R/V Laura Bassi - ARCTIC Expedition 2021

Project Cruise Report

Integrated reconstruction of ice sheet dynamics during Late Quaternary Arctic climatic transitions

- IRIDYA -

06/08/2021 – 14/09/2021, Bergen (NOR) – Bergen (NOR)

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Table of Content

Pages

1. Summary 03
2. Participants list 05
3. Research programme and objectives 08
4. Narrative of the Cruise 13
5. Data acquisition and preliminary results 19
    5.1 Acoustic survey 19
    5.2 Sediment sampling 23
6. Collaborations 29
7. Acknowledgements 31
8. References 31
9. Supplementary information 33
    (A) Logbook 33
    (B) Vessel's characteristics 40
    (C) Scientific equipment 47

1- SUMMARY

The project PRA-IRIDYA targets a multidisciplinary, integrated reconstruction of the climatic transitions occurred in the Arctic during the late Quaternary, aiming at collecting new information necessary to understand the complex interconnections and feedback mechanisms regulating the climate-ocean-cryosphere system.

The new field data acquisition was performed during the oceanographic cruise LB21 of the Italian icebreaker Polar Vessel Laura Bassi during August 6th – September 14th, 2021, with departure and arrival at Bergen harbour (Norway). The oceanographic expedition was supported by the Italian Program for Research in the Arctic (PRA) and the Institute of Oceanography and Applied Geophysics (OGS). The activities of IRIDYA were slit during two legs and included the geophysical acquisition of multibeam bathymetry and sub-bottom profiles along the western margin of Svalbard, and the geological acquisition of sediment cores collected with a OKTOPUS multi-corer for undisturbed surface sediments and a OSIL piston-corer to recovery a large temporal record. The deepest coring site was located in the abyssal plain of the Greenland Sea at 3800 m depth, during the project CASSANDRA (see collaborations), whereas the IRIDYA sampling sites were located at a depth of 1600–1800 m bsl.

The acquisition plan of the project IRIDYA initially also envisaged a seismic multi-channel acquisition which could not be carried out due to the refusal of permits by the Norwegian authorities. The expected times for the seismic acquisition were instead used to expand the area of the detailed bathymetric survey whose data will be used to complete the International Bathymetric Map of the Arctic (IBAO).

Notwithstanding the several contingency problems associated with the newly installed instrumentation and the bad weather conditions, the IRIDYA group succeeded to collect a highly valuable new dataset that includes *ca.* 3150 km_2 of multibeam bathymetry, *ca.* 1500 km of sub-bottom (Topas) profile, and over 35 m of sediments containing the record of last glacial termination (last 20 ka). Further, two multi-cores at each coring site were sliced on board producing a total of 225 samples ready for shore based analyses.

Further, during the oceanographic cruise LB21, new collaborations were agreed between the scientific groups of the three PRA projects operating onboard, that will combine their own expertise in support to the others projects (details in the report below).

RIASSUNTO

Il progetto PRA-IRIDYA prevede la ricostruzione multidisciplinare e integrata delle transizioni climatiche avvenute nell'Artico durante il tardo Quaternario, con l'obiettivo di raccogliere nuove informazioni necessarie per comprendere le complesse interconnessioni e i meccanismi di feedback che regolano il sistema clima-oceano-criosfera.

Una nuova acquisizione di dati di campagna è stata eseguita durante la crociera oceanografica LB21 sulla nave polare italiana Laura Bassi avvenuta dal 6 agosto al 14 settembre 2021, con partenza e arrivo al porto di Bergen (Norvegia). La spedizione oceanografica è stata sostenuta dal Programma Italiano per la Ricerca nell'Artico (PRA) e dall'Istituto di Oceanografia e Geofisica Sperimentale (OGS). Le attività di IRIDYA sono state svolte nel corso dell’intera campagna artica (durante i due Legs) con acquisizione geofisica di batimetria a multi-fascio e profili di *sub-bottom* lungo il margine occidentale delle Svalbard e con acquisizione geologica di carote di sedimento raccolte utilizzando un multi-carotiere OKTOPUS per recuperare sedimenti superficiali indisturbati e un carotiere a pistone OSIL per estendere il registro temporale ad unità più vecchie. La massima profondità di campionamento raggiunta è stata di 3800 m nella piana abissale del Mare di Groenlandia durante il progetto CASSANDRA (vedi collaborazioni), mentre i siti di campionamento di IRIDYA erano posti a profondità di 1600–1800 m.

La campagna IRIDYA prevedeva inizialmente anche una acquisizione di sismica multicanale che tuttavia non si è potuta effettuare causa diniego dei permessi da parte delle autorità Norvegesi. I tempi previsti per l’acquisizione sismica sono stati invece utilizzati per ampliare l’area del rilievo batimetrico di dettaglio i cui dati serviranno per completare la mappa Internazionale della Carta Batimetrica Artica (IBAO).

Nonostante alcuni problemi logistici associati alla strumentazione appena installata a bordo e alle condizioni meteorologiche avverse, il gruppo IRIDYA è riuscito a raccogliere un nuovo set di dati di grande valore che include *ca.* 3150 km$_2$ di batimetria multibeam, *ca.* 1500 km di profili di sub-bottom (Topas), e oltre 35 m di sedimenti contenenti il registro degli eventi climatici che hanno seguito l’ultimo massimo glaciale (ultimi 20-mila anni). Inoltre, ad ogni sito di campionamento, due carote per ogni Multi-carotaggio sono state campionate al cm producendo un totale di 225 campioni immediatamente disponibili per analisi di laboratorio al ritorno della campagna.

Si riporta, infine, che durante la campagna oceanografica LB21, sono nate delle collaborazioni scientifiche tra i gruppi dei tre progetti PRA che uniranno le rispettive competenze scientifiche a supporto del progetto degli altri (dettagli riportati nel report).

2- PARTICIPANTS LIST

RESEARCH GROUP LEG-1: 6–28/8/202, Bergen-Longyearbyen			
NAME	***GENDER***	***AFFILIATION***	***POSITION/ACTIVITY***
Romeo Roberto	M	OGS CGN	TECHNOLOGIST- PARTY CHIEF
Daniela Accettella	F	OGS CGN	TECHNOLOGIST
Francesco Coslovich	M	OGS CGN	TECHNOLOGIST
Isabella Tomini	F	OGS CGN	TECHNOLOGIST
Giampaolo Visnovic	M	OGS CGN	TECHNOLOGIST
Fabrizio Zgur	M	OGS CGN	TECHNOLOGIST
Matias Morales	M	Kongsberg	TRAINER
Ghigliotti Laura	F	CNR IAS	CHANGE (PI)
Di Blasi Davide	M	CNR IAS	CHANGE
Marino Vacchi	M	CNR IAS	CHANGE
Marianna Del Core	F	CNR IAS	CHANGE
Renata G. Lucchi	F	OGS GEO	IRIDYA (PI)
Riccardo Geletti	M	OGS GEO	IRIDYA
Nessim Douss	M	OGS GEO	IRIDYA
Andrea Gallerani	M	CNR ISMAR	IRIDYA

RESEARCH GROUP LEG-2: 30/8–14/9/202, Longyearbyen-Bergen			
NAME	***GENDER***	***AFFILIATION***	***POSITION/ACTIVITY***
Lorenzo Facchin	M	OGS CGN	TECHNOLOGIST- PARTY CHIEF
Francesco Coslovich	M	OGS CGN	TECHNOLOGIST
Andrea Cova	M	OGS CGN	TECHNOLOGIST
Jacopo Pasotti	M		PRESS
Vedrana Kovacevic	F	OGS OCE	Indian mooring in Kongsfjorden, S1
Manuel Bensi	M	OGS OCE	Indian mooring in Kongsfjorden, S1
Paolo Mansutti	M	OGS OCE	Indian mooring in Kongsfjorden, S1
Leonardo Langone	M	CNR ISP	Indian mooring in Kongsfjorden, S1
Patrizia Giordano	F	CNR ISMAR	Indian mooring in Kongsfjorden, S1
Renata G. Lucchi	F	OGS GEO	IRIDYA (PI)
Andrea Caburlotto	M	OGS GEO	IRIDYA
Maurizio Azzaro	M	CNR ISP	CASSANDRA (PI)
Francesca Becherini	F	CNR ISP	CASSANDRA
Maria Papale	F	CNR ISP	CASSANDRA
Alessandro Ciro Rapazzo	M	CNR ISP	CASSANDRA
Warren Cairns	M	CNR ISP	CASSANDRA
Carmen Rizzo	F	CNR ISP	CASSANDRA
Matteo Feltraccio	M	CNR ISP	CASSANDRA
Tommaso Diociaiuti	M	OGS OCE	CASSANDRA
Diego Borme	M	OGS OCE	CASSANDRA
Marina Monti	F	OGS OCE	CASSANDRA

Lidia Urbini	F	OGS OCE	CASSANDRA
Federica Relitti	F	OGS OCE	CASSANDRA
Scipinotti Riccardo	M	ENEA	
Ferriani Stefano	M	ENEA	

CREW of the P/V LAURA BASSI 6/8–14/9/2021

NAME	***RANK***
Giuseppe Borredon	Master
Scotto Di Perta Andrea	Chief Mate
Di Silvestri Matteo	Navigation Officer
Coppola Salvatore	Navigation Officer
Gargiulo Stefano	Chief Engineer, Leg-1
Illiano Umberto	Chief Engineer, Leg-2
Scotto Di Perrotolo Mario	2nd Engineer
Marchelli Marcello	Engineer Officer
Assenza Parisi Bartolo	A.B.
Scotti D’antuono Pasquale	A.B.
Pugliere Lorenzo	Bosun
Di Bonito Guido	A.B.
Ambrosino Di Miccio Pasquale	Deck Boy
Riccardi Giuseppe	Deck Boy
Schiano Di Cola Ciro	Cook
Barone Francesco	Motorman
Pugliese Salvatore	Engineer Boy
Jovic Goran	Electrician
Festivo Lazzaro	Chief Mate (SN)
Pugliese Enrico	Cook
De Crescenzo Ciro	Deck Boy
Karanusic Ivan	Electrician


