10 mm 5.5 ton	
.5										M.O.	
Bot	tom depth.	140 m						40		Steel Steinlass / Divinigal Elect Origination	
011	going date:	2020 10 13						40		steel stainless / Divingcell Float Cylinder	
Out	going time (UTC)	00.19							+	🛉 🗓	
Juc	going time (UTC):	2021 11 12								<u>A</u> .	
nco	ming uate:	2021.11.12								ئا <i>س</i> ەر ئاسەر	
nco	oming time (UTC):	0615								,	
Cor	nments:										
Res	nonsihle: Terie Hr	wland									
Res	ponsible: Terje Hc	ovland									
Res	ponsible: Terje Ho G OS	ovland							60	Kevlar Rope 10 mm 5.5 ton 3x20m	
Res AR(ponsible: Terje Hc G OS ID:	ovland							60	Kevlar Rope 10 mm 5.5 ton 3x20m	105 m
Res ARC PTT	ponsible: Terje Ho GOS ID: ustic release: IXS	ovland							60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc	ponsible: Terje Ho GOS ID: ustic release: IXSI al po: 300	EA ARX61	rv exnire:	2028 03 23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri	ponsible: Terje Ho GOS ID: ustic release: IXSI al no: 300 ge code: 1420	ovland EA ARX61 Batte	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri Ran	ponsible: Terje Ho GOS ID: ustic release: IXSI al no: 300 ge code: 1420 pase rode: 1425	evland EA ARX61 Batte	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri Rar Rel	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1420	EA ARX61 Batte	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri Rar Rel	ponsible: Terje Ho GOS ID: ustic release: IXSI al no: 300 ge code: 1420 pase code: 1455 m Name MS	EA ARX61 Batte	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT ACC Seri Rar Reli	ponsible: Terje Ho 50S ID: ustic release: IXS al no: 300 ge code: 1420 case code: 1455 m Name M5 weight (incl. anch	EA ARX61 Batte	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri Rar Reli atic Sum	ponsible: Terje Ho GOS ID: ustic release: IXSS al no: 300 ge code: 1420 asse code: 1455 m Name MS weight (incl. ancho weight (excl. ancho	expland EA ARX61 Batte pr): [kg] pr): [kg]	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri Rar Reli atic Sum Sum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 sase code: 1455 mo Name MS weight (incl. ancho weight (excl. ancho volume:	EA ARX61 Batte Dr): [kg] Dr): [kg] [l]	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri Rar Reli Sum Sum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1455 m Name M5 weight (incl. ancho weight (excl. ancho volume: vancy (anchor on);	EA ARX61 Batte Dar): [kg] [l] [kg] [kg]	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Ser Rar Reli Sum Suo Buo	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1455 m Name MS weight (incl. ancho weight (excl. ancho volume: vancy (anchor on): vancy (anchor on):	ovland EA ARX61 Batte or): [kg] [l] [kg] [kg]	ry expire:	2028.03.23			· · · · · · · · · · · · · · · · · · ·		60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri Rar Reli Sum Suo Buo	ponsible: Terje Ho GOS ID: ustic release: IXSI al no: 300 ge code: 1420 code: 1420 m Name MS weight (incl. anchor weight (excl. anchor volume: yancy (anchor on): yancy (anchor off): kile Stainless Steel	extand EA ARX61 Batte or): [kg] [kg] [kg]	ry expire:	2028.03.23					60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m
Res ARC PTT Acc Seri Ratic Sum Sum Sum Sum Sum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 asase code: 1455 in Name MS weight (incl. ancho weight (excl. ancho volume: vancy (anchor on): vancy (anchor or); ikle Stainless Steel ikle Galvanized Steel	Devland EA ARX61 Batte Dr): [kg] [l] [kg] [kg] [kg]	ry expire:	2028.03.23			40		60	Kevlar Rope 10 mm 5.5 ton 3x20m	106 m 126 m
Res ARC PTT Acc Ser Rar Reli atio Sum Sum Sum Sum Sum Sum Sum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 sase code: 1420 weight (incl. anchor weight (excl. anchor volume: vancy (anchor on): kle Stainless Steel kle Galvanized Steel ble Stainless Steel	Diviand EA ARX61 Batte Dor): [kg] [l] [kg] [kg] [kg]	ry expire:	2028.03.23			40		60	Kevlar Rope 10 mm 5.5 ton 3x20m A. Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250	106 m
Res ARC PTT Acc Seri Rar Reli Sum Sum Sum Sum Sum Sum Sum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1455 in Name M5 weight (incl. ancho weight (excl. ancho volume: vancy (anchor on): vancy (anchor or): vancy (anchor or):	EA ARX61 Batte	ry expire:	2028.03.23			40		60	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250	106 m 126 m 127 m
