the Nansen LEGACY

Mooring service cruise 2019

Cruise Report

The Nansen Legacy Report Series 19/2021

Mooring service cruise 2019

Cruise 2019710

R/V Kronprins Haakon

Tromsø - Longyearbyen

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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 NL, and mooring recoveries and deployments for partner projects were planned, depending on sea ice conditions and time available. The cruise left from Longyearbyen 12.11.2019 heading first to the Barents Sea and the NL moorings. First sea ice was encountered at Sørkapp, but moorings M4 and M3 could be recovered and re-deployed in open water. M1 and M2 were successfully recovered deployed in ice. After a CTD transect, mooring work continued on the A-TWAIN transect at 31 E with mooring and CTD transect work. Further moorings were recovered at 24 E, 22 E and 18 E, as well as deployed at 22 E. An attempt was made to recover a mooring on the Yermak Plateau. While the mooring was found and communication was established, the sea ice cover prevented recovery in the time that was left before the ship had to turn south again to reach Longyearbyen on the 27.11.2019. Despite at times heavy sea ice cover, the cruise was highly successful which could not have been achieved without the capabilities of the vessel.

Contents

1 Background

This cruise is a joint venture between two main projects; Nansen Legacy (NLEG) and A-TWAIN/ SIOS-InfraNor. Nansen Legacy 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 governing heat transport and redistribution in the Atlantic Water boundary current in the north (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 long-term trends in the Fram Strait Atlantic Water inflow branch 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, chl-a and carbon chemistry were collected at selected locations, mostly near key moorings (NLEG T2-1.1, T3-1.2).

2 Survey area

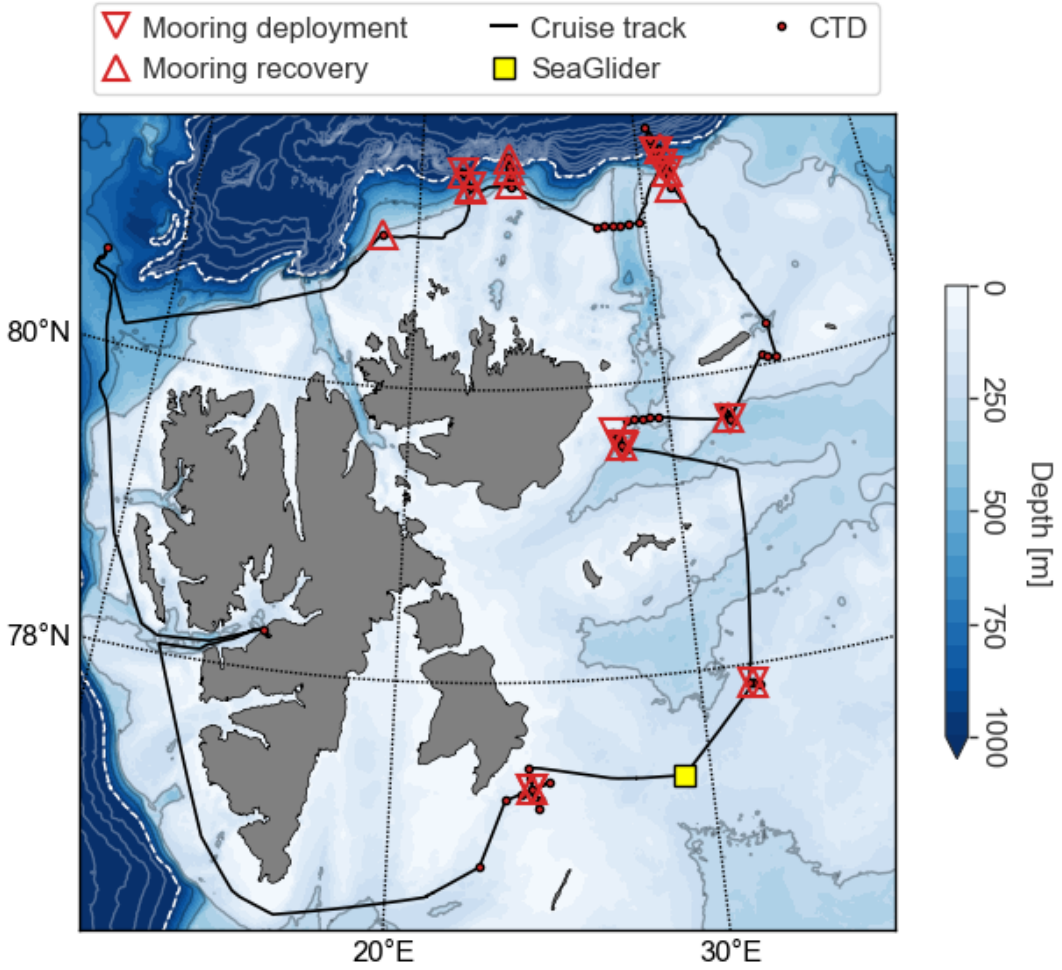


Figure 1. Map of cruise track, mooring operations, glider deployment and CTD stations.

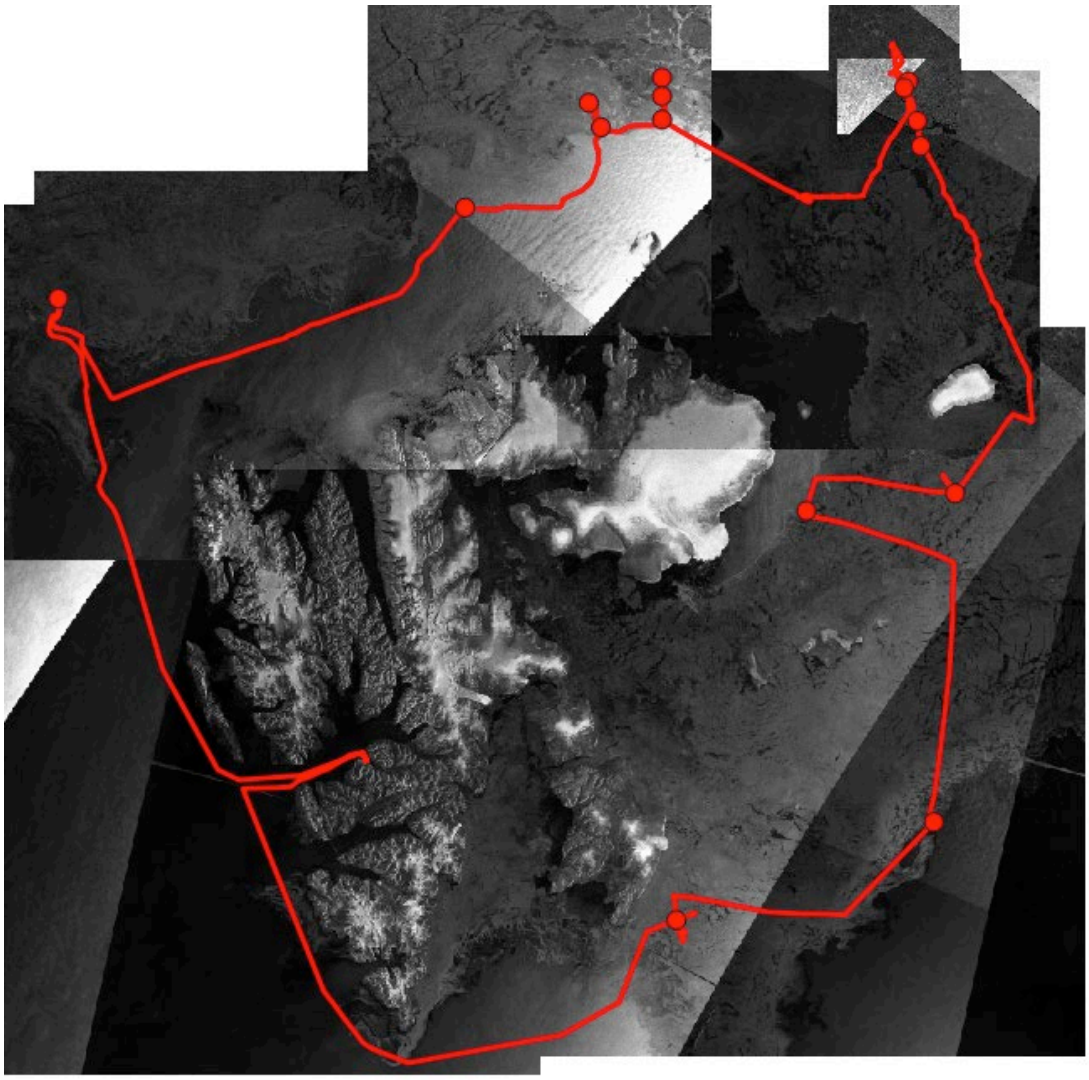


Figure 2. Illustration of sea ice conditions during the cruise. Some of the SAR image mosaics (southern and western parts) are from after the ship was there.

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 T1-1.2, four moorings were deployed in the northern Barents Sea in 2018. During the present cruise those moorings were recovered, redeployed, and augmented by four additional moorings and instruments (also for T2-1.1, T3-2.2, T3-3.2, T3-4.4 and TC-1.1) at selected locations. For T1-2.1, six moorings were deployed over the continental slope north of Svalbard in 2018 and three of these were recovered on the present cruise. For the Fram Centre A-TWAIN project, which is expanded through the new RCN-funded SIOS-InfraNor project, two moorings were recovered (including one for partner institute IOPAS) and five new ones successfully deployed over the continental slope north-east of Svalbard. The mooring AT800-4 could not be found and

is considered lost. During the deployment of mooring IOPAS23, the cable broke before attaching the top float. Echosounder observations showed the mooring lying partially on the seafloor. Sea ice cover was too heavy to try and recover the mooring again. In addition, five moorings for A-TWAIN partners (UNIS, SAMS, UPMC) were recovered and two deployed (IOPAS, UPMC) on the way back to Longyearbyen.
Four of the recovered moorings were in open water (NLEG M4, M3, E1 and Arctic Prize West), the rest in ice covered water. All mooring deployments except NLEG M4 and M3 were in ice covered water.

Table 1. Mooring recoveries during cruise number 2019710.