ARGO
SHIP MANAGEMENT & SERVICES
OGS

LEG-1


Arctic cruise Laura Bassi LB21.II

LEG-2

3- RESEARCH PROGRAMME AND OBJECTIVES

Motivation and relevance of the research

The paleo Svalbard-Barents Sea Ice Sheet (SBSIS) complex is considered the best available past analogue to develop future projections for the present-day West Antarctic Ice Sheet, whose loss of stability is the major uncertainty in projecting future global sea level changes. Reconstructions of the Barents Sea paleo bathymetry suggest a similar background for climate evolution as for West Antarctica. The Barents Sea was much shallower and partly emerged until the Late Pliocene (Butt et al., 2002; Laberg et al., 2012; Zieba et al., 2017), and gradually deepened due to substrate erosion during past glaciation until most of the SBSIS became marine-based (Laberg et al., 2010). In analogy with the modern West Antarctica, the SBSIS became more vulnerable to the warm North Atlantic Current (NAC) intrusion on the shallow continental shelf causing rapid melting and frequent instabilities of its grounding line, amplified by the contemporaneous progressive sea level rise during glacial terminations. The effects of such ice sheet destabilization was a fast inland retreat of the ice front through collapses of large portions of the ice sheet and surge to the ocean causing pronounced sea level jumps.

Evidence of such mechanisms is recorded in the sedimentary archive through massive IRD delivery and extensive freshwater discharge along the Svalbard margin during warm intervals (e.g. D-O events and meltwater pulses, Lucchi et al., 2013, 2015, 2018). At the same time, prominent release of fresh water is thought to have interfered with the characteristics of water masses and the oceanic circulation inducing slow-down of the global thermohaline circulation, eventually triggering the onset of cold periods (Rahmstorf et al., 2015; Golledge et al., 2019, Turney et al., 2020).

The identified area for this study is located along the western margin of Svalbard corresponding to the eastern side of the Fram Strait that is the only deep-sea open gateway through which water masses are exchanged between the North Atlantic and Arctic Oceans (Fig. 1A). Warm North Atlantic Waters forming the West Spitsbergen Current (WSC) are advected northward across the eastern side of the Fram Strait (Fig. 1B). The warm WSC is responsible for almost ice-free conditions in the west and north Svalbard during winter, exerting a strong control on Arctic climate (IPCC, 2019). At the same time, cold Arctic waters (East Greenland Current, Fig. 1B) descend southward across the western side of the Fram Strait contributing to the maintenance of the Greenland ice cap.

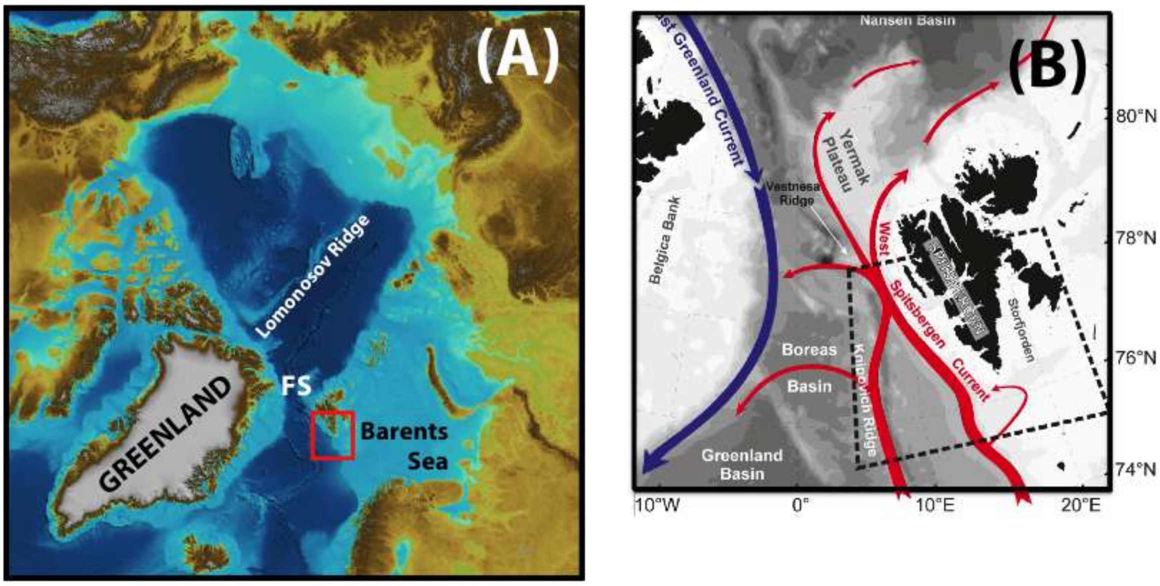


Figure 1. *(A) Location of the study area (red box) in the Arctic (bathymetry from Jakobsson et al., 2012). FS= Fram Strait. (B) Principal oceanic currents crossing the Fram Strait: red arrows indicate the warm Atlantic water (West Spitsbergen Current, WSC) advected north along the eastern side of the Fram strait; the blue arrow indicates the cold Arctic water (East Greenland Current) descending southward across the western side of the Fram Strait.*

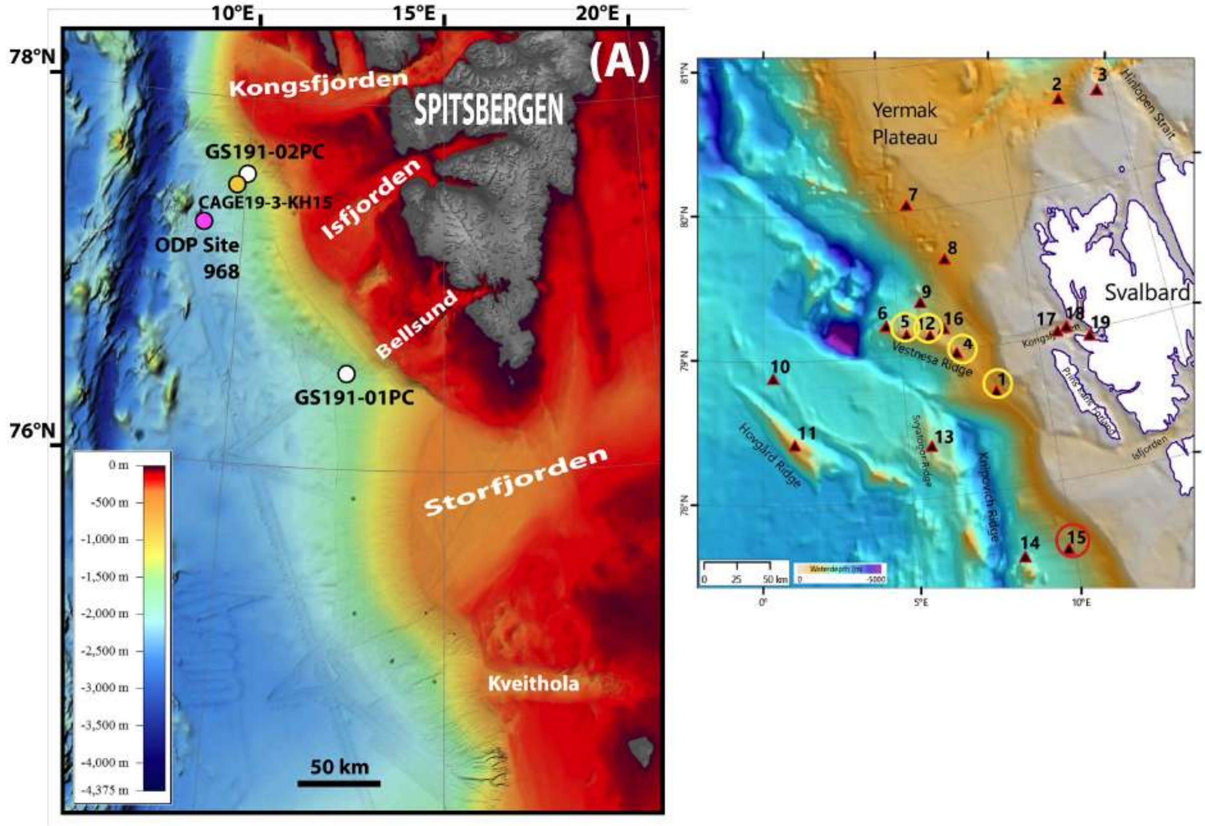


Figure 2. *Core locations: (A) Eurofleets2-PREPARED cores GS191-01PC and -02PC (white dots) and core CAGE19-3KH-15 (yellow dot). The ODP Site 968 is also indicated (pink dot). (B) CAGE19-3KH geological dataset indicating the additional cores that will be analysed by IRIDYA: red circle immediately available for analyses (core CAGE19-3KH-15), yellow circle available for correlations during the project course.*

The geological record of IRIDYA was strategically located along the main path of the WSC, covering a longitudinal transect of about 320 km between the NW Barents Sea and the western margin of Svalbard (Fig. 2) where two contourite sediment drifts were identified by Rebesco et al. (2013), and named Bellsund and Isfjorden sediment drifts (Fig. 3). Contourite drifts are key geological and morpho-bathymetric features ideal for palaeoceanographic and palaeoclimatic reconstructions, since they form along the pathways of major bottom currents, producing expanded sedimentary sequences, rich in biogenic fraction suitable for radiocarbon dating and isotope studies (Rebesco et al., 2014). The acquisition was strategically designed to generate two down-slope transects of sediment cores across the Bellsund and Isfjorden drifts that will allow us to better constrain the interplay between ocean forcing and cryosphere. Promising palaeoceanographic information obtained from the investigation of the former available geological record, led to the identification of very expanded and continuous depositional sequences, considered suitable for ocean drilling for the reconstruction of the last 3.5 Ma climatic oscillations and related ice sheet dynamics. IRIDYA project is therefore meant to be an Italian preparatory action in support to IODP proposal 985-Full2 (Lucchi et al., 2021).