Res ARC PTT Acc Seri Rar Reli Sum Sum Sum Sum Sum Sum Sum Sum Sum Sum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1455 m Name M5 weight (incl. anchor weight (excl. anchor volume: vancy (anchor on): vancy (anchor off): kle Stainless Steel ble Stainless Steel bble Stainless Steel	el	ry expire:	2028.03.23			40		60	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Clares Subora v. 6	106 m 126 m 127 m
Res ARC PTT Acc Seri Ran Reli atic Sum Sum Sum Sum Sum Sum Sum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1455 in Name M5 weight (incl. ancho weight (excl. ancho weight (excl. anchor output) weight (excl. anchor weight (excl. anchor output) ikle Salualises Steel hble Stainless Steel hble Stai	evland EA ARX61 Batte Dor): [kg] [kg] [kg] [kg] el el el Doment	ry expire:	2028.03.23			40		60 1,5	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6	106 m 126 m 127 m
Res ARC PTT Acc Seri Rar Buo Suo Suo Suo Suo Suo Suo Suo Suo Suo S	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ge code: 1420 asase code: 1455 m Name MS weight (incl. anchor weight (excl. anchor volume: vancy (anchor off): kle Stainless Steel hble Stainless Steel NS NS NS NS NS NS NS NS NS NS	byland EA ARX61 Batte Dr): [kg] [l] [kg] [kg] el el Doment Spec.	ry expire:	2028.03.23			40		60	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6	106 m 126 m 127 m
Res ARC PTT Acc Ser Ran Reli atic um um um um um um um um um um um um um	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 sase code: 1420 sase code: 1420 weight (incl. anchor weight (excl. anchor volume: vancy (anchor on): kite Stainless Steel bible Galvanized Steel bible Stainless Steel bible Galvanized Steel bible Stainless Steel Steal	el Spr): [kg] [] [kg]	ry expire:	2028.03.23			40		60 1 1,5	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6	106 m 126 m 127 m 128 m
Res ARC PTT Acc Ser Ran Relia atic bum auon buo hac hac hac hac hac hac hac hac hac hac	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1455 weight (incl. ancho weight (excl. ancho volume: vancy (anchor on): vancy (anchor on):	EA ARX61 Batte Dr): [kg] [l] [kg] [kg] [kg] el el el Spec. Spec. Spec. Spec. Spec. Spec. Spec.	ry expire:	2028.03.23			40		60	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6	106 m 126 m 127 m 128 m
Res ARC PTT Acc Ser Ran Reli um um um um hac hac hac hac hac hac	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1420 ease code: 1455 m Name M5 weight (excl. anche volume: volume: vancy (anchor on): vancy (anchor of): kle Stainless Steel bble Stainless Steel bble Stainless Steel bble Stainless Steel bble Stainless Steel kle Stainless Steel kle Stainless Steel kle Stainless Steel kle Stainless Steel	elester ament byland EAARX61 Batter (kg)	ry expire:	2028.03.23			40 75 22		60 1 1,5	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release	106 m 126 m 127 m 128 m
Res ARC PTT Acc Seri Rali atic bac hac hac hac hac hac hac hac hac	ponsible: Terje Ho GOS ID: ustic release: IXSS al no: 300 ge code: 1420 asse code: 1455 In Name MS weight (incl. ancho weight (excl. ancho volume: vancy (anchor on): vancy (anchor on): vancy (anchor or): vancy (anchor or): ixle Stainless Steel hble Galvanized Steel hble Galvanized Steel ikle Stainless Steel ikle Galvanized Steel ikle Galvanized Steel	evland EA ARX61 Batte Dr): [kg] [l] [kg] [kg] [kg] [kg] [kg] [kg] [kg] [kg	ry expire:	2028.03.23			40		60	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release	106 m 126 m 127 m 128 m
Res ARC PTT Acc Seri Reli atic bum um um um um um um um um um um um um u	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 asse code: 1455 in Name MS weight (incl. anchor weight (excl. anchor weight (excl. anchor volume: vyancy (anchor off): ikle Stainless Steel hole Galvanized Steel hole Galvanized Steel hole Stainless Steel ikle Stainless Steel ikle Stainless Steel kle Stainless Steel ikle Galvanized Steel ikle Galvanized Steel ikle Galvanized Steel ikle Galvanized Steel ikle Galvanized Steel ikle Galvanized Steel	byland EA ARX61 Batte br): [kg] [l] [kg] [kg] [kg] [kg] [kg] [kg] [kg] [kg	ry expire:	2028.03.23			40 75 22		60 1 1,5	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release	106 m 126 m 127 m 128 m