Mooring ID	Date	Time [UTC]	Latitude	Longitude	Depth	Project	Mooring info
NLEG M4	2019-11-14	07:46	77.2686	24.4067	69	NLEG	Bottom frame; ADCP, CTD
NLEG M3	2019-11-15	08:08	77.8677	31.7133	200	NLEG	Bottom frame; ADCP, CTD
NLEG M1	2019-11-16	08:20	79.5894	28.0975	259	NLEG	ADCPs, CTDs, BGC sensors, sea ice
NLEG M2	2019-11-17	11:34	79.6839	32.2764	354	NLEG	ADCPs, CTDs, BGC sensors, sea ice
Arctic Prize East	2019-11-18	17:52	81.3025	31.3428	184	Arctic Prize	ADCPs, CTDs, BGC sensors, sediment trap
AT200-4	2019-11-18	20:16	81.4098	31.2418	206	A-TWAIN	ADCPs, CTDs, BGC sensors, sea ice
IOPAS22	2019-11-19	16:03	81.5648	31.1000	991	INTAROS/ A-TWAIN	ADCPs, CTDs, sea ice
NLEG E1	2019-11-23	14:29	81.4097	24.0909	273	NLEG	ADCPs, CTDs
NLEG E2	2019-11-23	19:04	81.5108	24.0179	706	NLEG	ADCPs, CTDs
NLEG E3	2019-11-23	21:50	81.5843	24.0437	1205	NLEG	ADCPs, CTDs
CNRS22	2019-11-24	09:41	81.3814	22.2714	500	INTAROS	CTDs
CNRS12	2019-11-24	10:45	81.3828	22.2502	502	INTAROS	ADCP
UNIS BPS	2019-11-24	18:47	81.4852	21.9300	855	INTAROS	BPS
Arctic Prize West	2019-11-25	08:30	81.0338	18.4133	232	Arctic Prize	ADCPs, CTDs, BGC sensors, sediment trap

Table 2. Mooring deployments

Mooring ID	Date	Time	Latitude	Longitude	Depth	Project	Mooring info
NLEG M4-2	2019-11-14	12:12	77.2686	24.4067	67	NLEG	Bottom frame; ADCP, CTD
NLEG M4-b	2019-11-14	13:02	77.2699	24.4071	70	NLEG	CTDs
NLEG M3	2019-11-15	09:05	77.8677	31.7137	201	NLEG	Bottom frame; ADCP, CTD
NLEG M1-2-a	2019-11-16	10:56	79.6742	27.8413	100	NLEG	BPS and hydrography mooring
NLEG M1-2-b	2019-11-16	14:08	79.5691	28.1559	301	NLEG	BPS and hydrography mooring
NLEG M1-2-BioAc	2019-11-16	15:39	79.5891	28.0915	256	NLEG	Bio-acoustics ADCP
NLEG M1-2	2019-11-16	19:57	79.5829	28.0730	265	NLEG	ADCPs, CTDs, BGC & OA, sediment trap, sea ice
NLEG M2-2	2019-11-17	19:53	79.6758	32.3151	356	NLEG	ADCPs, CTDs, BGC sensors, sea ice
IOPAS23	2019-11-20		81.6022	30.4217	1823	A-TWAIN	ADCP, MMP, CTD

							Mooring line broke => mooring does not stand upright
AT200-5	2019-11-21	10:49	81.4135	31.2368	211	SIOS-IN*/ A-TWAIN	ADCPs, CTDs, BGC sensors, sea ice
AT800-5	2019-11-21	19:35	81.5488	30.8711	878	SIOS-IN/ A-TWAIN	ADCPs, CTDs, BGC & OA sensors
AT800-BioAc-1	2019-11-22	09:18	81.5472	30.8388	876	SIOS-IN/ A-TWAIN	Bio-acoustics ADCP
AT800-BioAc-2	2019-11-22	10:15	81.5482	30.8907	873	INTAROS/ A-TWAIN	Bio-acoustics ADCP
AT500-2	2019-11-22	13:32	81.4577	31.0753	496	SIOS-IN/ A-TWAIN	Bottom frame; ADCP, CTD
CNRS23	2019-11-24	14:45	81.3825	22.2687	502	INTAROS	CTDs
IOPAS13	2019-11-24	23:16	81.4860	21.9378	855	INTAROS	ADCPs, CTDs, sea ice

McLane sediment trap on mooring M1-2 (NLEG Tasks T3-2.2 & T3-4.4)
Sediment trap was prepared by Kristine Cerbule (UiT) and deployed at depth approximately 95 m on NLEG mooring M1-2 (7934.975N; 2804.380E, bottom depth 265 m). Deployment date and time: 16.11.2019 (18:55-19:57).
McLane sediment trap model Mark 78H-21 with 21 sampling bottles (volume of each bottle: 0.5 l) were filled with fixative solution. The fixative mixture was made using filtered seawater (taken from CTD at 15.11.2019). Depth of the seawater sampling was around 196 m, salinity – 34.85ppt. Water was filtrated using GF/F filters to remove particulate material. Salinity was increased by adding 5g NaCl to each liter of filtrated seawater (11l in total). 1100 ml of hexamine buffered formaldehyde (37% solution) was then added to the water.
Bottles were programmed for following deployment dates:
18.11.2019, 16.12.2019, 13.01.2020, 10.02.2020, 09.03.2020, 23.03.2020, 06.04.2020, 20.04.2020, 04.05.2020, 11.05.2020, 18.05.2020, 25.05.2020, 01.06.2020, 15.06.2020, 29.06.2020, 13.07.2020, 27.07.2020, 10.08.2020, 24.08.2020, 07.09.2020, 28.09.2020

3.1.2 CTD measurements

A total of 121 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 M4, M3, M1, M2, A-TWAIN, NLEG E-line) or across selected gateways (Kvitøyrenna south and north, trough east of Kvitøya). CTD profile numbers up to 337 (morning of 18.11) and along NLEG moorings E1-E3 (profiles 409, 410, 411) were taken for NLEG, the remaining ones for A-TWAIN.
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 04-2860 (primary)
- SBE 5T submersible pump, s/n 05-9378 (primary)
- Digiquartz Temperature Compensated Pressure Sensor, s/n 141612
- SBE 3P Temperature sensor, s/n 03-5884 (secondary)
- SBE 4C Conductivity sensor, s/n 04-4386 (secondary)
- SBE 5T submersible pump, s/n 05-9379 (secondary)
- SBE 43 Oxygen sensor, s/n 3785 (primary)
- SBE 43 Oxygen sensor, s/n 0633 (secondary)

- Benthos Altimeter, s/n 73084
- WET Labs C-Star Transmissometer, s/n CST-1839DR
- WET Labs ECO-AFL/FL Fluorometer, s/n FLRTD-1547
- Biospherical/Licor PAR/Irradiance sensor, s/n 70736

Temperature and conductivity sensors were factory calibrated in May 2019. The primary oxygen sensor was last calibrated in December 2018 and likely requires new calibration. The secondary oxygen sensor was calibrated in June 2019.
Data from the ship-mounted SPAR sensor (Biospherical/Licor, s/n 20568) was integrated in the CTD data stream.
For all casts, the big 24-bottle rosette was used. On the first CTD station (#297), the CTD was deployed over the side. On all following stations, the CTD package was lowered through the moonpool.
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 into the water 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. Issues with the oxygen sensors were known beforehand, and data should be assessed critically as no calibration with water samples and titration was available.
As deployment through the moonpool meant that surface measurements were not possible with the big rosette, a SAIV SD204 CTD (s/n 882) was lowered over the side directly before, during, or directly after a cast to a depth of approximately 25 m. The profiles can be merged with the SBE CTD profiles after the cruise.

3.1.3 Lowered ADCP measurements

Dual Lowered ADCP measurements were made at all except the first CTD profile; in total 120 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 M418_ 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 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 S418_ 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 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 encountered already when rounding Sørkapp (very open drift ice, pancakes), but not recorded in ASSIST. Upon encountering a more consolidated ice cover, opportunistic ship-based sea ice observations were done following the ASSIST setup. Observers included an experienced sea ice scientist (AR) and two new observers (ØL, NS). Observations of ice concentration, type, thickness, topography, snow cover, and meteorology were entered directly in the browser-based form. Observations were done to best ability but obviously limited by lack of daylight and thus limited visibility. The range of visibility was largely dictated by the range of the ship's beams and ambient light from deck. Sea ice was assessed from the bridge, and photos were taken pointing port, ahead, and starboard. A total of 31 observations were done.

Sea ice satellite imagery from SAR was used extensively for route planning and navigation through the ice. Access to SAR mosaics was possible via the QGis plugin set up by Mikhail Itkin, NPI, on the bridge, and on AR's laptop, and worked very well, in particular when access to sea ice information was possible through iridium only.

3.1.5 Glider deployment

A glider, planned for a four-month mission, 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 Marcos Porcires (UNIS) in collaboration with pilot Algot K. Peterson (on land, University of Bergen). It was deployed 15.11 at 01:25 UTC at 77.301 N, 29.158 E.

3.1.6 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.

An Optimare Precision Salinometer (s/n 018) was returned to the ship prior to the cruise after repair. The instrument was set up for measurements and tested against a Guildline Portasal (s/n 66999) by Terje Hovland with salt samples collected at selected stations. A linearity test was also performed using IAPSO standard seawater with salinities 38, 35, 30, and 10. The measurements confirmed that the instrument is now fully functional. A protocol will be written with step-by-step instructions for future use.

Chemical sampling

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

Seawater samples for assessment of ocean acidification state (OA)/ carbonate chemistry (total alkalinity (TA) and total inorganic carbon (DIC)), nutrients, and oxygen isotopes ($\delta^{18}O$) were taken from the Niskin bottles mounted on the large 24-bottle CTD rosette at 5-15 depths throughout the water column at 12 stations, including one station in Isfjorden just outside Adventfjorden, NL mooring location M1 and stations on the A-TWAIN transect line (Table 3). Additional sampling was done at 10 locations on the transit out Isfjorden from the underway clean seawater intake (Table 4). A total of 146 DIC and $\delta^{18}O$ and 103 nutrient samples were taken, and stored in the cold room or in the fridge. The TA/DIC samples will be analysed during the following cruise, whereas $\delta^{18}O$ and nutrient samples will be shipped for analysis after the cruise.

The CTD was deployed over the side at CTD station 297. On all other stations, it was deployed through the moonpool, which meant that a surface or 5m sample could not be taken. At M1, a sample was instead taken from the clean seawater intake right after the CTD was back on deck. On later stations, this was not possible as the seawater intake was closed due to too much sea ice.

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 µl $HgCl_2$ was added after the sampling. Sampling and analysis followed the protocol described in *Nansen Legacy Sampling Protocol version 1, chapter 8.2* and Dickson et al., 2007.

Nutrient samples were taken on any stations and depths not sampled by UiT personnel. The samples were filled into plastic vials, which were rinsed three times, and 200 µl Chloroform were added.

Oxygen isotopes $\delta^{18}O$ samples were filled into plastic vials, which were rinsed three times and then filled to the rim. The bottles were additionally sealed with parafilm.

Table 3: Overview of sampling depths for chemical sampling from the CTD. At all locations and depths, samples were taken for TA/DIC and $\delta^{18}O$. Nutrients were taken apart from sampling depths marked in italics (nutrients instead sampled by UiT).

Date, time (UTC)	**CTD stn #**	**Station description**	**Latitude (N)**	**Longitude (E)**	**Bottom depth**	**Sampling depths (db)**
12/11/2019, 15:42	297	IsA	78 16.42	15 29.93	111	100, 50, 30, 10, 5
16/11/2019, 20:26	319	M1 (Nansen Legacy samples)	79 35.09	28 05.24	263	255, 200, 150, 100, 75, 50, 30, 20, 10, (5 from the seawater intake)
18/11/2019, 18:09	338	SAMS East mooring	81 18.14	31 20.44	184	174, 150, 120, 90, 60, 50, 40, 30, 20, 10
18/11/2019, 21:57	340	ATWAIN 200 mooring	81 24.85	31 15.06	205	201, 150, 120, 90, 60, 50, 40, 30, 20, 10
19/11/2019, 00:20	342	ATWAIN 500 m former mooring site	81 28.24	31 08.68	527	300, 200, 150, 120, 90, 60, 50, 40, 30, 20, 10*
19/11/2019, 06:58	345	ATWAIN 800 m mooring (prior to recovery attempt)	81 33.21	30 55.76	892	*891, 501, 300, 200, 120, 90, 60, 50, 40, 30, 20, 10*
19/11/2019, 20:13	348	ATWAIN transect	81 34.27	30 46.25	1291	*1255***, 1000, *500, 300, 200, 150, 120, 90, 60,* 50, 40, *30, 20, 10*
19/11/2019, 22:39	349	ATWAIN transect	81 36.60	30 40.50	1840	1847, 1500, 1000, 500**, 300, 200, 150***, 120, 90, 60, 50, 40, 30, 20, 10
20/11/2019, 01:27	350	ATWAIN transect	81 38.03	30 40.08	2190	*2164,* 1500, 1000*, 500, 300, 200, 150, 120, 90, 60, 50, 40, 30, 20, 10*
20/11/2019, 04:47	351	ATWAIN transect	81 43.34	30 31.11	2948	*2992,* 2500, 2000, 1500, 1000, *500, 300, 200, 150, 120, 90, 60, 50, 40, 30, 20, 10*
22/11/2019	401	ATWAIN 800 m mooring, after deployment of main mooring	81 32.88	30 50.31	878	881, 500, 300, 200, 150, 120, 90, 60, 50, 40, 30, 20, 10
22/11/2019, 11:42	402	ATWAIN 500 m bottom lander, prior to deployment	81 27.56	31 03.82	481	499, 301, 200, 150, 120, 90, 60, 50, 40, 30, 20, 10

* bottom bottle did not close
** bottom valve not closed properly before deployment
*** Niskin leaking

Table 4: Overview of samples taken from the underway system (clean seawater intake) in Isfjorden. At all locations, samples were taken for DIC, nutrients and d18O.