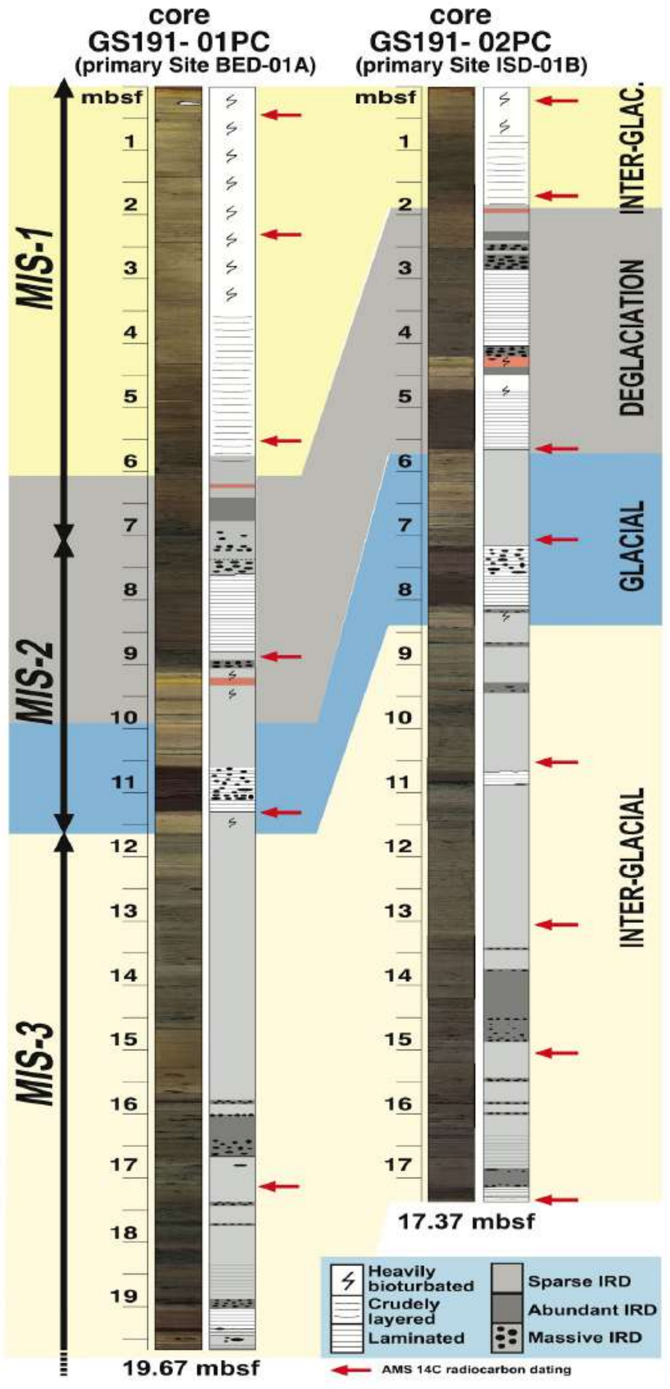


Figure 3. *The Calypso cores recovered during Eurofleets2-PREPARED cruise (Lucchi et al., 2014). The preliminary investigation indicated the presence of very expanded and continuous marine palaeoclimatic records spanning the last 60 ka. The sites of core GS191-01PC and -02PC were indicated in the proposal IODP-985Full2 as primary sites for ocean drilling.*

Objectives and impacts

The main objective of the IRIDYA project is the high-resolution (sub-centennial) multidisciplinary reconstruction of the paleoceanographic and palaeoclimatic changes that occurred around the Fram Strait during the last 60 ka and their impact on the paleo SBSIS dynamics. Glacial terminations will be specifically focused as well as other climatic fluctuations responsible for meltwater events as direct evidence of the ice sheet feedback to climate warming. The specific objectives of IRIDYA are:

1. The definition of a detailed age model for continental margin cross correlations with other existing cores, and for geophysical data calibration;
2. The reconstruction of depositional processes associated to climatic oscillations;
3. The identification and characterization of local/regional paleo ice sheet meltwater events;
4. The reconstruction of the trigger mechanisms of past meltwater events;
5. the reconstruction of local/regional impact of prominent meltwater events on glacial dynamics and oceanographic configuration (e.g. surface and deep-water masses characterization prior/during/after meltwater events);
6. The definition of the delay between land surface (ice cores records) and marine (sediment cores records) feedbacks to paleoclimatic changes as analogue for on-going and projected global warming in polar areas;
7. The identification, on the newly acquired data, of alternate sites suitable for IODP drill in support to proposal 985-Full2 (https://www.iodp.org/docs/proposals/1111-985-full2-lucchi-cover/file).

Implementation of the acquisition programme

The proposed acquisition programme included an acoustic and seismic survey of the study area, and the retrieval of sediment cores (piston and multi-cores) at 3 sites located in the NW margin of the Barents Sea and along the western margin of Svalbard (Fig. 4). The seismic survey served for the identification of new possible alternate sites to be considered for ocean drilling (IRIDYA specific objective 7). This initial plan was rearranged as the Norwegian authorities did not give the permission to perform the seismic survey. Instead, we decided to extend the multibeam acquisition on the middle slope area located between the sampling sites on the Isfjorden and Bellsund Drifts. Further, Site PC2b (Fig. 4), that corresponds to the proposed IODP Site BED-02A, resulted to contain surface coarse-grained sediments associated with a fringe of mass transport deposits (MTD) that caused the bending of the core barrel. In order to define a new suitable location for the proposed drill site, we decided to resample the area in the close surroundings, avoiding the presence of MTD in the close stratigraphic section. Given the limited acquisition time the new core site (Site IRIDYA-04, Fig. 5) was sampled instead of the initially planned Site PC1 located in the NW Barents Sea that was not cored (Fig. 4).

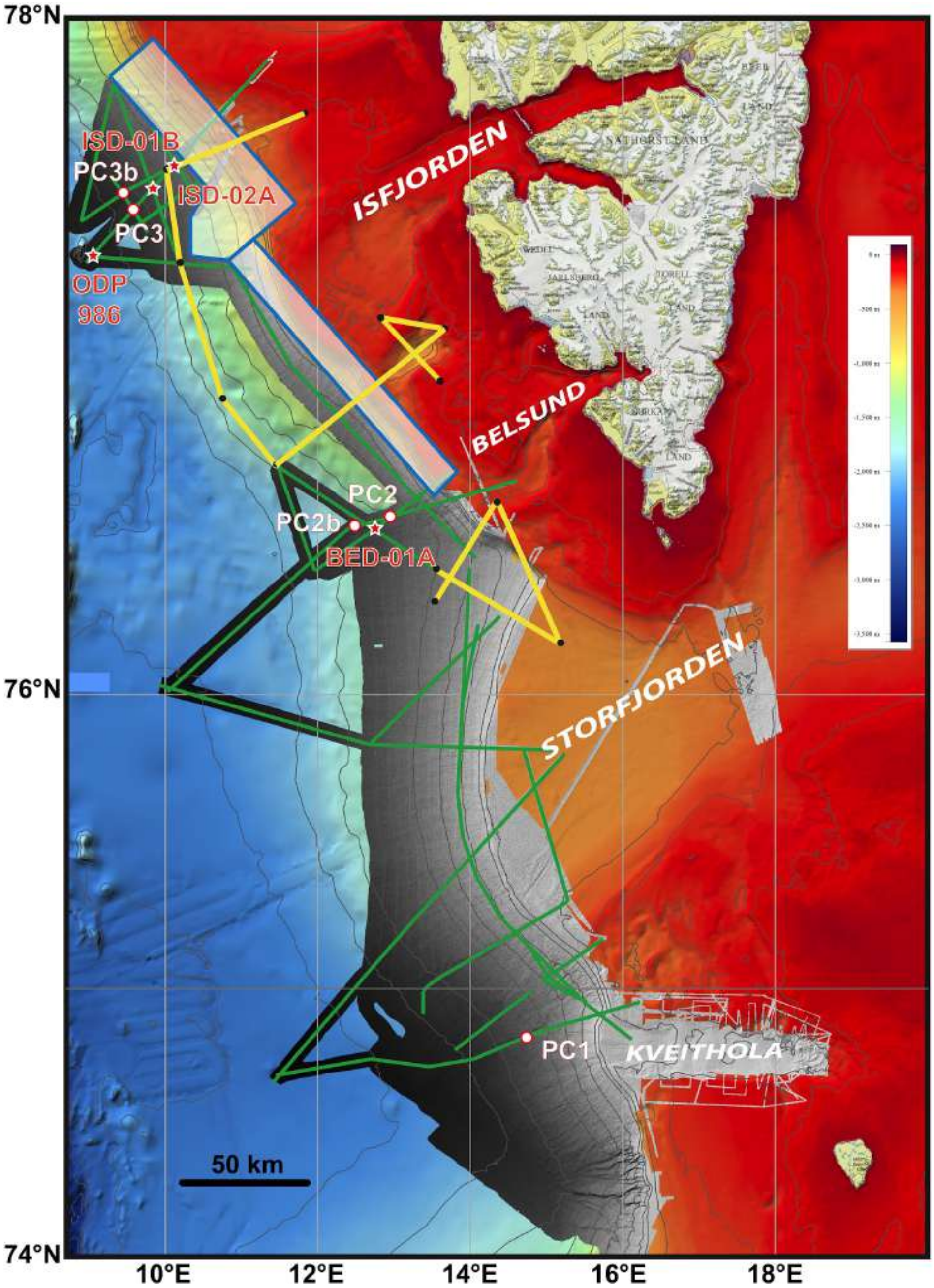


Figure 4. *Proposed acquisition plan. The gray shaded area indicates the existing multibeam bathymetry; green lines refer to existing multichannel seismic lines (mcs), yellow lines indicate the planned new acquisition mcs lines, and the blue boxes delimit the foresaw multibeam acquisition. White dots are the IRIDYA coring sites, whereas the red stars indicate the already cored sites including the location of ODP drill Site 986.*