Res ARC PTT ACC Seri Ran Reli atic Sum Sum Sum Sum Sum Sum Sum Sum Sum Sum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1420 ease code: 1455 weight (incl. anchor weight (excl. anchor volume: vancy (anchor on): vancy (anchor or): vancy (anchor or): kle Stainless Steel ble Galvanized Steel kle Galvanized Steel	byland EA ARX61 Batte Dor): [kg] [l] [kg] [kg] [kg] [kg] [kg] [kg] [kg] [kg	ry expire:	2028.03.23			40 75 22		60 1 1,5	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release Duplex steel / Mounting Ring 20 cm	106 m 126 m 127 m 128 m
Ress ARC PTT Acc Seri Ran Reli Jum Jum Jum Jum Jum Jum Jum Jum Jum Jum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1455 in Name MS weight (excl. anchor volume: vancy (anchor of): kle Stainless Steel kle Galvanized Steel kle Stainless Steel kle Stainless Steel kle Galvanized Steel	EAARX61 Batter Dr): [kg] [l] [kg] [kg] [kg] [kg] [kg] [kg] [kg] [kg	ry expire:	2028.03.23			40 75 22		60 1 1,5	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release Duplex steel / Mounting Ring 20 cm	106 m 126 m 127 m 128 m
Res ARC PTT Acc Ser Ran Reli atic hac hac hac hac hac hac hac hac hac ha	ponsible: Terje Ho GOS ID: ustic release: IXSS al no: 300 ge code: 1420 asse code: 1455 In Name MS weight (incl. ancho weight (excl. ancho volume: vancy (anchor on): vancy (evaland EA ARX61 Batte Batte Cor: [kg] [l] [kg] [kg] [kg] [kg] [kg] [kg] [kg] [kg	ry expire:	2028.03.23			40		60 1 1,5	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release Duplex steel / Mounting Ring 20 cm Danline Rope 16 mm pom thimble on	106 m 126 m 127 m 128 m
Res ARC PTT Acc Seri Reli atic ium ium ium ium ium ium ium ium ium ium	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 asse code: 1455 m Name MS weight (incl. anchor weight (excl. anchor volume: vyancy (anchor off): ikle Stainless Steel hole Galvanized Steel hole Galvanized Steel ikle Stainless Steel ikle Stainless Steel ikle Stainless Steel ikle Stainless Steel ikle Galvanized Steel ikle Gal	byland EA ARX61 Batte br): [kg] [l] [kg] [ry expire:	2028.03.23			40		60 1 1,5 0.2 8.0	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release Duplex steel / Mounting Ring 20 cm Danline Rope 16 mm pom thimble on top	106 m 126 m 127 m 128 m
Res ARC PTT ACC Ser Ran Reli Jum Jum Jum Jum Jum Jum Jum Jum	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 sase code: 1420 sase code: 1420 weight (incl. anchor weight (excl. anchor volume: vancy (anchor off): kle Stainless Steel ble Galvanized Steel kle Galvanized Steel stel Galvanized Stee	byland EA ARX61 Batte br): [kg] []] []] [kg] []] []] [kg] []] []] [kg] []] []] [kg] []] []] [kg] []] []] []] []] []] []] []] []] []] [ry expire:	2028.03.23			40		60 1 1,5 0.2 8.0	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release Duplex steel / Mounting Ring 20 cm Danline Rope 16 mm pom thimble on top	106 m 126 m 127 m 128 m
Ress ARC Accc Ger aticical har har har har har har har har har har	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 case code: 1420 case code: 1455 weight (incl. anchor weight (excl. anchor volume: vancy (anchor on): vancy (anchor or): vancy (anchor or): v	byland EA ARX61 Battel <	ry expire:	2028.03.23			40		60 1 1,5 0,2 8,0	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-SM Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release Duplex steel / Mounting Ring 20 cm Danline Rope 16 mm pom thimble on top Steel Galvanized / Chain Longlink 19 mm	106 m 126 m 127 m 128 m
Ress AARC ACC Serial atic atic atic atic atic atic atic atic	ponsible: Terje Ho GOS ID: ustic release: IXS al no: 300 ge code: 1420 ease code: 1420 ease code: 1455 m Name MS weight (excl. anchor weight (excl. anchor weight (excl. anchor weight (excl. anchor volume: vancy (anchor of): kle Stainless Steel kle Galvanized Steel Kle	byland EA ARX61 Batte batte batte (kg) (kg) (kg) (kg) (kg) (kg) (kg) (kg)	ry expire:	2028.03.23			40		60 1 1,5 0,2 8,0	Kevlar Rope 10 mm 5.5 ton 3x20m Stainless Steel / Seabird SBE 37-5M Microcat CTD Steel Stainless / Nortek Signature 250 Steel Galvanized / Vitrovex Glass Sphere x 6 Steel Duplex / Ixsea Acoustic Release Duplex steel / Mounting Ring 20 cm Danline Rope 16 mm pom thimble on top Steel Galvanized / Chain Longlink 19 mm	106 m 126 m 127 m 128 m 129,5 m