Date, time (UTC)	Station	Latitude (N)	Longitude (E)	Bottom depth (m)
12/11/2019, 16:33	ISF-1	78 15.86	15 12.64	254
12/11/2019, 16:50	ISF-2	78 14.53	15 01.17	202
12/11/2019, 17:12	ISF-3	78 12.61	14.45.86	173
12/11/2019, 17:35	ISF-4	78 10.69	14 30.28	212
12/11/2019, 17:54	ISF-5	78 09.72	14 16.29	224
12/11/2019, 18:22	ISF-6	78 07.78	13.57.25	304
12/11/2019, 18:44	ISF-7	78 06.82	13 41.84	306
12/11/2019, 19:11	ISF-8	78 04.54	13 27.76	359
12/11/2019, 19:45	ISF-9	78 04.24	13 02.99	266
12/11/2019, 21:04	ISF-10	78 03.80	12 06.46	238

Vertical profiles and water sampling

Water sampling at nine locations during the cruise (attachment with dates and positions for sampling) during the period from 16/11/2019 to 25/11/2019. Samples taken at M1 and M2 are for NLEG T3.1-2, the remaining ones for A-TWAIN. The following 11 to 12 depths were used for CTD:

a) shallow stations (up to around 350 m): 10; 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: 10; 20; 30; 60; 90; 120; 150; 200; 300; 500 m and bottom depth.

Salinity and temperature was noted for each depth.

Water was sampled for nutrients (stored frozen in 100 ml bottles), and filtrated for chlorophyll a total (GF/F filters) and particular organic carbon (pre-burned GF/F filters) - three replicates for each sampling depth. 200 ml of water for each sample was filtrated for chl a total and 500ml for POC samples. Filters stored frozen.

3.1.7 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. At very low temperatures (<-18deg C) and extensive sea fog, several sensors froze and reliable data is unavailable during these periods.

THERMOSALINOGRAPH

The seawater 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 heavy sea ice, the intake had to be closed during large parts of the cruise. No dedicated log was kept of times of starting and stopping the intake pump, and the record therefore has to be processed carefully. To filter out data when

the intake was closed, the difference between the two temperature sensors as well as the flow rate recorded by the pCO2 system (<2.6 l / minute when close or clogged up by ice) can be used.

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 NN065 NS2400 NF1600 CX 1,0 BP000 BX17000 ND111100000 TP000300 TE00000300 EZ1020001 EX00000 EA004688 EJ-009 EI001 ED00084 ES35 CK
(narrowband profiling, 65 bins with 24 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 NF0600 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, 6 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. Preliminary processing during the cruise suggests potential data quality issues, likely related to the heavy ice cover leading to presence of ice under the hull and the ADCP windows.

PCO2 MEASUREMENTS
T2.1.1
The underway instrumentation for autonomous high-frequency surface water measurements of partial pressure of CO_2, pCO_2, (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 oceans role in the carbon budget and estimates of anthropogenic CO2 uptake.
Annual maintenance was done on the pCO2 system toward the end of the cruise by Ceslav Czyz.
As described above, the seawater intake was closed during large parts of the cruise due to heavy sea ice, and data have to be processed accordingly.

POSITION LOG
GPS-based position logs for each day are available.

3.2 Communication and Outreach

In addition to the science party, artist Hege Holen Paulsrud and journalist Ragnhild Gustad joined the cruise. Hege has previously participated in a NL cruise and returned to observe the science activities onboard. She produced several comics and text that was and will be used for outreach and communication by the project and partner institutions. She also shares her experiences on social media (Instagram, @hegeholenpaulsrud). Ragnhild writes for the Tromsø-based newspaper Nordlys and reported directly from and after the cruise. Three articles were published describing the goals of the cruise and the activities onboard, and several will be published after the cruise.

Several blog posts for the Nansen Legacy blog on forskning.no and sciencenorway.no were written by the cruise participants and published by the project office. See Appendix IV for an overview of submitted and published posts.


SOMEWHERE, FAR FAR AWAY...
NANSEN LEGACY
WAIT FOR IT...
WAIT FOR IT...
WAIT FOR IT...
POP!
POP!
POP!
POP!
JAAAA!!!
WOOP WOOP
WEEE!!
WE'RE SO GOOOOD!
No.1
thewaitinggame
byhege

References

Dickson, A.G., Sabine, C.L. and Christian, J.R. (eds), 2007: Guide to best practices for ocean CO2 measurement. Sidney, British Columbia, North Pacific Marine Science Organization, 191pp. (PICES Special Publication 3; IOCCP Report 8).

Appendix I: List of participants

Name	Institute	Task
Arild Sundfjord	NPI	Cruise leader/oceanography
Kristen Fossan	NPI	Mooring engineer
Ceslav Czyz	NPI	Mooring engineer
Jan Are Jacobsen	NPI	Mooring engineer
Øyvind Lundesgaard	NPI	NLEG postdoc fellow/oceanography
Angelika Renner	IMR	Co-leader/oceanography/ chemical water sampling/sea ice
Terje Hovland	IMR	Mooring engineer
Marcos Porcires	UNIS	Mooring engineer
Kjersti Kalhagen	UNIS	NLEG PhD fellow oceanography
Kristine Cerbule	UiT	BGC sampling, sediment trap preps
Nicholas Szapiro	MET	Sea ice observations
Angieszka Beszczynska-Möller	IOPAS	Oceanography
Piotr Wieczorek	IOPAS	Mooring engineer
Nicholas Rundle	NOC	Mooring engineer
Ragnhild Gustad	Nordlys	Journalist
Hege Holen Paulsrud	Independent	Artist
Marianne Måsøy Amundsen	Univ. i Sørøst-Norge	Student/nautics hosted by IMR

Appendix II: Cruise program

Cruise timeline - for more details please refer to Sample log

12 Nov
Started loading at 0730, left port at 1450
CTD profile with water samples at mouth of Adventfjorden
Underway water samples taken for OA analysis
Steaming
13 Nov
Steaming, preparing instruments
Meetings to plan mooring operations and CTD transects
First CTDs at transect approaching M4 in evening
14 Nov
CTDs around M4 site
M4 recovery
CTDs south of M4
M4-2 redeployment
M4b (hydrography mooring) deployment
Post-deployment CTD at M4
CTDs north of M4
Steaming to glider deployment site
15 Nov
Glider deployed during night
Steaming through ice to M3; ice free from around 20 minutes before arrival
CTD with water for sediment trap preparations at M3
M3 recovered
M3-2 deployed
Short CTD transect (3 stations) across topography over (and including) M3
Steaming for M1
16 Nov
CTD at 300 m en route
CTD at M1 site w/water samples
Recovery of M1
Steamed to 100 m, deployed UNIS M1-2-a, CTD
CTD at 180 m for transect
Steamed to 300 m, deployed UNIS M1-2-b, CTD
Steamed to M1 main site, deployed M1-2-BioAc WSW of first M1, CTD
Deployed M1-2 at 265 m, 5 m deeper than first M1 because of addition of sediment trap etc.
CTD with water samples
Steamed to Kvitøyrenna South saddle transect, started in evening
17 Nov
Continued Kvitøyrenna South saddle transect
Steamed to M2, CTD with water samples
Recovered M2
CTD transect from 100 m across topo towards deepest part of basin
Deployed M2-2
Steaming to short CTD transect across shallow trench saddle East of Kvitøya
18 Nov
Short CTD transect across trench saddle East of Kvitøya

Steamed to Arctic Prize East mooring; recovered
CTD profile with water samples
Steamed to A-TWAIN-200-4; recovered
CTD with water samples
Started CTD transect from 200; 350; 500; 755; 860

19 Nov

Completed CTD transect with water sample profile at A-TWAIN-800 location.
Searched for AT-800 with echo sounder and transponder for 2-3 hours – no response
CTD with water samples
Steamed to IOPAN22 (1280 m) mooring; recovered. Post-recovery CTD
Started CTD transect northwards to 2800 m – strong drift towards NNW so data must be processed taking drift into account!

20 Nov

Continued CTD transect, water samples at several stations.
Steamed to 1800 m for IOPAN deployment of IOPAS23
Mooring deployment line broke just before the last elements were to be attached.
Mooring fell with too little buoyancy to stand upright.
Steamed to AT200 m location for 12 hr CTD and ADCP repeat profiling

21 Nov

Finished CTD profiling at breakfast, with water samples at the last profile
Deployed AT200-5
Steamed to AT800 location for new search for lost mooring
Deployed AT800-5
Repeat CTD stations at 880 m through night

22 Nov

Finished repeat CTDs
Deployed AT800-BioAc-1 (Nortek at 400 m) (west of main AT800 mooring)
Deployed AT800-BioAc-2 (Nortek at 800 m) (east of main AT800 mooring)
Steamed to 480 m for CTD with water samples
Deployed AT500-2 (bottom frame)
Steamed south for CTD transect across Kvitøyrenna North
Started CTD transect

23 Nov

Fire wapor system broke -> several cabins on deck 3 flooded. Several hours delay as ship lay still while identifying and fixing the most acute problems
Continued CTD transect until breakfast
Steaming for NLEG E1
CTD near E1. Recovery of NLEG E1. Sea state was rough after a night and morning with winds between 12 and 15 m/s, so we waited 2-3 hours after arriving at position to let the sea calm down with the decreasing wind. Recovery was tricky as the floating mooring line did a loop around one propeller pod (which was shut off in advance). Mooring recovered in controlled manner but with one rope cut.
Steaming for NLEG E2
CTD. Recovery of NLEG E2.
Steaming for NLEG E3
Recovery of NLEG E2. Drifting sea ice. CTD after recovery
CTD transect from 1200 to 200 m during night

24 Nov

Steamed for 22 E, 500 m depth moorings

Recovered UPMC Temperature mooring (CNRS22)
Recovered UPMC ADCP frame (CNRS12)
Deployed UPMC Temperature mooring (CNRS23)
Steamed for 850 m at 22E
CTD. Recovered UNIS BPS mooring
Deployed IOPAS13

25 Nov

Steamed for Arctic Prize West
CTD; Arctic Prize West mooring recovered
Steamed for Yermak Pass mooring

26 Nov

Pinged and found UPMC YPB mooring at right location. Tried to find top float on echo sounder but did not pass right over (but it was seen on multibeam). Too difficult ice to make large enough hole for releasing, since ice was drifting in different direction of water column current. CTD close by.
Steaming for Longyearbyen.
Packing, cleaning, reporting and securing data.