4- NARRATIVE OF THE CRUISE

The field acquisition of the project PRA-IRIDYA took place during both Leg-1 and Leg-2 of the 3rd expedition of the Italian RV Laura Bassi (the 1st in the Arctic) during the summer 2021. IRIDYA shared time acquisition with other two PRA projects: the project CHANGE offshore the NE margin of Greenland (Leg-1) and the project CASSANDRA developed along the 75°N parallel (Leg-2). In this report the working time will be indicated in UTC.

The IRIDYA sampling sites were renamed with respect to the initially submitted acquisition plan in order to take in consideration the temporal sequence of sampling as follows:

IRIDYA-01 (former PC3) corresponding to alternate Site ISD-03A of proposal IODP-985-Full2

IRIDYA-02 (former PC2b) corresponding to alternate Site BED-02A of proposal IODP-985-Full2

IRIDYA-03 (former PC2) corresponding to alternate Site BED-03A of proposal IODP-985-Full2

LEG-1 **06 – 28/08/2021**

06 August 2021

17.00, departure from Bergen for the Leg-1 of the research expedition. The first part of the Leg was dedicated to the Project CHANGE (PI: Laura Ghigliotti, CNR-IAS)

6 –11 August 2021

Transit to the NW of Greenland (CHANGE operational area). The cruise speed was reduced starting from 75°46’N, 07°06’W heading NW, due to the occurrence of patchy sea ice then becoming more consistent and laterally continuous with extended multi-year ice locally over 1 m-thick.

11 –17 August 2021

Acquisition for the project PRA-CHANGE.

17 –18 August 2021

14.30, conclusion for the project CHANGE and navigation to Longyearbyen (Svalbard, NOR) to disembark the technician of Kongsberg. Thick sea ice was found heading to Svalbar till the meridian zero at longitude 79°N. After this longitude the Greenland Sea became ice free.

!9 August 2021 (Wind SW3, Sea State SW2, Air Temp 2°C)

06.00, arrived in Longyearbyen.

07.00, disembark of the Kongsberg technician. Assemblage of the piston corer with a 15 m-long barrel, reorganisation of the wet-lab to host the IRIDYA group, and planification meeting for the IRIDYA project.

20.50, transfer to the IRIDYA operational area.

20 August 2021 (Wind NW4, Sea State NW3, Swell 1 m, Air Temp 3°C)

6.00, arrival at the IRIDYA operational area, on the upslope of the Isfjorden sediment drift.

06.16 – 11.32, sub-bottom (SBP) Topas and multibeam EM304 acquisition starting from 200 m wd and moving down-slope across IODP-985-Full2 Sites ISD-01B, ISD-02A, and ODP Site 968 located at 2090 m wd. (Fig. 4).

12.04 –14.04, measurement of the Sound Velocity Profile (SVP) to calibrate the acoustic data.

14.00 –16.30, transit to the coring Site IRIDYA-01, with Topas acquisition in multiping modality.

16.48 –18.33, Deployment of the multicore LB21-3-IRIDYA-01MC. The multicorer deployment was assisted by the echosounder EK80 allowing to trace the instrument deployment and the penetration in the sediments. Deployment velocity 90 m/min down to 1732 m wd. Recovery of 6 full liners over 10, with a recovery length between 33–34 cm.

From 18.40, acoustic survey with multibeam EM304 and SBP-Topas on the transfer to the Bellsund drift following the isobath 1200.

21 *August 2021* (Wind NW2, Sea State NW2, Swell 1 m, Air Temp 5°C)

04.53 end of the acoustic survey along the isobath 1200.

04.53 –06.15, SBP-Topas acquisition across core Sites IRIDYA-02 and IRIDYA-03.

06.15 –06.30, Transit to core Site IRIDYA-02.

06.40 –08.07, deployment of the Multicore LB21-3-IRIDYA-02MC. Deployment velocity 90 m/min down to 1728 m wd. Recovery of 6 full liners over 10, with recovery lengths between 17–34 cm.

08.10 –14.08, Deployment of the Piston core LB21-3-IRIDYA-02PC. Core barrel 15 m long with 5 m of free-fall, and trigger weight 120 kg. Deployment velocity 90 m/min down to 1724 m wd. The core barrel bended at *ca.* 7 m from the bottom by hitting a layer of cobbly sand.

15.23 –16.40, transfer to core Site IRIDYA-03.

16.50 –18.30, Deployment of the Multicore LB21-3-IRIDYA-03MC. Deployment velocity 90 m/min down to 1485 m wd. Recovery of 6 full liners over 10, with recovery lengths between 24–30 cm.

From 18.33, acoustic survey with multibeam EM304 and SBP-Topas along the isobath 1300, heading the Isfjorden drift, in order to reach over the night the core Site IRIDYA-01 for piston coring. In the meanwhile, the SBP-Topas record acquired between the Sites IRIDYA-02 and IRIDYA-03 was analysed to define a new sampling site alternative to IRIDYA-02 (IRIDYA-04).

22 August 2021 (Wind ESE 3, Sea State ESE 2, Swell 1 m, Air Temp 4°C)

06.20, arrived in the area of the Isfjorden drift.

Although the piston corer was assembled with a 12 m long barrel ready for the deployment at Site IRIDYA-01, the core operation was suspended because the coring warp was damaged during core bending at the site IRIDYA-02 and needed repairing. Therefore, the full day and night were dedicated to the acoustic survey (multibeam and SBP-Topas) of the upper slope of the Isfjorden drift as indicated in the acquisition plan, and the multicores recovered at the sites IRIDYA-02 and IRIDYA-03 were sub-sampled.

23 August 2021 (Wind SSE 5, 24 knot, increasing; Sea State SSE 4, Swell 2.5 m, Air Temp 4°C)

Piston coring operation is still not possible because of the strong wind and high swell.

Continue the acoustic survey (multibeam and SBP-Topas) of the upper slope of the Isfjorden drift. The survey was planned to end at the Bellsund drift in the early morning in order to be ready for piston coring the newly identified Site IRIDYA-04 located upslope, next to IDIDYA-02.

24 August 2021 (Wind S 3, Sea State S 3/4, Air Temp 5°C)

02.30, end of the acoustic acquisition on the Bellsund Drift upper continental slope. We decided to investigate this area better by running additional SBP-Topas nearby sites IRIDYA-03 and -02.

02.40 –06.20, start of Topas in multiping modality acquisition. Two lines were performed: one dip-line parallel to the one crossing Sites IDIDYA-03 and 02, and a second line crossing along-slope site IDIDYA-04.

06.20 –08.42, first attempt of Piston coring Site IRIDYA-4 with a 12 m barrel and trigger weight of 120 kg. Deployment velocity 100 m/min down to 1662 m wd. Beside the echosounder EK80 indicated the piston coring system reached the seafloor, the trigger system did not release the core barrel.

08.44 –10.20, second attempt. Deployment velocity 100 m/min down to 1666 m wd. The core barrel penetrated the sediments (muddy external surface) but AGAIN the trigger system did not release the core barrel (note: there were perfect weather conditions with Wind still, Sea State still, Air Temp 5°C).

11.30, contingency leave of the study area heading to Longyearbyen. During the transit the piston corer trigger system was tested to solve the problem resulting in bad functioning.

21.40, transit to the upper slope of the Isfjorden drift for acoustic (multibeam and SBP-Topas) acquisition over the night.

25 August 2021 (Wind SW 3, Sea State SW 3, Air Temp 4°C)

02.54 –04.23, acoustic acquisition on the upper continental slope of the Isfjorden drift.

04.23, transit to Site IRIDYA-01 for piston coring.

05.59 –08.02, first attempt of deployment of the piston corer assembled with a 12 m long barrel and trigger weight of 120 kg. The operation was interrupted due to the impossibility to extract the pin that secures the lock of the trigger system. Recovery onboard of the coring system to fix the problem.

08.38 –10.33, second deployment attempt of the piston corer. This time the trigger system was assembled with a lighter trigger weight (100 kg instead of 120 kg), and the security pin was replaced with a "*caviglia*". Deployment velocity 100 m/min down to 1719 m wd. Piston core LB21-3-IRIDYA-01PC was successfully performed!

12.42 –12.51, transfer to the starting point of the acoustic line IRIDYA-40 (multibeam and SBP-topas).

12.51, start of the acoustic line IRIDYA-40 along isobath 1400. Worsening of wind and sea state conditions: Wind SSW 6, Sea State SSW 4/5, Air Temp 4°C.