Mooring M5

Chain LL 2m x 13mm	18 m		3x Vitrovex 17" buoyancy à 25kg		
10m x 8mm	20 m		SBE37 - CTD	s/n	6097
	30 m	l	SBE56 - T	s/n	1331
	40 m	J	SBE56 - T	s/n	1332
Ď	50 m	I	SBE56 - T	s/n	1333
ynee	75 m	I	SBE 56 - T	s/n	1334
ma ro	100 m	T T	SBE37 - CTD	s/n	6017
pe 24	125 ш	J	SBE56 - T	s/n	1335
2m x {	150 m	I	SBE56 - T	s/n	1337
3mm	175 m	I	SBE 56 - T	s/n	1338
	200 т	e 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SBE37 - CT	s/n	7334
	250 m	I	SBE56 - T	s/n	1339
Chain LL 3m x 13mm	l	00	2x Vitrovex 17" buoyancy à 25kg		
Strap 2t 2m Chain LL 3m x 12m-	275 m		coustic Release R661	s/n ARN REI No c	758 M: 4670 .: 4679 liagnostic
5m x 15mm	280 m		Anchor 600kg		

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Mooring name:	NIVERSITETET I BERGEN Geofysisk Institutt F3-1						
Designet	Arven etter Nansen						
Project.	Barents sea						
Denition	Lat 76° 37.012' N						
POSIDOIL	Lon 31° 01.854' E						
Denth:	277 m						
Deployed:	2020.10.10 16:50 UTC						
Deproyee	G O Sars						
Recover:	2021						
Notes:							
Latest upd	ate: 17/10/2020						