27 Nov

To port after breakfast.
Daily evening meetings were held at 2000, with summaries of the day, plan for next 1-2 days, and presentations at some of the meetings.

Appendix III: CTD stations

Date	Time (UTC)	Latitude (N)	Longitude (E)	Bottom depth (m)	Ship CTD station number	CTD station name	Comments
2019-11-12	15:32	78.2737	15.4990	111	297	IsA	
2019-11-13	21:36	76.7437	22.7775	145	298	298	
2019-11-14	01:17	77.1973	23.5775	120	299	299	
2019-11-14	02:23	77.2390	24.0448	91	300	300	
2019-11-14	03:23	77.2685	24.4072	67	301	M4	
2019-11-14	04:45	77.3133	24.9455	82	302	302	
2019-11-14	09:31	77.1347	24.5913	65	303	303	
2019-11-14	10:12	77.1965	24.6518	71	304	304	
2019-11-14	13:15	77.2692	24.4058	69.5	305	305	
2019-11-14	14:08	77.3449	24.3767	62.6	306	306	
2019-11-14	15:02	77.4199	24.3261	44.2	307	307	
2019-11-15	07:40	77.8677	31.7133	200	308	M3	
2019-11-15	09:39	77.8525	31.9128	172	309	309	
2019-11-15	10:24	77.8678	31.7082	202	310	M3	
2019-11-15	11:16	77.8800	31.5513	230	311	311	
2019-11-16	05:44	79.5602	28.2872	316	312	312	
2019-11-16	06:59	79.5886	28.0891	259	313	M1	
2019-11-16	11:07	79.6736	27.8343	97	314	M1-2-a	
2019-11-16	12:08	79.6313	27.9673	178	315	315	
2019-11-16	14:13	79.5694	28.1586	301	316	316	
2019-11-16	15:46	79.5889	28.0938	258	317	M1	
2019-11-16	20:12	79.5852	28.0920	265	318	M1	
2019-11-16	20:12	79.5848	28.0875	263	319	M1	
2019-11-16	22:54	79.7539	28.3733	168	320	320	
2019-11-16	23:51	79.7546	28.6750	221	320	321	
2019-11-17	00:58	79.7544	28.9834	278	322	322	
2019-11-17	02:08	79.7542	29.2805	223	323	323	
2019-11-17	03:13	79.7549	29.5786	196	324	324	
2019-11-17	08:19	79.6782	32.3045	356	325	325	
2019-11-17	12:45	79.7678	31.9759	120	326	326	
2019-11-17	13:47	79.7361	32.0970	99	327	327	
2019-11-17	14:35	79.7061	32.2147	239	328	328	
2019-11-17	15:18	79.6944	32.2613	297	329	329	
2019-11-17	16:09	79.6844	32.3020	357	330	330	
2019-11-17	17:04	79.6749	32.3437	362	331	331	
2019-11-17	17:51	79.6592	32.4010	369	332	332	
2019-11-17	20:07	79.6731	32.3133	356	333	333	

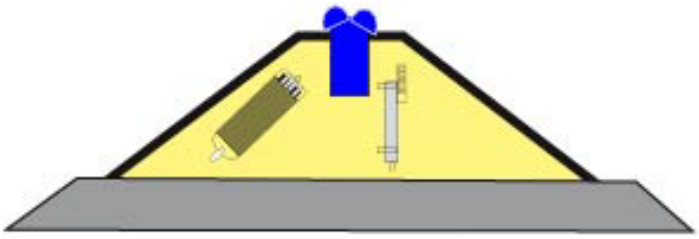
2019-11-18	01:11	80.0690	33.9347	232	334	334	
2019-11-18	02:15	80.0562	34.1604	224	335	335	
2019-11-18	03:25	80.0360	34.4711	181	336	336	
2019-11-18	06:17	80.2787	34.3680	317	337	337	
2019-11-18	18:10	81.3024	31.3408	184	338	338	
2019-11-18	21:16	81.4097	31.2402	201	339	339	
2019-11-18	21:58	81.4097	31.2399	203	340	340	
2019-11-18	23:28	81.4438	31.1403	347	341	341	
2019-11-19	00:20	81.4634	31.1061	0	342	342	
2019-11-19	02:08	81.4921	31.0516	657	343	343	
2019-11-19	03:23	81.5204	30.9478	762	344	344	
2019-11-19	06:58	81.5488	30.8708	881	345	345	
2019-11-19	16:31	81.5740	30.9971	1203	346	346	
2019-11-19	18:25	81.5568	30.8151	0	347	347	
2019-11-19	20:13	81.5714	30.7708	1292	348	348	
2019-11-19	22:39	81.6100	30.6751	0	349	349	
2019-11-20	01:26	81.6338	30.6679	2093	350	350	
2019-11-20	04:47	81.7223	30.4793	2921	351	351	
2019-11-20	20:24	81.4115	31.2376	211	352	352	repeat CTDs at AT200 until CTD #388
2019-11-21	20:01	81.5449	30.7921	880	389	389	repeat CTDs at AT800 until CTD #401
2019-11-22	11:42	81.4579	31.0778	481	402	402	
2019-11-22	18:37	81.0837	29.6994	229	403	403	
2019-11-22	20:02	81.0837	29.2767	0	404	404	
2019-11-22	21:29	81.0828	28.8336	354	405	405	
2019-11-22	22:44	81.0830	28.5453	242	406	406	
2019-11-23	00:02	81.0832	28.1994	118	407	407	
2019-11-23	06:02	81.0832	27.8540	80	408	408	
2019-11-23	11:49	81.4155	23.9886	303	409	409	
2019-11-23	15:43	81.5160	23.9983	717	410	410	
2019-11-23	22:14	81.5907	24.0000	1212	411	411	
2019-11-24	00:03	81.5365	24.0409	804	412	412	
2019-11-24	01:54	81.4615	24.0703	496	413	413	
2019-11-24	03:15	81.3909	24.0894	199	414	414	
2019-11-24	06:59	81.3828	22.2485	503	415	415	
2019-11-24	14:45	81.4858	21.9259	860	416	416	
2019-11-25	06:02	81.0339	18.4191	227	417	417	