26 August 2021 (Wind SSW 7, Sea State SSW 6, Swell 5 m, Air Temp 4°C)

05.49, end of the acoustic acquisition and stop of the operation due to foreseen severe wind and sea wave conditions. Transit heading to the coast of Svalbard.

17.00, berthing in the Isfjorden. Wind WSW 5, Sea State WSW 3, Air Temp 4°C.

27 August 2021 (Wind NNE 3, Swell 2 m, Air Temp 4°C)

Berthing in the Isfjorden. Packing of the laboratory materials and preparation for the Leg-2.

28–29 August 2021

Attracted at Longyearbyen main dock for change of the scientific party.

LEG-2	**29/08 – 14/09/2021**

29 August 2021

20.00, departure from Longyearbyen heading Kongsfjorden. Beside of the PRA research projects, Leg-2 of the RV Laura Bassi Arctic expedition included other activities:

- The recovery of a Indian mooring sited in Kongsfjorden at 190 m wd, in front of the Research Station of Ny Alesund

- The deployment of mooring S1 that has a continuous monitoring record from 2012 (see also EUROFLEETS2_PREPARED project).

- and a CTD-cast mesoscale transect between mooring S1 and Spitsbergen (ending at 12 miles from the coast).

30 August 2021

10.00 –15.00, recovery of the Indian mooring in Kongsfjorden.

17.15, transfer from Ny Alesund to the Site IRIDYA-04 for piston coring.

31 August 2021

10.45, arrived at the Site IRIDYA-04.

11.00 –14.00, preparation and deployment of the piston corer with 15 m-long barrel and 100 kg trigger weight. Deployment velocity 100 m/min down to 1665 m wd. Piston core LB21-3-IRIDYA-04PC was successfully performed.

14.00 –15.37, extrusion of the plastic liner from the barrel and preparation of the multi corer.

15.37 –17.34, deployment of the multi corer with 10 core tubes. Deployment velocity 100 m/min. Recovery of 8 multi cores LB21-3-IRIDYA-04MC.

17.40, transfer to the mooring Site S1 offshore Bellsund.

01–02 September 2021

Maintenance and deployment of the mooring S1 (V. Kovacevic, M. Bensi, L. Langone, P. Giordano, P. Mansutti), and meso-scale CTD casts transect NE–SW oriented from Site S1 towards Spitsbergen.

Transfer to the operational area of the PRA project CASSANDRA, starting from Station 1 located on the parallel 75°N.

02 –14 September 2021

CASSANDRA project activity. We considered the possibility to deploy the multi-corer at 3 stations along the transect:

1- Start of the transect on the well known western margin of Svalbard (high sedimentation rate and soft sediments);

2- Mid way in the Greenland Sea at the maximum depth (nearly 4000 m);

3- End of the transect on the eastern margin of Greenland.

Possible problems about sites 2 and 3: lack of knowledge about the bathymetry and kind of seafloor (no time to run a topas survey). High probability to find stiff seafloor due to low sedimentation rate and/or presence of abundant IRD.

04/09/2021 at 7.00, deployment at the CASSANDRA Station 10 of the multi-corer assembled with 8 core tubes (deployment velocity 100 m/min, 2495 m wd). Successful recovery of 8 cores.

08/09/2021 at 9.24, deployment at the CASSANDRA Station 30 of the multi-corer assembled with 12 core tubes (deployment velocity 100 m/min, 3597 m wd). Successful recovery of 12 cores.

14 September 2021

10.12, the rough sea precluded the possibility to deploy the last multi-corer at the end of the 75°N oceanographic transect. The captain decided to stop any further operation and to start the transit back to Bergen.