Mooring NLEG F3-1



UI UI	NIVERSITETET I BERGEN Geofysisk Institutt
Mooring name:	F2
Project: Location: Position:	Arven etter Nansen Barents sea Lat 77° 02.925' N Lon 31° 01.706' E
Depth: Deployed:	237 m 2020.10.10 G O Sars
Recover: Notes:	
Latest upd	ate: 17/10/2020

Mooring NLEG F2

Appendix V: Deployed Nansen Legacy and A-TWAIN moorings



Mooring IOPAS14



Mooring CNRS24



Mooring IOPAS23

Rigg ATWAIN800 Satt ut 9.11.2021, kl 1	0-6 81 33,006N (81 1:20 030 52,662E(30	.5501) Dyp: 0,8777)	Fra bunn:	Ned i vann:
Nortek Sign 250) SNR 828	13(1)	867	19:20
4 glasskuler				
ISUS	SNR. 0294	41	839	19:20
RBR Concerto 2 m Kevlar	CL+PAR SN. 204992 4	5 835	19:20	
ADCP300	SNR 24485	97	783	19:10
0,5 m Kjetting	Galv.			
50 m Kevlar				
4 glasskuler 2 m Kjetting				
0,5 m Kjetting	Galv.			
RBR Concerto	SNR. 60594	99	781	19:10
100 m Kevlar				
RBR Concerto	SNR. 201413	151	729	18:59
RBR Concerto	SNR.201414	201	679	18:55
0,5 m Kjetting	Galv.			
50 + 50(51)m	Kevlar			
RBR Concerto	SNR.201403	302	578	18:47
4 Glasskuler 2 m Kjetting G 0,5 m Kjetting 100 (102) m K	iul v. Galv. evlar			
RBR Solo	SNR.102492	408	472	18:40
BBR Solo	SNR 102487	615	265	18:33
50(51) m Kevl	ar	015	203	10.55
100+100(104)	m Kevlar			
NORTEK Sig	55 SNR:	304	576	18:47
SBE37 2 m Kevlar	SNR. 23177			
Contros	SNR. 1220-001			
Svivel				
AR861B2S	SNR. 2630 Arm: Release	2BE9 2B55		
3 m Kevlar				
2 m Kjetting ANKER 11	00 kg	880	0	