Appendix IV: Deployed Nansen Legacy and A-TWAIN moorings

Name: M4

Location: N77.2686 E24.4067

Depth: 71 m
Deployment: 14.11.2019



SBE37 #16963

NORTEK #100751

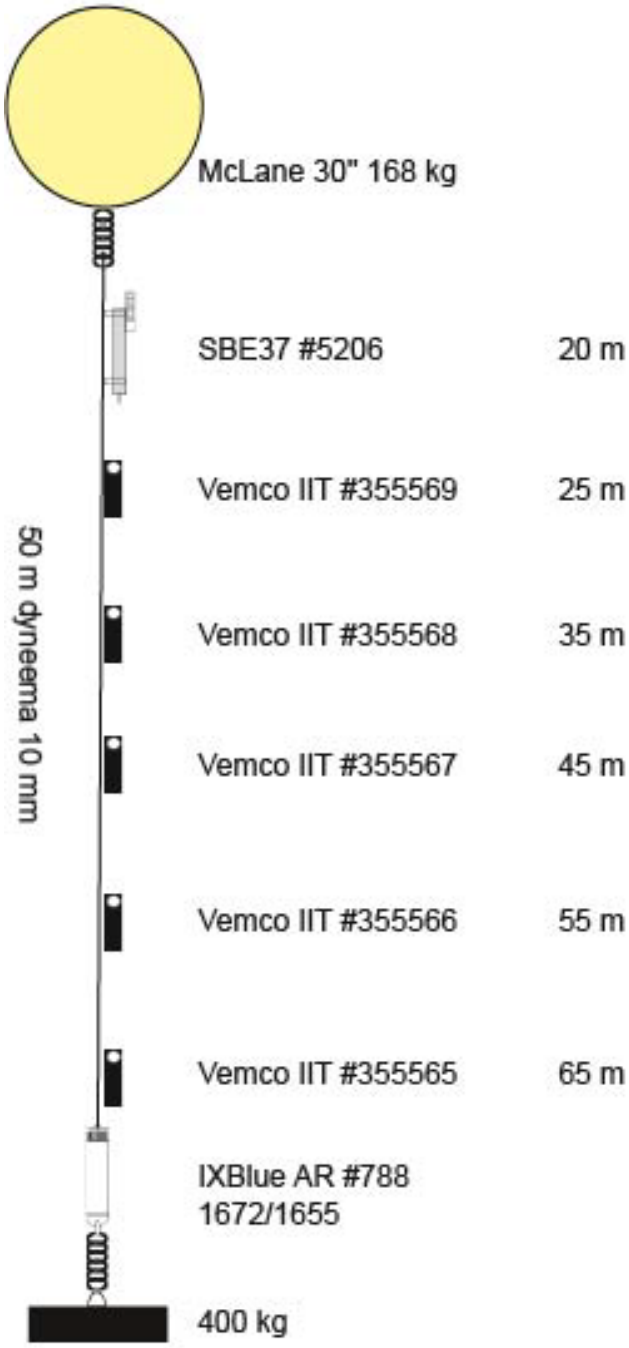
IXBlue AR #1698
0ABC/0A55

Mooring NLEG M4-2

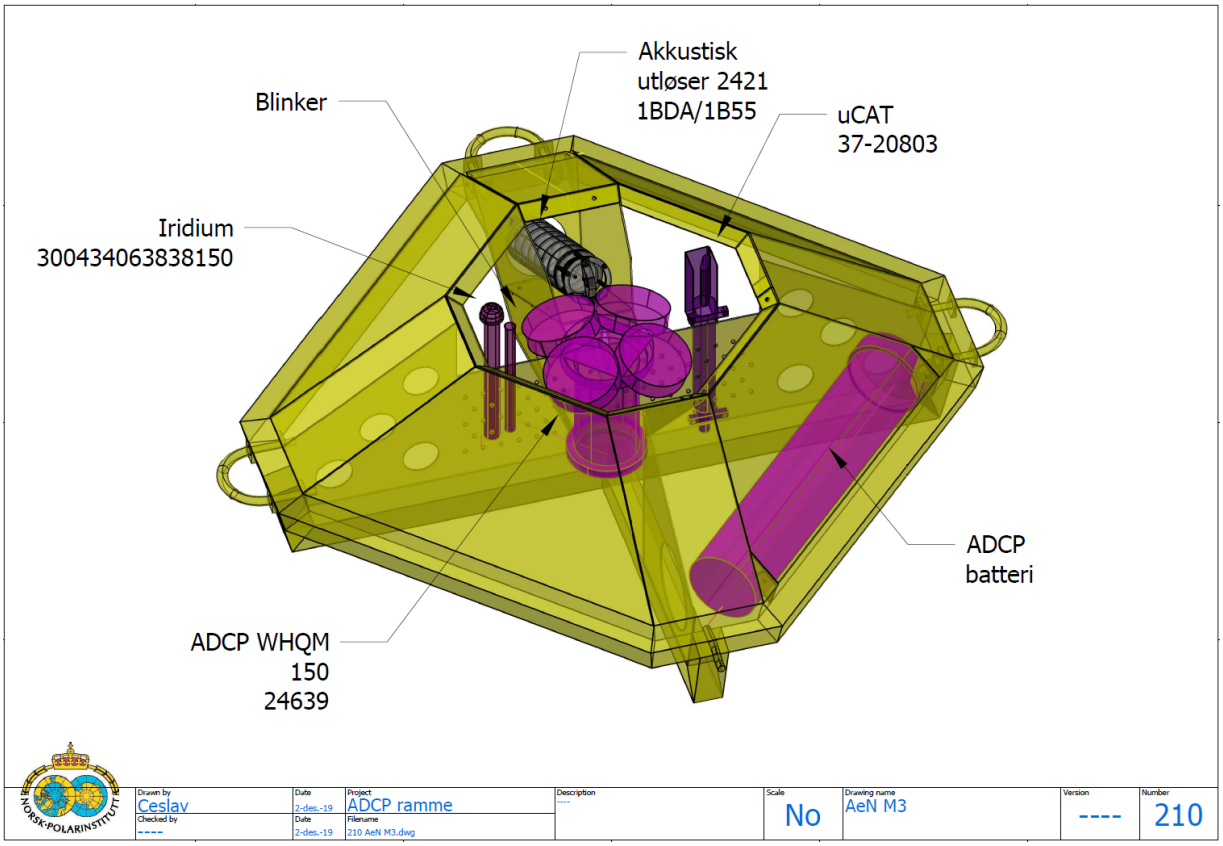
Name: M4 Hydrography

Location: N77.2699 E24.4071

Depth: 71 m
Deployment: 14.11.2019



Mooring M4-b

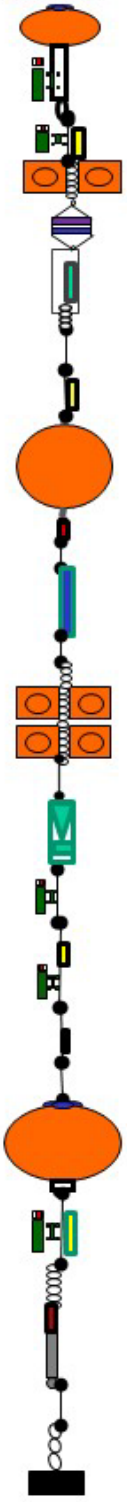


NORSK-POLARINSTITUTT	Drawn by: Ceslav	Date: 2-des.-19	Project: ADCP ramme	Description: ----	Scale: No	Drawing name: AeN M3	Version: ----	Number: 210
	Checked by: ----	Date: 2-des.-19	Filename: 210 AeN M3.dwg					

Mooring NLEG M3-2

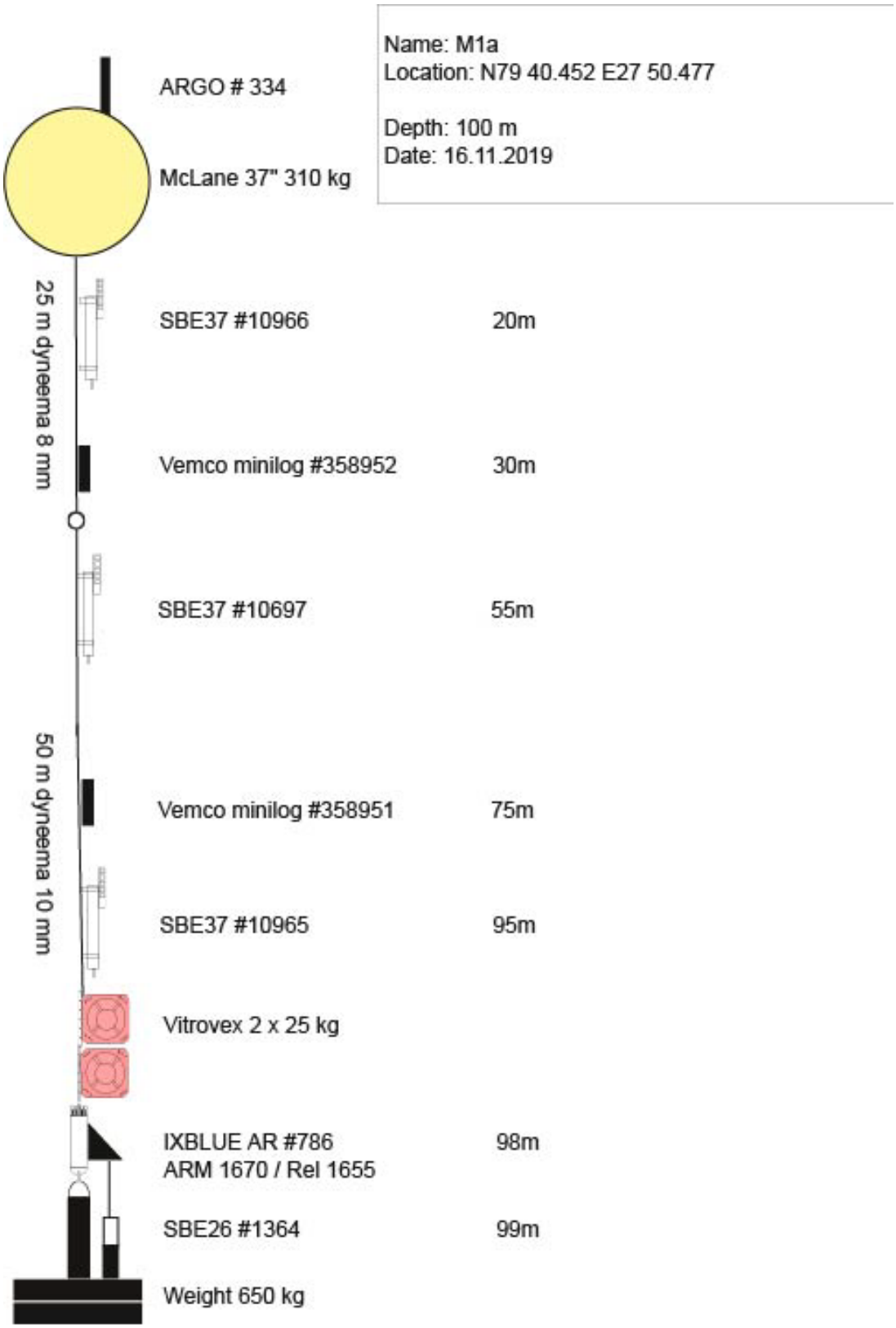
Rigg M1-2 79 34.975 N

Satt ut 16.11.2019 , kl 19:57 028 04.380 E

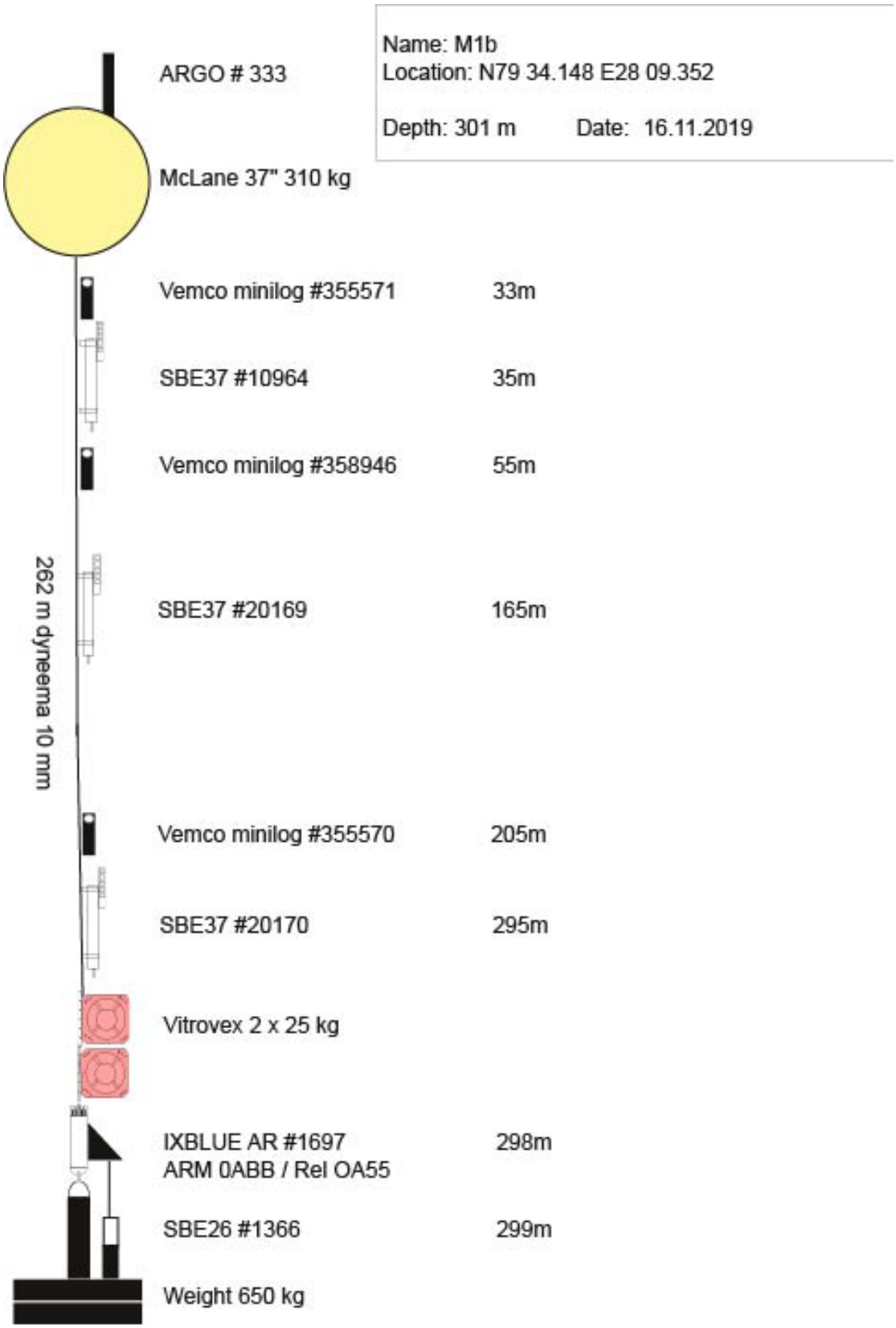


			Dyp:	Fra bunn:	Ut:
Nortek S500	SNR. 809		19	233	19:54
RBR Concerto	NR.201408		20	232	19:54
SeaPhox	NR.2225/2035		22	230	19:54
2 Glasskuler i 1 m Kjetting galv.					
ISUS	SNR. 232		24	228	19:54
SBE16V2 ECO	SNR. 50296/5803		25	227	19:54
0,5 m Kjetting galv.					
20 m Kevlar					
10 m Kevlar					
RBR SoloT	SNR. 102478		55	197	19:39
HF36			56	196	
Svivel					
2 m Kevlar					
Aural Hvallyd	SNR. 222		60	192	19:39
2 m Kevlar					
1 m Kjetting galv.					
4 Glasskuler i 2 m Kjetting galv.					
0,5 m Kjetting galv.					
20 m Kevlar					
McLane Sedim.	SNR. 14449-02		88	164	19:30
RBR Concerto	SNR. 201403		89	163	19:30
50 m Kevlar					
RBR SOLO	SNR. 102477		149	113	19:19
20 + 10 m Kevlar					
RBR Concerto	SNR. 201402		170	82	19:12
40 m Kevlar					
RBR SOLO	SNR. 102476		209	43	19:07
20 + 10 m Kevlar					
ADCP150	SNR. 16493		240	12	19:05
SeaPhox	SNR. 20172/2004		241	11	19:05
RBR Concerto	SNR. 201401		242	10	19:05
AR861B2S	SNR. 2631	Ping on:	2B47		
		Release:	2B55		
5 m Kevlar.		Arm:	2BEA		
2 m Kjetting galv.					
ANKER	700/(600)kg		252	0	