15-16 September 2021

Arrival to Bergen and disembarkment

5- DATA ACQUISITION AND PRELIMINARY RESULTS

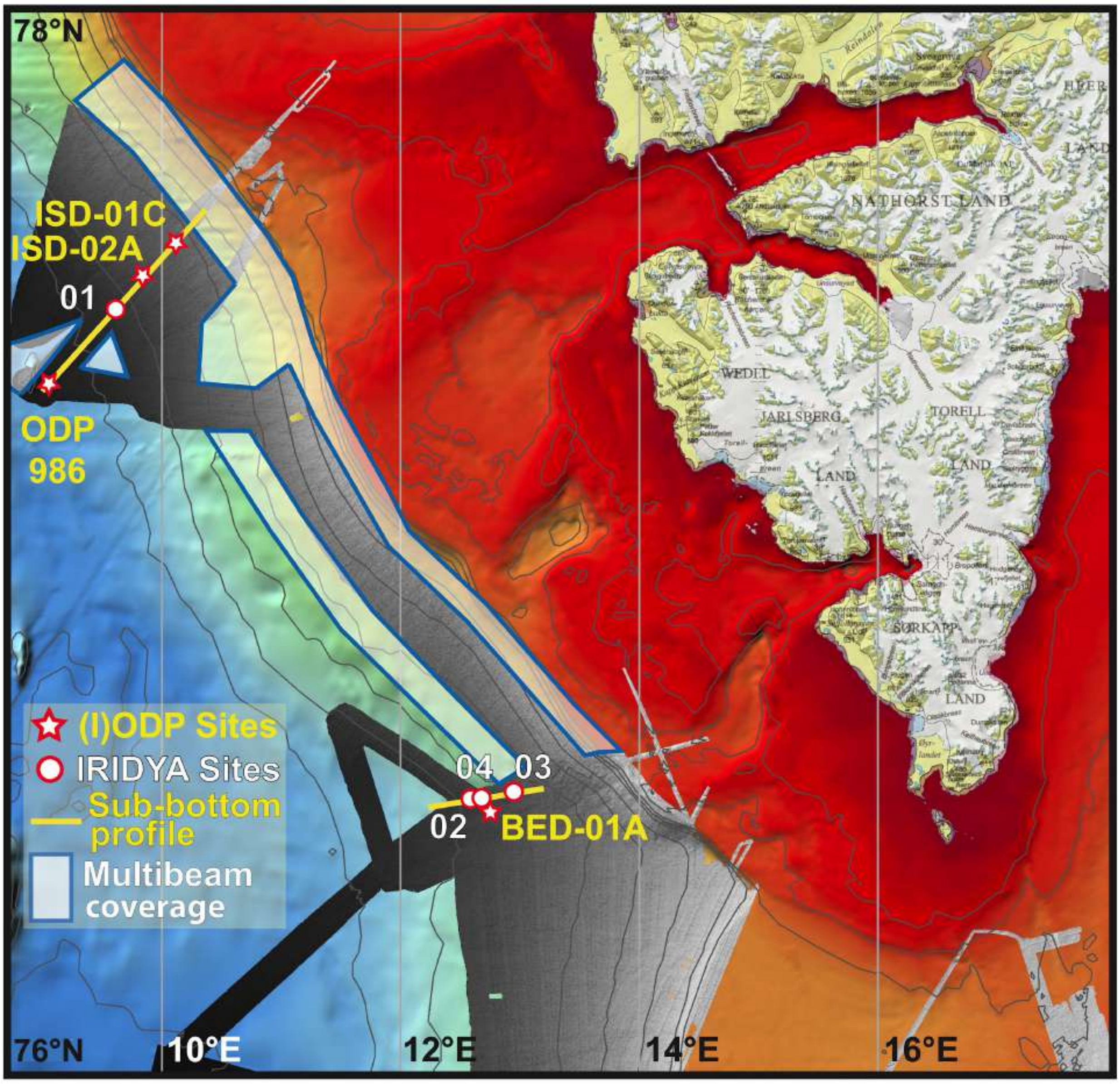


Figure 5. *Acquisition map of the project IRIDYA (details in legend).*

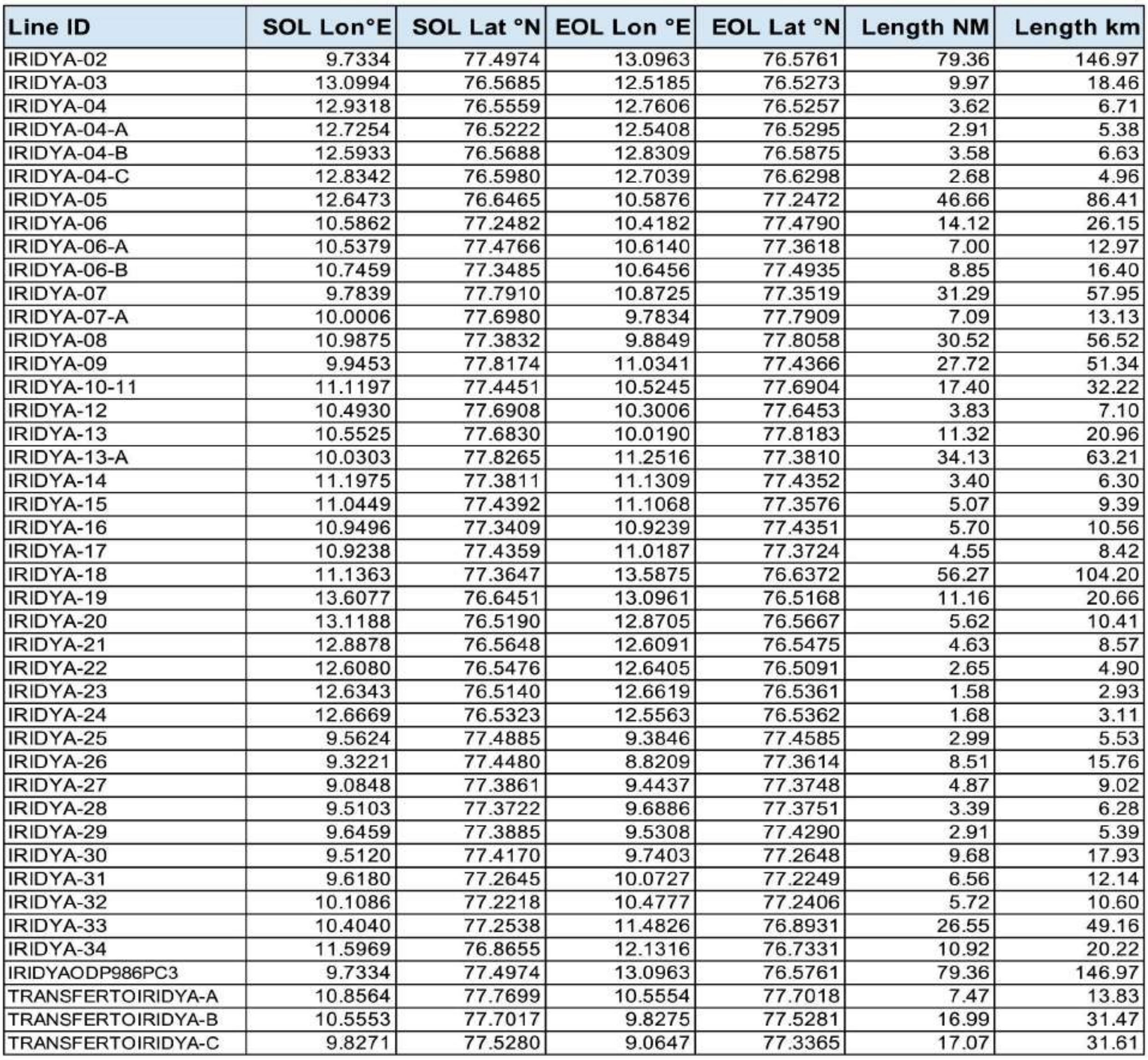
5.1 ACOUSTIC SURVEY

The acoustic survey included two sub-bottom (Topas) profiles acquired to link stratigraphically the sampled sites on the Isfjorden and Bellsund Drifts, and a multibeam survey to outline seabed structures associated with the glacial dynamics (e.g. presence of debris flows, gullies, channels and seafloor landslides), and to implement the International Bathymetric Chart of the Arctic Ocean (IBCAO, Jakobsson et al., 2020).

The bathymetry was acquired with a hull mounted multibeam echosounder Kongsberg EM-304 operating with 30 kHz frequency with lateral swat 5.5 times the water depth. Additional instrumental details are reported in the supplementary information. The new acquisition area covered about 3200 km^2 filling the upslope area at the edge with the continental shelf where bathymetric structures related to incipient melting of the paleo-ice-streams are more likely to occur, the distal area of the Isfjorden Drift (two uncovered sectors), and part of the mid-slope area located between the Isfjorden and Bellsund drifts (Fig. 5). The raw data will be processed at OGS with Qimera software.

The sub-bottom profiles (Tab. 1) were acquired with a keel mounted Konsgerg-Geoacoustic Topas PS18 working primarily with 15-21 KHz frequency and 3.5° beam width. Additional instrumental details are reported in the supplementary information. The acoustic data were regularly calibrated during the cruise using a Valeport miniSVP sound velocity profiler.

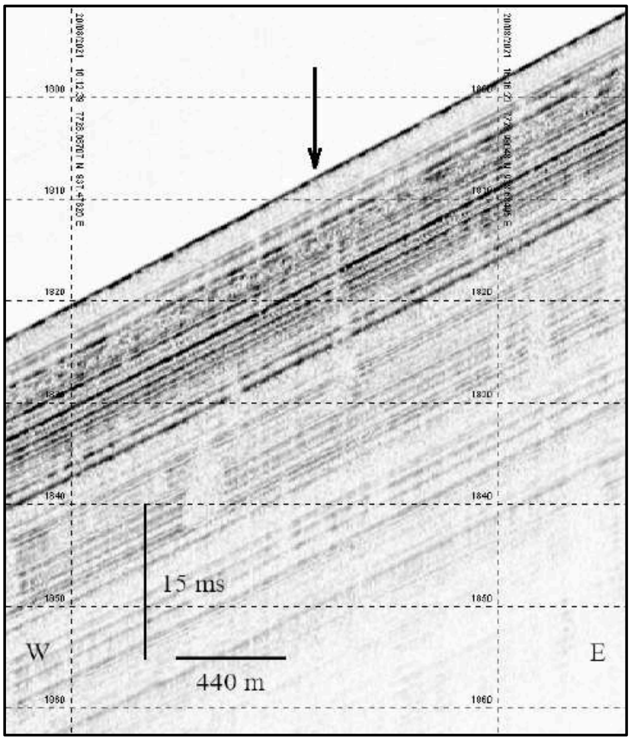
Table 1. *Sub-Bottom Profile (Topas) acquisition*



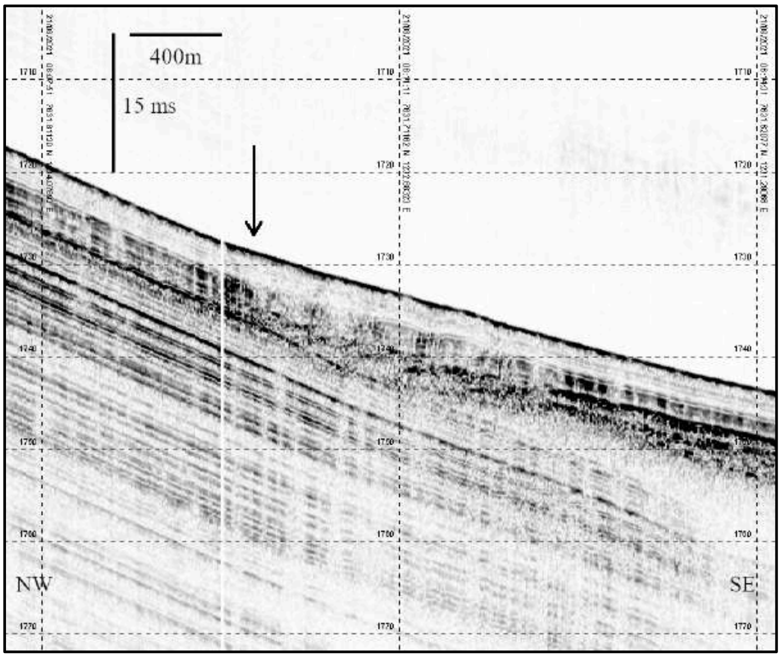
Line ID	SOL Lon°E	SOL Lat °N	EOL Lon °E	EOL Lat °N	Length NM	Length km
IRIDYA-02	9.7334	77.4974	13.0963	76.5761	79.36	146.97
IRIDYA-03	13.0994	76.5685	12.5185	76.5273	9.97	18.46
IRIDYA-04	12.9318	76.5559	12.7606	76.5257	3.62	6.71
IRIDYA-04-A	12.7254	76.5222	12.5408	76.5295	2.91	5.38
IRIDYA-04-B	12.5933	76.5688	12.8309	76.5875	3.58	6.63
IRIDYA-04-C	12.8342	76.5980	12.7039	76.6298	2.68	4.96
IRIDYA-05	12.6473	76.6465	10.5876	77.2472	46.66	86.41
IRIDYA-06	10.5862	77.2482	10.4182	77.4790	14.12	26.15
IRIDYA-06-A	10.5379	77.4766	10.6140	77.3618	7.00	12.97
IRIDYA-06-B	10.7459	77.3485	10.6456	77.4935	8.85	16.40
IRIDYA-07	9.7839	77.7910	10.8725	77.3519	31.29	57.95
IRIDYA-07-A	10.0006	77.6980	9.7834	77.7909	7.09	13.13
IRIDYA-08	10.9875	77.3832	9.8849	77.8058	30.52	56.52
IRIDYA-09	9.9453	77.8174	11.0341	77.4366	27.72	51.34
IRIDYA-10-11	11.1197	77.4451	10.5245	77.6904	17.40	32.22
IRIDYA-12	10.4930	77.6908	10.3006	77.6453	3.83	7.10
IRIDYA-13	10.5525	77.6830	10.0190	77.8183	11.32	20.96
IRIDYA-13-A	10.0303	77.8265	11.2516	77.3810	34.13	63.21
IRIDYA-14	11.1975	77.3811	11.1309	77.4352	3.40	6.30
IRIDYA-15	11.0449	77.4392	11.1068	77.3576	5.07	9.39
IRIDYA-16	10.9496	77.3409	10.9239	77.4351	5.70	10.56
IRIDYA-17	10.9238	77.4359	11.0187	77.3724	4.55	8.42
IRIDYA-18	11.1363	77.3647	13.5875	76.6372	56.27	104.20
IRIDYA-19	13.6077	76.6451	13.0961	76.5168	11.16	20.66
IRIDYA-20	13.1188	76.5190	12.8705	76.5667	5.62	10.41
IRIDYA-21	12.8878	76.5648	12.6091	76.5475	4.63	8.57
IRIDYA-22	12.6080	76.5476	12.6405	76.5091	2.65	4.90
IRIDYA-23	12.6343	76.5140	12.6619	76.5361	1.58	2.93
IRIDYA-24	12.6669	76.5323	12.5563	76.5362	1.68	3.11
IRIDYA-25	9.5624	77.4885	9.3846	77.4585	2.99	5.53
IRIDYA-26	9.3221	77.4480	8.8209	77.3614	8.51	15.76
IRIDYA-27	9.0848	77.3861	9.4437	77.3748	4.87	9.02
IRIDYA-28	9.5103	77.3722	9.6886	77.3751	3.39	6.28
IRIDYA-29	9.6459	77.3885	9.5308	77.4290	2.91	5.39
IRIDYA-30	9.5120	77.4170	9.7403	77.2648	9.68	17.93
IRIDYA-31	9.6180	77.2645	10.0727	77.2249	6.56	12.14
IRIDYA-32	10.1086	77.2218	10.4777	77.2406	5.72	10.60
IRIDYA-33	10.4040	77.2538	11.4826	76.8931	26.55	49.16
IRIDYA-34	11.5969	76.8655	12.1316	76.7331	10.92	20.22
IRIDYAODP986PC3	9.7334	77.4974	13.0963	76.5761	79.36	146.97
TRANSFERTOIRIDYA-A	10.8564	77.7699	10.5554	77.7018	7.47	13.83
TRANSFERTOIRIDYA-B	10.5553	77.7017	9.8275	77.5281	16.99	31.47
TRANSFERTOIRIDYA-C	9.8271	77.5280	9.0647	77.3365	17.07	31.61