Mooring AT800-7

Institute of Marine Research Mooring Instruments



Shi	o plat orm:	КРН						~ ~			0 m
Sta	t on name:	Atwain-Ateros-BIOAC-02				$+$ \sim \sim	\sim	\sim	00000000		
Lat	tude:	N 81°	32,892	Longitu	ide:	F 30°53,358	Weight [kg]	Vol	Length [m]	Material / Object	
Bot	om depth (m	nl 872m		Total h	eight [m]	20000000		1	1	L	
Out	going date:	09 NC	V 2021	Outgoi	ngtme:	13:51utc	-				
Inco	oming date:			Incomi	ng t me:	10101010	-				0 m
	Sining date:			inconn	B t lite.						
Arg	os			S/N:		154					
PTT	ID:	29532		Hex:							
Acc	oust c Release	e Ixblue									
Тур	e:	R5		S/N:		21350036					
Bat	type:	Alk. original		Bat ex	p:	Aprox. june2025					
Rar	ige code:	3525		Release	e code:	3555					
Cor	nments for de	eployment op	erat ons:								
Inct	rument start	10 11 21 kl13	lute				-				
11151	a unienic start	10.11.21 K112	ute								
Cor	nments for re	covery opera	t ons:				1				
All	rope from NP	should be ch	ange out	with 200	+200m		-				
Blin	king light sta	rt blinking ap	prox 10m	in af er su	urfacing						
Dat	ery on releas	e must be ch	angeune	XI TELOVE	i y						
		In	strument	s / sensor	S						
#	Brand	Туре		S/N	Depth	Comment					
1	Nortek	Signature 1	.00	101598	395	2års utset					
2	Novatech	Blinkelys	rkelys F10-061 395		New bat						
3	SIS	ArgoTx		154	395	New saf LS20					
4	t										
5	t										
6	t										
7	t										
		Ins	truments	s conf g in	fo						
#	Type/sn	Ping/	Recor	d Bat	ery	Comment					
		Time/cell	interv	al info	1		(110 2 Singature100	Singature100	395 m	
1	Sig100adcp	180s/10m	2t	lithi	um	2xlithium				L	
2	Sig100echo		20sek			400m range	i	25	2	Vitrovex glass sphere	
3	t						İ				300 m
4	t						ļ			P	335111
5	t										
6	t								460	(np tau360+40+20)+(40hi rope)	
			Rigging	g parts						(,	
#	Туре					Qty		50	2	Vitrovex glass sphere	859 m
1	Shackle galva	anized steel									L
2	Shackle stain	less steel 3.2	5 T								
3	Kevlar tau								2 21	strap	
4	Strope						22		0.8	Acoust c release	
5	Ring (plast c/	/metal)									
6	Strope										
7	Ring (plast c/	/metal)								φ	864 m
Res	ponsible for a	deployment o	r recover	y operat (ons:				6 2t	strap	ــــــ
							500	******	2	railway wheel and chain	
											872 m
							7-7-7-		1	┙┥╺┿╺┾╍╪╍╡╸┿╺┍╪╺┽╸┥╸┥╸┥╸┥╸	1////

Mooring AT800-BioAc-2-3 (ATWAIN/INTAROS BioAc)



Mooring AT500-2

] [Rigg	AT 09.11	WAIN200-6	81 24.630N(8 031 14.598E(81.4105) (31.2433)	Dyp:	Over bunn:	I vannet:
C	Орр	.20	kl		()			
Ĉ			ADCP Nortek GFI	SNR: 802		40	162	19:38
	0		6 Glasskuler 3 m Kjetting Galv.			41	161	
			SBE16/ECO	SNR. 30241/5803		45	157	19:38
U S			1 m Kjetting galv. 0,5 m Kjetting galv.					
ľ			SBE37 10 m Kevlar	SNR. 20773		49	153	19:38
Î			Hvallydopptaker 23	6		59	143	19:30
Ĭ			2 m Kevlar					
8			0,5 m Kjetting galv.					
			50 m Kevlar					
			SBE37	SNR. 15252		113	89	19:30
			20 m Kevlar					
Ĭ			50(51) m Kevlar					
			ADCP150	SNR: 24619		185	17	19:20
			5 m Kevlar					
			SBE37	SNR. 9293		190	12	19:20
	<u>)</u>		4 Glasskuler i 2 m g	alvanisert kjetting				
8			0,5 m Kjetting syrefa	ast				
ð			Svivel					
Į			AR861CS	SNR. 1454 Arm: Releas	09Al se: Arm	B + 0955		
Í			3 m Kevlar					
ß			3 m Chain					
			ANCHOR 900/(80	00) kg		202	0	