Mooring M1-2


Name: M1a
Location: N79 40.452 E27 50.477
Depth: 100 m
Date: 16.11.2019
ARGO # 334
McLane 37" 310 kg
25 m dyneema 8 mm
SBE37 #10966
20m
Vemco minilog #358952
30m
SBE37 #10697
55m
50 m dyneema 10 mm
Vemco minilog #358951
75m
SBE37 #10965
95m
Vitrovex 2 x 25 kg
IXBLUE AR #786
ARM 1670 / Rel 1655
98m
SBE26 #1364
99m
Weight 650 kg

Mooring M1-a


Name: M1b
Location: N79 34.148 E28 09.352
Depth: 301 m
Date: 16.11.2019
ARGO # 333
McLane 37" 310 kg
Vemco minilog #355571
33m
SBE37 #10964
35m
Vemco minilog #358946
55m
262 m dyneema 10 mm
SBE37 #20169
165m
Vemco minilog #355570
205m
SBE37 #20170
295m
Vitrovex 2 x 25 kg
IXBLUE AR #1697
ARM 0ABB / Rel OA55
298m
SBE26 #1366
299m
Weight 650 kg

Mooring M1-b

Institute of Marine Research

Data record book for self registrating instruments detail

Ship/Platform: Kronprins Håkon
Location: **M1 – 2-bioAC**
Latitude: N 79° 35.348
Longitude: E 028° 05.487

#	Brand	Type	Serial No.	Depth	Comments
1	Nortek	Signatur 100	101598	252	1årconfi
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Bottom depth [m]: 259
Outgoing date: 2019.11.16
Outgoing time (UTC): 15:39
Incoming date: Click here to enter a date.
Incoming time (UTC):

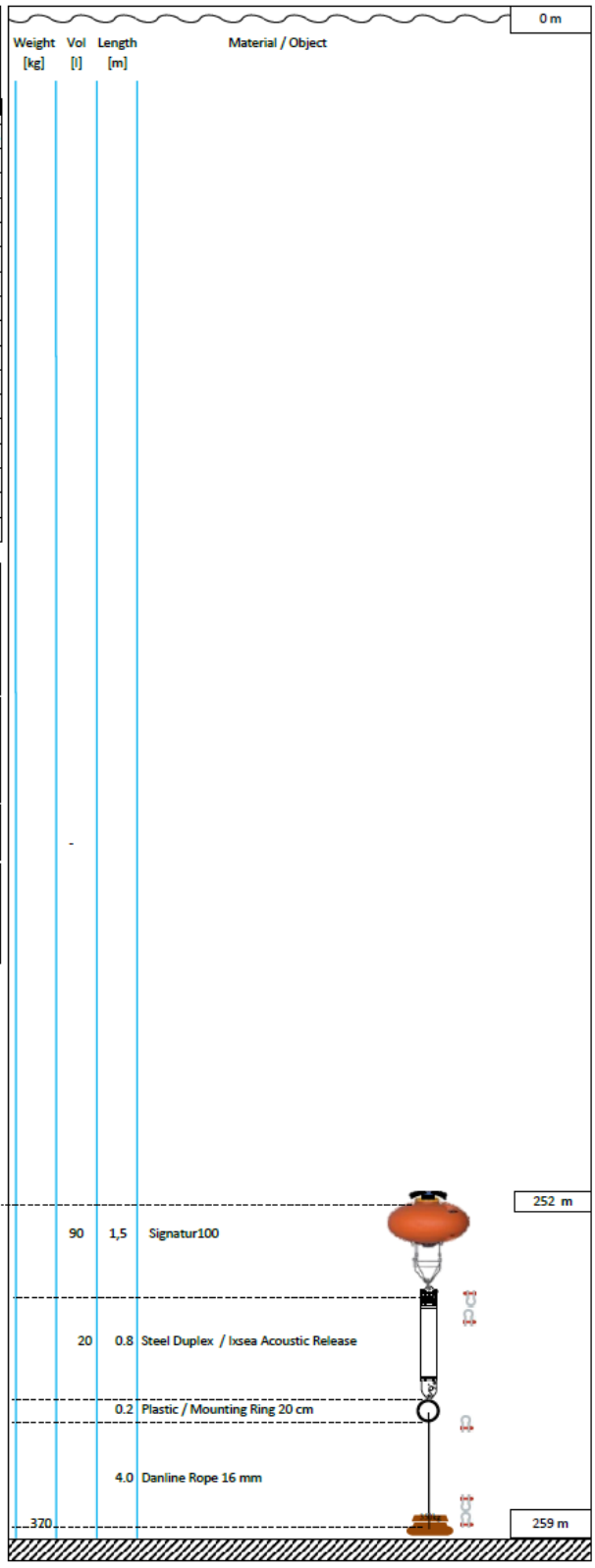
Comments:

Responsible(s): Terje Hovland

ARGOS
PTTID: 29534 SN: 153

Acoustic release: IXSEA **AR861**
Serial no: **2636** Battery expire: 2023.04.24
Range code: **2B91**
Release code: **2B55**

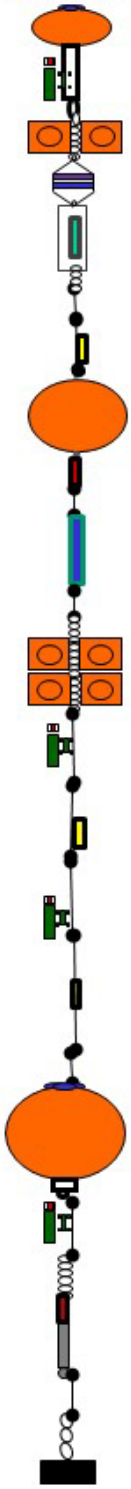
Station name: **M1 – 2-bioAC**		
Color code:		
Sum weight (incl. anchor): [kg]		
Sum weight (excl. anchor): [kg]		
Sum volume: [l]		
Buoyancy (anchor on): [kg]		
Buoyancy (anchor off): [kg]		
Shackle Stainless Steel		S
Shackle Galvanized Steel		G
Thimble Stainless Steel		
Thimble Galvanized Steel		
Thimble Delrin		
Description	Spec	No.
Shackle Stainless Steel	2.0 T	2
Shackle Stainless Steel		0
Shackle Galvanized Steel	2.0 T	2
Shackle Galvanized Steel	3.2 T	5
Shackle Galvanized Steel		0
Shackle Galvanized Steel		0
Shackle Galvanized Steel		0
Thimble Stainless Steel		0
ThimblesStainless Steel		0
Thimble Galvanized Steel		0
Thimble Galvanized Steel		0
Thimble Delrin		2
Bolt Stainless Steel (RCM-7)		0
		0
		0



Mooring M1-2-bioAC

Rigg M2-2
Satt ut 17 Nov 2019, kl 19:53

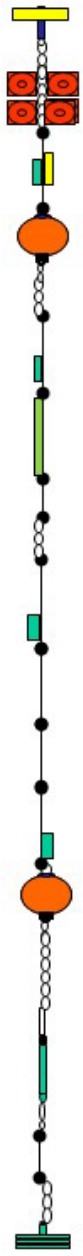
79 40.536 N
032 18.884 E



			Dyp:	Fra bunn:	Ut:
Nortek S500	SNR. 812		30	330	19:51
RBR Concerto	NR.201414		30	330	19:51
2 Glasskuler i 1 m Kjetting galv.					
IXUS	NR.343		32	328	19:51
SBE16V2 ECO	SNR. 50240241/1718		33	327	19:51
0,5 m Kjetting galv.					
20 m Kevlar					
10 m Kevlar					
RBR SoloT	SNR. 102488		63	297	19:44
HF36			64	296	
Svivel					
2 m Kevlar					
Aural Hvallyd	SNR. 288		67	293	19:44
2 m Kevlar					
4 Glasskuler i 2 m Kjetting galv.					
0,5 m Kjetting galv.					
40 m Kevlar					
RBR Concerto	SNR. 201413		95	265	19:36
50 m Kevlar					
RBR SOLO	SNR. 102487		165	195	19:33
50 m Kevlar					
RBR Concerto	SNR. 201412		215	145	19:31
100 m Kevlar					
RBR SOLO	SNR. 102486		277	83	19:28
20 m Kevlar					
ADCP150	SNR. 24636		347	13	19:25
RBR Concerto	SNR. 201411		350	10	19:25
AR861B2S	SNR. 2632	Ping on:	2B47		
		Release:	2B55		
5 m Kevlar.		Arm:	2BEB		
2 m Kjetting galv.					
ANKER	760/(670)kg		360	0	

Mooring M2-2

Rigg ATWAIN200-5 81 24.807N
Satt ut 21 Nov 2019, kl 10:58 031 14,206E



		Dyp:	Over bunn:	I vannet:
ADCP Nortek GFI	SNR: 100396	42	166	10:45
3 m Kjetting galv. 4 Glasskuler		40	168	10:45
2 m Kevlar RBR Concerto-Par	SNR. 201186	42	166	10:45
Hydro Float 36''				
1 m Kjetting galv.				
10 m Kevlar				
RBR Concerto	SNR. 201409	55	153	10:28
Hvallydopptaker	SNR. 229	57	151	10:28
2 m Kevlar				
0,5 m Kjetting galv.				
50 (49) m Kevlar				
RBR Concerto	SNR. 201406	109	99	10:20
20 m Kevlar				
50(51) m Kevlar				
5 m Kevlar				
RBR Concerto	SNR. 201404	194	14	10:15
ADCP150	SNR: 16640	196	12	10:15
2 m Kjetting galv				
Svivel				
AR861CS	SNR. 553 Arm: 151E Release: Arm + 1555			
5 m Kevlar				
2 m Chain				
ANCHOR 850 kg		208	0	

Mooring AT200-5

Rigg ATWAIN800-5 81 32,925N

Satt ut 21.11.2019 , kl 19:30 : 030 52,264E

			Dyp:	Fra bunn:	Ned i vann:
SBE37IM	SNR 21023		13(1)	867	19:20
4 glasskuler					
IXBLUE VG861ET	SNR. 1039 arm BE7D ping on CF47				
SEAFOHX	SNR. PHS2032		38	842	19:20
SBE37	SNR. 20181		39	841	19:20
ISUS	SNR.		41	839	19:20
SBE16	SNR. 6928		42	838	19:20
5 m Kevlar					
RBR Concerto	SNR. 60600		45	835	19:20
0,5 m Kjetting Galv.					
50(51) m Kevlar					
ADCP300	SNR		97	783	19:10
0,5 m Kjetting Galv.					
RBR Concerto	SNR. 60592		99	781	19:10
100(103) m Kevlar					
RBR Concerto	SNR. 201410		151	729	18:59
RBR Concerto	SNR.201407		201	679	18:55
0,5 m Kjetting Galv.					
50 + 50(51) m Kevlar					
RBR Concerto	SNR.201405		302	578	18:47
ADCP150	SNR: 24619		304	576	18:47
1 m Kjetting Galv.					
100 (103) m Kevlar					
RBR Solo	SNR.102492		408	472	18:40
200 (208) m Kevlar					
RBR Solo	SNR.102473		615	265	18:33
50(51) m Kevlar					
100+100(101) m Kevlar					
RBR Concerto D	SNR.552		867	13	18:25
SBE37/SEAFET	SNR. 20271/721-2003				
4 Glasskuler					
4 m Kjetting Gulv.					
Svivel					
AR861B2S	SNR. 2630	Arm: 2BE9			
		Release: 2B55			
5 m Kevlar					
2 m Kjetting					
ANKER 1000 kg			880	0	