Acoustic characterization of the depositional record at the sampling sites

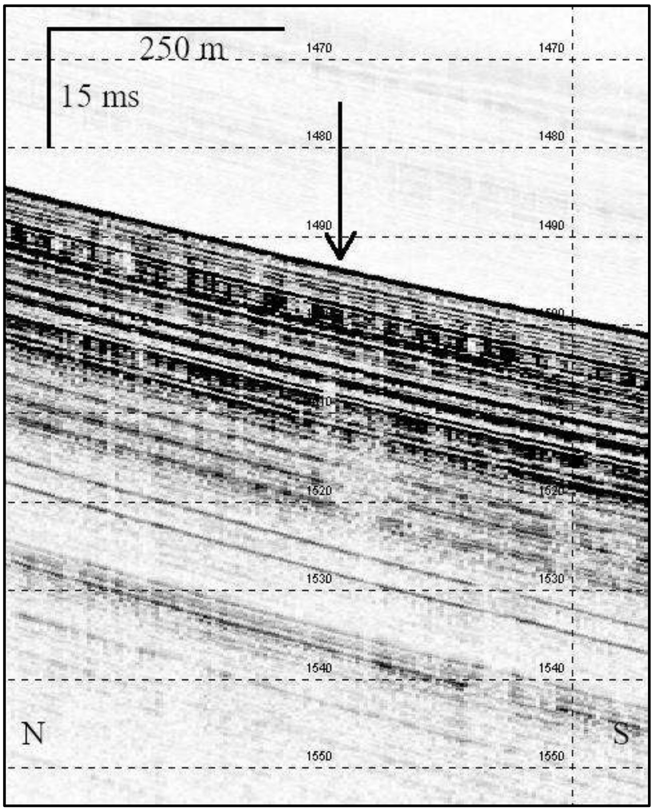
The sub-bottom profiles were primarily used to determine the best location for piston corer sediment sampling.



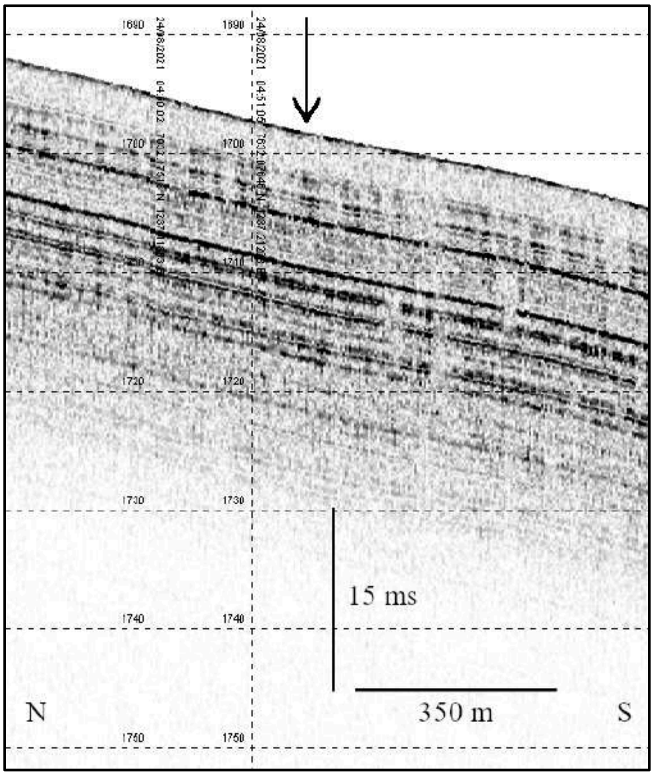
SITE IRIDYA-01 (IODP-985Full2 Site ISD-03A) This site is located on the Isfjorden Drift (Fig. 5). The sampling location is characterized by a consistent and laterally continuous presence of acoustically laminated sediments possibly associated with alternation of fine grained contourites and coarser grained sediments (sand/silt) originating from meltwater plumes and/or Ice Rafted Debris (IRD). At 5 ms depth there is a transparent layer containing chaotic reflections suggesting MTD (possibly Last Glacial Maximum, LGM). Low reflectivity, however, suggests the presence of soft deposits.



SITE IRIDYA-02 (IODP-985Full2 Site BED-02A) the location of this site was initially identified on the seismic record in order to avoid deeply located gravity mass deposits (not in figure). The sub-bottom images indicate the presence of generally stratified sediments with a large transparent deposit (MTD) located laterally to the coring site (possible LGM). The attempt of coring this site resulted in the bent of the core barrel over a black, stiff cobbly sand (fringe of the MTD).



SITE IRIDYA-03 (IODP-985Full2 Site BED-03A) is located on the Belsund Drift, SE and upslope with respect to site IDIDYA-02 (Fig. 5). Also this site is characterized by well stratified deposits with a possible coarse interval at about 5 ms. This site was sampled with the multi-corer only. Attempts of piston coring sampling failed by bad functioning of the trigger system that did not release the corer to free fall mode (see narrative).



SITE IRIDYA-04 is located upslope with respect to site IDIDYA-02 (Fig. 5) and it is characterized by well stratified sediments devoid of MTD. IRIDYA-04 can be considered as a new site for the proposal IODP-985 Full2 in replacement of site IRIDYA-02. The characteristics of the deeper part of the depositional sequence will be analysed on the seismic record available at OGS.

5.2 SEDIMENT SAMPLING

The sediment sampling was performed at each site by deploying both the multi-corer for undisturbed surface sediments, and the piston corer to recover the deeper (old) depositional sequence , with the only exception of Site IRIDYA-03 that was sampled with the multi-corer only due to technical problems and weather conditions that prevented the use of the Piston corer at this site. Table 2 and 3 report the coordinates, water depth and other useful information related to the sediment recovery at the 4 sampled sites.

MULTI CORES

The multi cores were performed with a OKTOPUS multi-corer allowing to collect up to 12 surface core samples. Detailed instrumental specifications are reported in the supplementary.

During the IRIDYA acquisition the multi-corer was usually assembled with 10 core tubes using both the original OKTOPUS and adapted core tubes. In the course of the Arctic expedition, however, we proved that the original tubes are much more performant allowing the 100% of sediment recovery (12 full tubes over 12 deployed). In order to recycle the original tubes the cores (maximum 40 cm long) were displaced into a 100 mm-diameter PVC tube using a core extruder. This operation should not cause relevant sediment disturbance (e.g. sediment compression) thanks to the short core length and the water saturated, soft characteristics of the surface sediments. Full cores were stored at + 4°C for: sedimentology and micropaleontological studies, and at -20°C for organic/inorganic pollutants investigation collaboration with the project PRA-CHANGE. At each site one full core was left for the archive. Further, at each core site 2 cores were routinely sliced at every 0.5 cm (upper 2 cm) and 1 cm (rest of the core length) and stored at -20°C for micropaleontological, geochemical, and microplastics analyses.

Table 2. *IRIDYA Multi-cores*

Multi core ID	Water Depth	Latitude Longitude	Deployed tube liners	Recovered cores	Total recovery
LB21-3-IRIDYA-01MC	1732 m	77° 29.83’N 09° 42.18’E	10	5	1.63 m
LB21-3-IRIDYA-02MC	1725 m	76° 31.74’N 12° 33.12’E	10	6	1.61 m
LB21-3-IRIDYA-03MC	1485 m	76° 33.33’N 12° 55.78’E	10	6	1.58 m
LB21-3-IRIDYA-04MC	1665 m	76° 32.02’N 12° 37.29’E	10	8	2.81 m

A total of 25 multi cores were collected during the IRIDYA acquisition for a total sediment recovery of 7.63 m (Tab. 2). Eight cores were fully sliced producing a total of 225 individual samples. The following tables report detailed information about the sediment characteristics of the recovered multi-cores and the analytical destination of the samples.