Mooring AT200-6

Institute of Marine Research Mooring Instruments



							ı ——					\sim
Shi	p plat orm:	KPH					\sim	\sim	\sim	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim\sim$	- 0 m
Sta	t on name:	M1-B	IOAC			1	Weight	Vol	Length	Matarial (Object		
Lat	tude:	N 79	35.178	Longitud	le:	E 28° 24.974	[kg]	[1]	[m]	Material / Object		
Bot	om depth [m	n] 265		Total hei	ght [m]							
Ou	tgoing date:	10.11	L.21	Outgoing	g t me:	07:40utc						
Inc	oming date:			Incoming	g t me:]					0 m
Arg	os			S/N:		181]					
PT	TD:	1577		Hex:			1					
Acc	oust c Release	Ixblue					1					
Тур	e:	R5		S/N:		21350035	1					
Bat	type:	Alk. origina	1	Bat exp	:	Approx june2025	1					
Rar	nge code:	3524		Release	code:	3555	1					
Col	nments for de	enlovment o	nerat ons				1					
Cha	at a secolar of the	1					-					
Sta	rt recording 1	100/8118000	IC									
Со	nments for re	covery opera	at ons:				1					
Bat	ery on next r	elease must	be chang	ed af er nex	kt recove	ery	1					
		In	strument	s / sensors								
#	Brand	Type	istrument	S/N	Depth	Comment						
1	Nortek	Signature	100	101764	244	2års utset						
2	Novatech	Blinkelys		F10-062	244	New bat						
3	SIS	ArgoTx		181	244	New saf LS20						
4	t											
5	t											
6	t											
7	t											
		In	strument	s conf g info				110	2	signature 100		257 m
#	Type/sn	Ping/	Recor	d Bate	rv	Comment						207.11
	1100/011	Time/cell	interv	al info	.,	connent					1-1-	
1	Sig100adcp	180s/10m	n 2t	lithiu	m	2xlithium					\blacksquare	
2	Sig100echo		20sek			400m range	ļ		2	2T stran	¥	
3	t								-	- Court		
4	t											
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Ь	τ											
			Rigging	g parts			15		1	adoust cirelease		
#	Туре					Qty	1.5		1	uquust e reiense		
1	Shackle galva	anized steel										
2	Shackle stain	less steel 3.2	25 T								ð	
3	Kevlar tau											
4	Strope	(matal)										
5	strong	metal)							2	2T strap		
7	Bing (plast c)	(metal)							+			
'	THE (plast C)	metal)									I	
De	ponsible for c	deployment	or recover	y operat or	ns:						Q.	
Res											-	
Res							370		1			265 ~~

Mooring NLEG M1-2-BioAc

Rigg I Satt ut	M1-4 10.11.2021,	kl	79 3 20:05 028	34.974 N(79.5829) 3 04.302 E(28.0717)		Dyp:	Fra bunn:	Ut:
	\bigcirc		Nortek S500	SNR 809		22	230	19:47
	F		RBR Concert	to NR 60600		23	229	19:47
						23		19.17
			2 Glasskuler 1	2 m Kjetting galv.				
	Ď		SeaPhox	NR.2035		26	226	19:47
			RBR CL + PA 2 m Kevlar 0,5 m Kjettin 20 m Kevlar 10 m Kevlar	AR SNR. 204991 g galv.		27	225	19:47
	_		RBR Concert	to SNR. 201403		57	195	19:36
			HF36			58	194	
	T		Svivel					
			2 m Kevlar	1 03 75 200		~	101	10.25
			Aural Hvally	d SNR. 288		61	191	19:35
			2 m Kevlar					
			4 Glasskuler i	2 m Kjetting galv.				
			0,5 m Kjetting 20 m Kevlar RBR Concerto 50 (51) m Kev	g galv. o SNR. 60591 vlar		87	165	19:27
	•		RBR SOLO	SNR. 102486		150	102	19:26
	Ħ		20 (21) + 10 r RBR Concert	n Kevlar o SNR. 60592		170	82	19:24
	T		40 (41) m Ke	vlar				
	D		RBR SOLO	SNR. 102477		210	42	19:22
	Ţ		20 + 10 (11) r	n Kevlar				
(Ò		ADCP150	SNR. 16640		240	12	19:20
	F		SBE 37	SNR. 23180		242	10	19:20
			Contros CO2	SNR. 1220-002		244	08	19:20
			AR861B2S	SNR. 2426	Ping on: Release:	1B47 1B55		
	a		3 m Kevlar.		Arm:	1BDF		
	8		2 m Kjetting	galv.				
	0		ANKER	825/(700)kg		252	0	

Mooring NLEG M1-4





3D mooring pos.: 77°N 16.148'; 24°E 24.427'; Mooring Depth: 165 [m]