Mooring AT800-5

Institute of Marine Research

Data record book for self registrating instruments detail

Ship/Platform:	Kronprins Håkon
Location:	Atwain SIOS AT 800BioAC-1 876m
Latitude:	N 81° 32.852
Longitude:	E 030° 50.33

Instruments / Sensors

#	Brand	Type	Serial No.	Depth	Comments
1	Nortek	Signatur 100	101128	400	2år confi
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Bottom depth [m]:	876
Outgoing date:	2019.11.22
Outgoing time (UTC):	09:18
Incoming date:	~~2019.04.18~~
Incoming time (UTC):	

Comments:
Start measuring 23.11.2019 kl 1200 utc

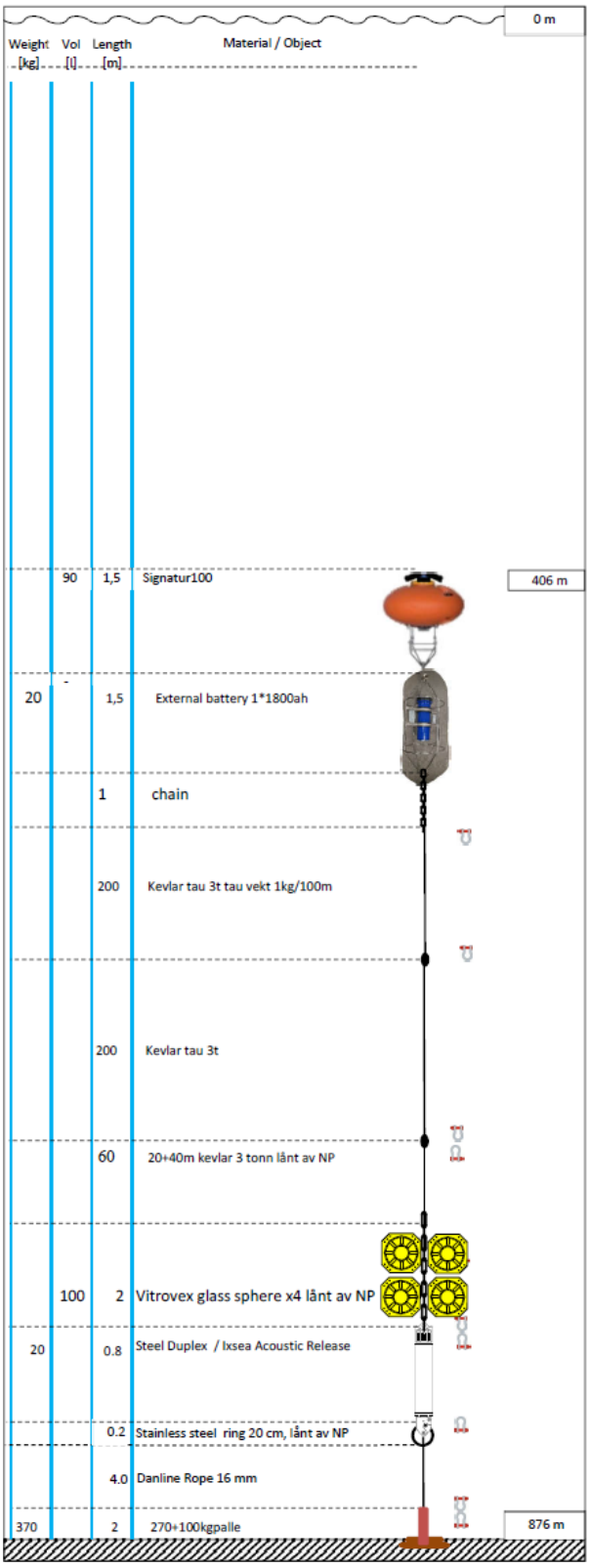
Responsible(s): Terje Hovland

ARGOS
PTTID: 22530 sn.295

Acoustic release: IXSEA **AR861**
Serial no: **2635** Battery expire: 2023.04.24
Range code: **2B90**
Release code: **2B55**

Station name: AT 800BioAC-1	
Color code:	
Sum weight (incl. anchor): [kg]	
Sum weight (excl. anchor): [kg]	
Sum volume: [l]	
Buoyancy (anchor on): [kg]	
Buoyancy (anchor off): [kg]	
Shackle Stainless Steel	S
Shackle Galvanized Steel	G
Thimble Stainless Steel	
Thimble Galvanized Steel	
Thimble Delrin	

Description	Spec	No.
Shackle Stainless Steel	2.0 T	2
Shackle Stainless Steel		0
Shackle Galvanized Steel	2.0 T	2
Shackle Galvanized Steel	3.2 T	5
Shackle Galvanized Steel		0
Shackle Galvanized Steel		0
Shackle Galvanized Steel		0
Thimble Stainless Steel		0
ThimblesStainless Steel		0
Thimble Galvanized Steel		0
Thimble Galvanized Steel		0
Thimble Delrin		2
Bolt Stainless Steel (RCM-7)		0
		0
		0



Mooring AT800-bioAC-1 (SIOS-InfraNor)

Institute of Marine Research

Data record book for self registrating instruments detail

Ship/Platform:	Kronprins Håkon
Location:	Ateros_AT 800-BioAC-2 873m
Latitude:	N 81° 32.891
Longitude:	E 030° 53.441

Instruments / Sensors

#	Brand	Type	Serial No.	Depth	Comments
1	Nortek	Signatur 100	100764	805	2år confi
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Bottom depth [m]:	873
Outgoing date:	2019.11.22
Outgoing time (UTC):	10:15
Incoming date:	~~2019.04.18~~
Incoming time (UTC):	

Comments:
Start measuring 23.11.2019 kl 1200 utc

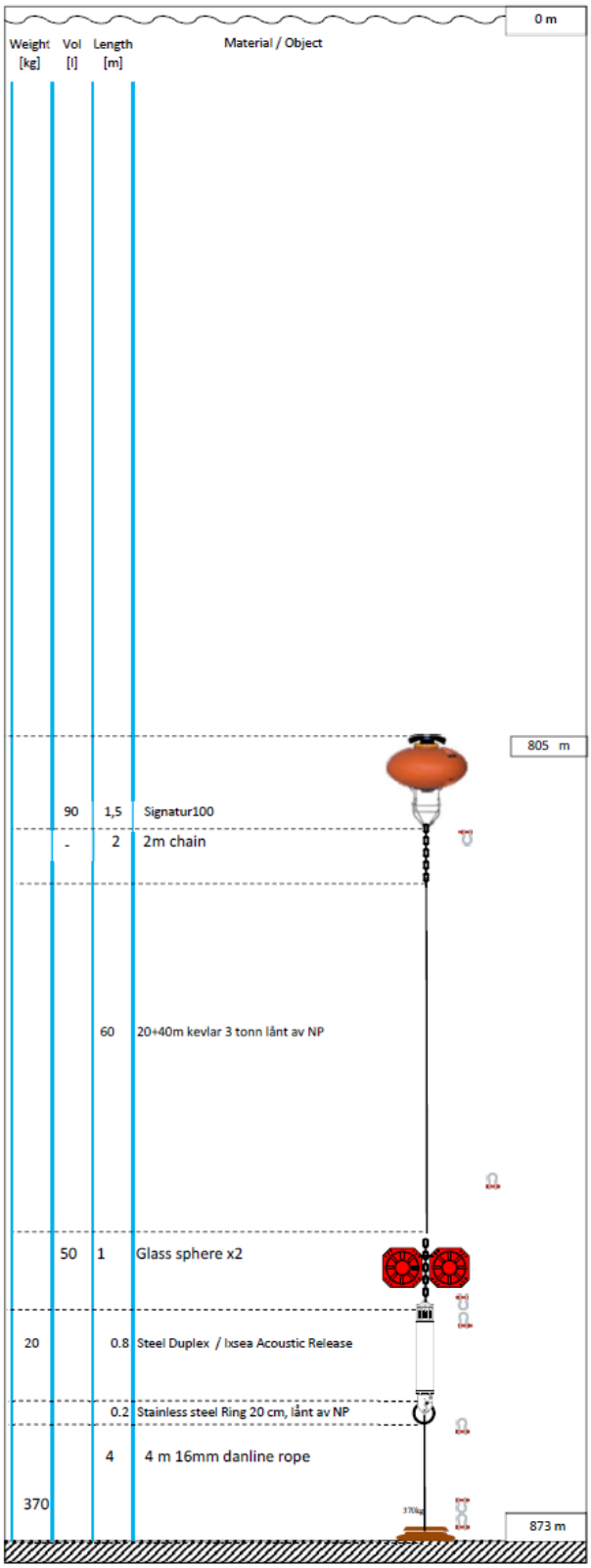
Responsible(s): Terje Hovland

ARGOS
PTTID: ~~60203 sn.275~~ **Novatech iridium tracker, lånt av NP**

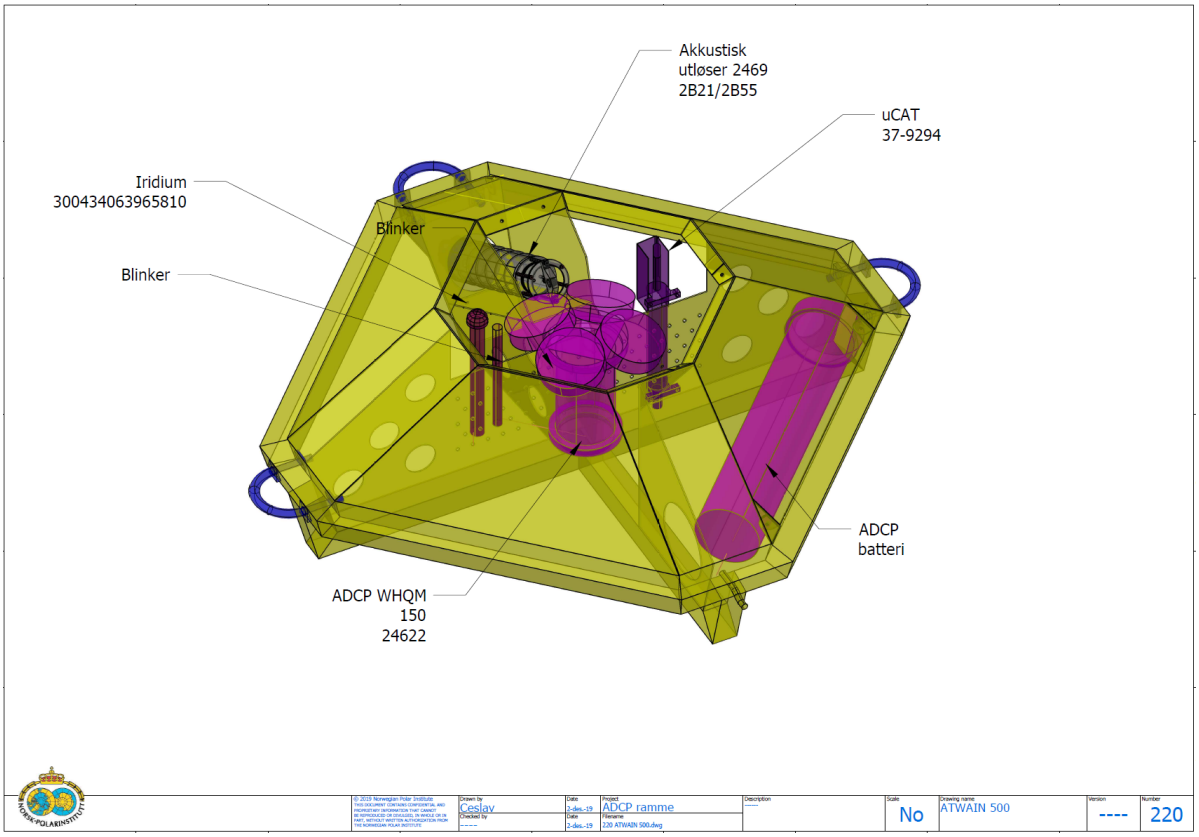
Acoustic release: IXSEA **AR861**
Serial no: **2371** Battery expire: 2023.11.20
Range code: **1BBE**
Release code: **1B55**

Station name: AT 800-BioAC-2	
Color code:	
Sum weight (incl. anchor): [kg]	
Sum weight (excl. anchor): [kg]	
Sum volume: [l]	
Buoyancy (anchor on): [kg]	
Buoyancy (anchor off): [kg]	
Shackle Stainless Steel	S
Shackle Galvanized Steel	G
Thimble Stainless Steel	
Thimble Galvanized Steel	
Thimble Delrin	

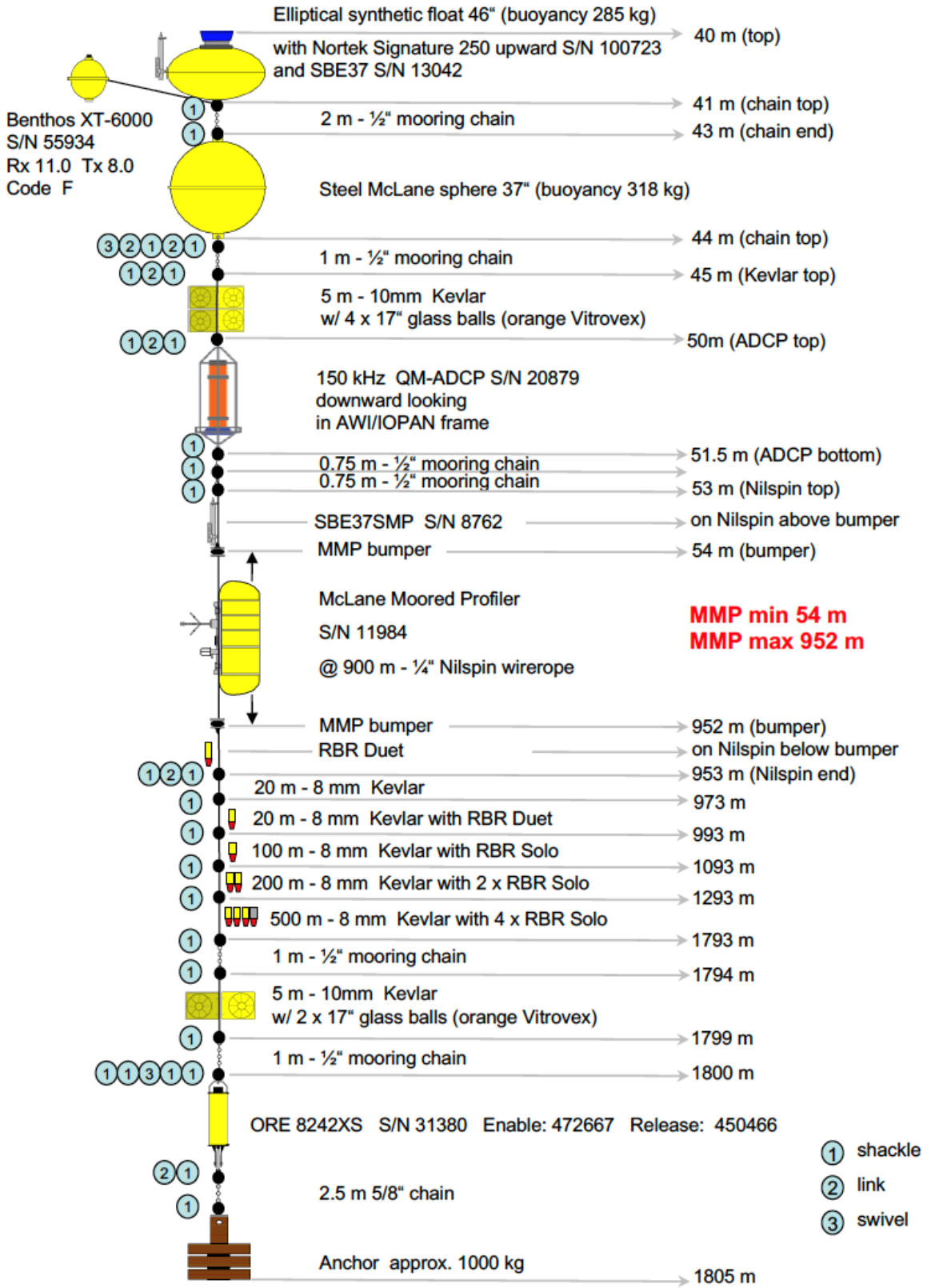
Description	Spec	No.
Shackle Stainless Steel	2.0 T	2
Shackle Stainless Steel		0
Shackle Galvanized Steel	2.0 T	2
Shackle Galvanized Steel	3.2 T	5
Shackle Galvanized Steel		0
Shackle Galvanized Steel		0
Shackle Galvanized Steel		0
Thimble Stainless Steel		0
ThimblesStainless Steel		0
Thimble Galvanized Steel		0
Thimble Galvanized Steel		0
Thimble Delrin		2
Bolt Stainless Steel (RCM-7)		0
		0
		0



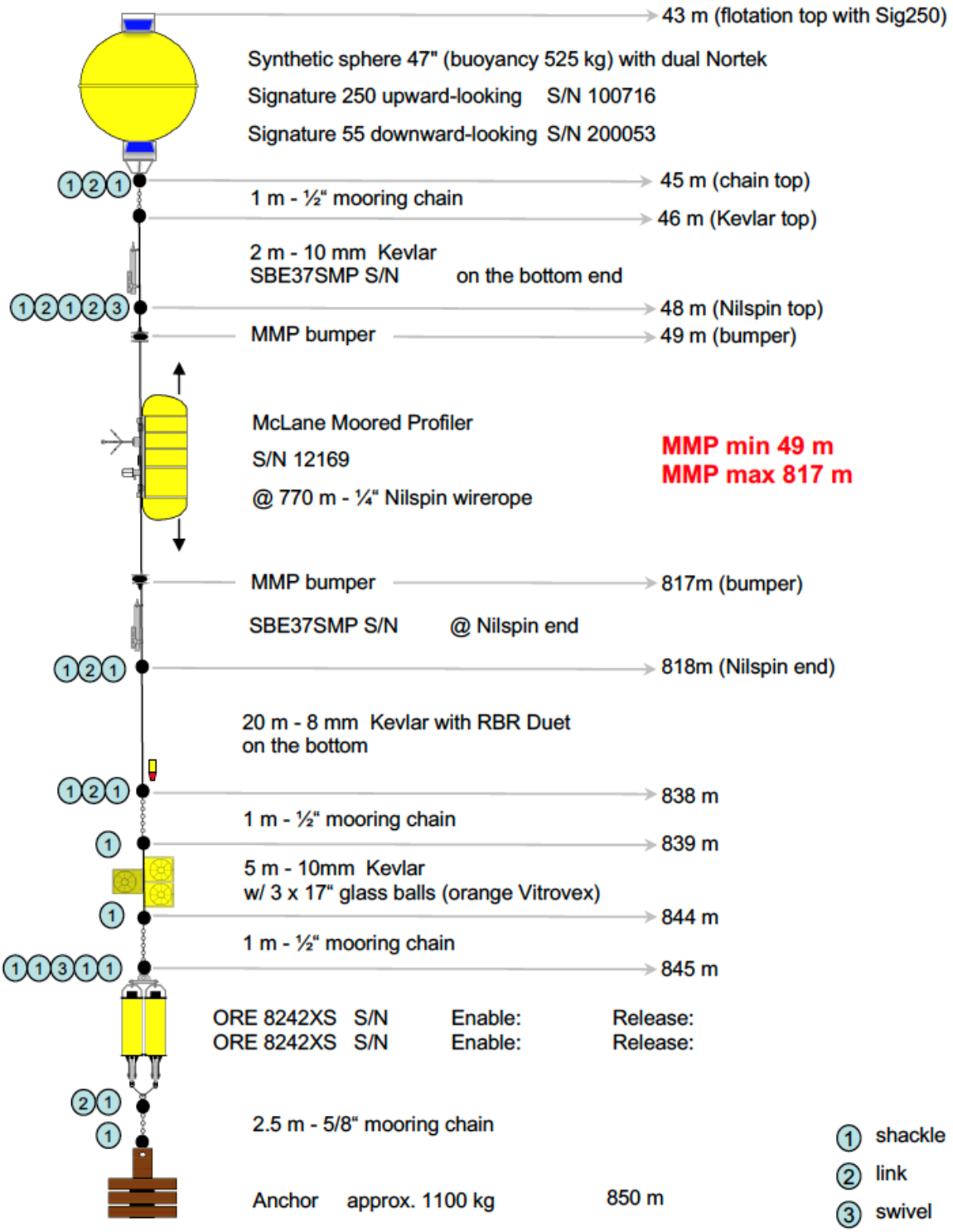
Mooring AT800-bioAC-2 (INTAROS/A-TWAIN)



Mooring AT500-2



Mooring IOPAS23



Mooring IOPAS13

Appendix V: Science blogs

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

- På leiting i mørket. A. Sundfjord, published 20.11.2019
- Hva ER denne rigg-greia? A. Renner, published 22.11.2019
- Fortellinger fra dypet. Ø. Lundesgaard, published 25.11.2019
- Nattevakta. A. Renner, published 26.11.2019
- Varme, A. Renner, published 27.11.2019

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

- From tornadoes in Oklahoma to Arctic survival training. N. Szapiro, published 13.11.2019
- Searching in the dark. A. Sundfjord, published 21.11.2019
- What IS this mooring business? A. Renner, published 22.11.2019
- Tales from the deep. Ø. Lundesgaard, published 25.11.2019
- Night watch. A. Renner, published 26.11.2019
- The heat – A. Renner, published 27.11.2019
- Where are we? A. Renner, published 28.11.2019
- Hard disks full of data despite ice, darkness and freezing temperatures. A. Renner & A. Sundfjord, published 29.11.2019

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.

>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*.

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.

Norwegian Meteorological Institute

UNIS
The University Centre in Svalbard

NERSC

NTNU

Akvaplan niva

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

With funding from The Research Council of Norway

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Photo cover: Arild Sundfjord