Errors [m] Slant / Horizontal / Vertical : 0 / 0 / 0

2D mooring pos.: 77°N 16.160' ; 24°E 24.429' ; Horiz. error: 36 [m]

Anchor release pos.: 77°N 16.116' 24°E 24.402' ; Depth: 68 [m]

Drift: 60[m]; Heading: 10 [o]

Sound speed at site: 1480 [m/s]

#1 pos: 77°N 16.158' 24°E 24.970' range: 273[m] range soundspeed 1480

#2 pos: 77°N 16.022' 24°E 24.354' range: 283[m] range soundspeed 1480

#3 pos: 77°N 16.219' 24°E 23.846' range: 314[m] range soundspeed 1480



3D mooring pos.: 77°N $\,$ 16.279' ; $\,$ 24°E $\,$ 24.509' ; $\,$ Mooring Depth: 162 [m] $\,$

Errors [m] Slant / Horizontal / Vertical : 4 / 2 / 4

2D mooring pos.: 77°N 16.282' ; 24°E 24.479' ; Horiz. error: 31 [m]

Anchor release pos.: 77°N 16.248' 24°E 24.570' ; Depth: 80 [m]

Drift: 63[m]; Heading: 337 [o]

Sound speed at site: 1480 [m/s]

#1 pos: 77°N 16.158' 24°E 24.970' range: 326[m] range soundspeed 1480
#2 pos: 77°N 16.022' 24°E 24.354' range: 510[m] range soundspeed 1480
#3 pos: 77°N 16.219' 24°E 23.846' range: 327[m] range soundspeed 1480
#4 pos: 77°N 16.339' 24°E 24.627' range: 198[m] range soundspeed 1480

Appendix VII: Science blogs

Blogs published on https://blogg.forskning.no/blogg-arven-etter-nansen:

https://blogg.forskning.no/arven-etter-nansen/sa-kjorer-vi-i-gang-igjen-jakten-pautstyr-i-morke-polarnatten/1948441

Blogs published on https://sciencenorway.no/blog-nansen-legacy-project:

https://sciencenorway.no/blog-nansen-legacy-project-blog-researchers-zone/a-newround-of-hunting-for-instruments-in-the-dark-polar-night/1948405

https://sciencenorway.no/blog-environment-nansen-legacy-project-blog/huntingmoorings-in-the-dark/1964386

(also published on arvenetternansen.com)

Social media:

- Various Facebook posts on the Arven etter Nansen, IMR, NPI and Oceanography & Sea Ice FB pages during November 2021-January 2022
- Instagram and Twitter posts on Oceanography & Sea Ice NPI (November 2021)

The Nansen Legacy in numbers

6 years

The Nansen Legacy is a six-year project, running from 2018 to 2023.

1 400 000 km² of sea

The Nansen Legacy investigates the physical and biological environment of the northern Barents Sea and adjacent Arctic Ocean.



280 people

There are about 230 researchers working with the Nansen Legacy, of which 73 are early career scientists. In addition, 50 persons are involved as technicians, project coordinators, communication advisers and board members.

10 institutions

The Nansen Legacy unites the complimentary scientific expertise of ten Norwegian institutions dedicated to Arctic research.



>10 fields

The Nansen Legacy includes scientists from the fields of biology, chemistry, climate research, ecosystem modelling, ecotoxicology, geology, ice physics, meteorology, observational technology, and physical oceanography.

>350 days at sea

The Nansen Legacy will conduct 15 scientific cruises and spend more than 350 days in the northern Barents Sea and adjacent Arctic Ocean between 2018 and 2022. Most of these cruises are conducted on the new Norwegian research icebreaker RV Kronprins Haakon.





50/50 financing

The Nansen Legacy has a total budget of 740 million NOK. Half the budget comes from the consortiums' own funding, while the other half is provided by the Research Council of Norway and the Ministry of Education and Research.



Norwegian Ministry of Education and Research







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