Polar Vessel Laura Bassi

Date 20/08/2021

Station IRIDYA-01 (IODP 985-Full2 Site ISD-03A) Lat. 77° 29.83'N

Core LB21-3-IRIDYA-01MC Long. 09° 42.18'E

Water depth (mbsl) 1732 Core length 27–40 cm, Total recovery 1.63 m

Sediment type at the surface: soft, brownish silty clay. Presence of benthic sessile organisms

Core	Length cm	Destination
1	40	Full core for sedimentology (R.G. Lucchi)
2	34	full core for archive (R.G. Lucchi)
3	32	Full core for organic/inorganic pollutants (M. Dal Core)
4	27	Sliced for micropaleontology (C. Morigi), 29 samples
5	30	Sliced for microplastics and geochemistry (R.G. Lucchi & C. Morigi), 32 samples

Note: Slicing @ 0.5 cm in the upper 2 cm, and @ 1 cm down to core bottom

Polar Vessel Laura Bassi

Date 21/08/2021

Station IRIDYA-02 (IODP 985-Full2 Site BED-02A) Lat. 76° 31.74'N

Core LB21-3-IRIDYA-02MC Long. 12° 33.12'E

Water depth (mbsl) 1725 Core length 17–34 cm, Total recovery 1.65 m

Sediment type at the surface: soft, brownish silty clay

Core	Length cm	Destination
1	31.5	Full core for sedimenntology (R.G. Lucchi)
2	34	lost sediments in the wet lab
3	x	full core for archive (R.G. Lucchi)
4	23	Full core for organic/inorganic pollutants (M. Dal Core)
5	25	Sliced for micropaleontology (C. Morigi), 27 samples
6	17	Sliced for microplastics and geochemistry (R.G. Lucchi & C. Morigi), 19 samples

Note: Slicing @ 0.5 cm in the upper 2 cm, and @ 1 cm down to core bottom

Polar Vessel Laura Bassi

Date 21/08/2021

Station IRIDYA-03 (IODP 985-Full2 Site BED-03A) Lat. 76° 33.33'N

Core LB21-3-IRIDYA-03MC Long. 12° 55.78'E

Water depth (mbsl) 1485 Core length 24–30 cm, Total recovery 1.58 m

Sediment type at the surface: soft, brownish silty clay

Core	Length cm	Destination
1	30	Full core for sedimenntology (R.G. Lucchi)
2	26	full core for archive (R.G. Lucchi)
3	24.5	extra full core for archive (R.G. Lucchi)
4	24	Full core for organic/inorganic pollutants (M. Dal Core)
5	27	Sliced for micropaleontology (C. Morigi), 29 samples
6	26	Sliced for microplastics and geochemistry (R.G. Lucchi & C. Morigi), 28 samples

Note: Slicing @ 0.5 cm in the upper 2 cm, and @ 1 cm down to core bottom

Polar Vessel Laura Bassi

Date 31/08/2021

Station IRIDYA-04 (IODP 985-Full2 NEW Site BED-02A) Lat. 76° 32.02 N

Core LB21-3-IRIDYA-04MC Long. 12° 37.29 E

Water depth (mbsl) 1665 Core length 27–37 cm, Total recovery 2.81 m

Sediment type at the surface: soft, brownish silty clay

Core	Length cm	Destination
1	31	Full core for sedimenntology (R.G. Lucchi)
2	27.5	full core for archive (R.G. Lucchi)
3	28	full core for microfossils (C Morigi)
4	28	extra full core for archive (R.G. Lucchi)
5	29.5	extra full core for archive (R.G. Lucchi)
6	25.5	extra full core for archive (R.G. Lucchi)
7	27	extra full core for archive (R.G. Lucchi)
8	27	extra full core for archive (R.G. Lucchi)
9	29	Sliced for micropaleontology (C. Morigi) 31 samples
10	28	Sliced for microplastics and geochemistry (R.G. Lucchi & C. Morigi) 30 samples

Note: Slicing @ 0.5 cm in the upper 2 cm, and @ 1 cm down to core bottom

PISTON CORES

Piston cores were collected at 3 sites using a OSIL Standard Piston Corer deployed with a head weight of 250 kg, a pilot trigger weight of 120 kg, and a variable barrel length of 12 and 15 m. Table 3 reports the coordinates and sampling depth of the cored sites, whereas additional technical details on the OSIL piston corer are reported in the supplementary information.

Table 3. *IRIDYA Piston cores*

Piston core ID	Water Depth	Latitude Longitude	Length core barrel	Sediment recovery	Number of sections
LB21-3-IRIDYA-01PC	1719 m	77° 28.84’N 09° 42.22’E	12 m	8.37 m	9
LB21-3-IRIDYA-02PC	1724 m	76° 31.75’N 12° 33.17’E	15 m	4.99 m	5
LB21-3-IRIDYA-04PC	1665 m	76° 32.03’N 12° 37.25’E	15 m	7.30 m	8

At the corer retrieval, the plastic liners were cut into 1 m long sections labelled alphabetically from bottom to top on the removal from the barrel and then reconverted into a numerical sequence with the first section located at the top (seabed surface) following the standard international methodology. Top section’s caps were also labelled.

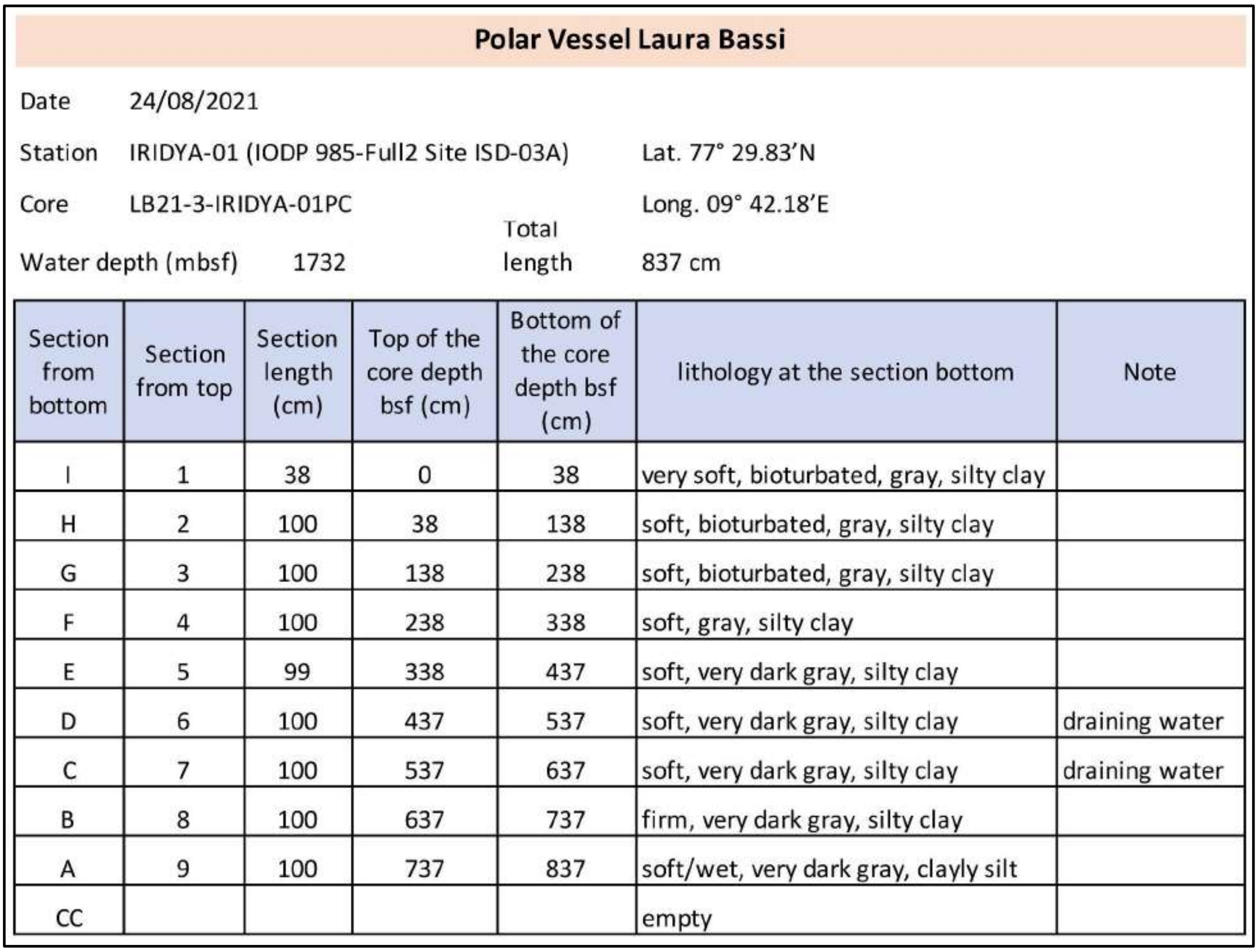
Piston corer setting and coring operation

During the IRIDYA project acquisition the deployment of the coring system required a number of technical adjustments to facilitate the operation and to improve the security during the corer assemblage, its swinging offboard to the vertical position, and its deployment for coring. With the present configuration, the trigger arm is connected to the corer head while the corer is held horizontally on the swinging system, whereas the trigger weight is connected to the trigger arm at the time the coring system is vertical, hanging offboard. In order to prevent the piston from rising along the barrel during the coring system deployment, the piston was fixed to the core catcher by means of rope.

The OSIL piston is a two-section assembly which is designed to separate during operation under heavy loads (e.g. stuck piston or strong vacuum below the piston). In such cases, water flows from above the piston into a central chamber of the piston through a ring of adjustable valves that controls the separation of the two sections. This occurred during 2 coring operations: at IRIDYA Site -02 and -04. The former possibly occurred during the barrel bending, whereas the reason for the piston detachment at Site -04 is still to be investigated. In the latter case, the piston was found at about 1 m above the sediments with lots of sea water trapped between the piston and the sediments generating strong sediment disturbance (wash out of the sediments). In general, however, the little sediment recovery during the IRIDYA acquisition (about 50% or less) suggests the present coring configuration still needs some adjustments in order to improve the sediment recovery and to reduce sediment disturbance.

The total sediment length recovered by piston coring at the 3 sites was of 20.65 m corresponding to a sediment recovery of 49% of the potential total length.

The following tables report detailed information about core site location, sections length, and the sediment characteristics observed at the section’s end.



Polar Vessel Laura Bassi

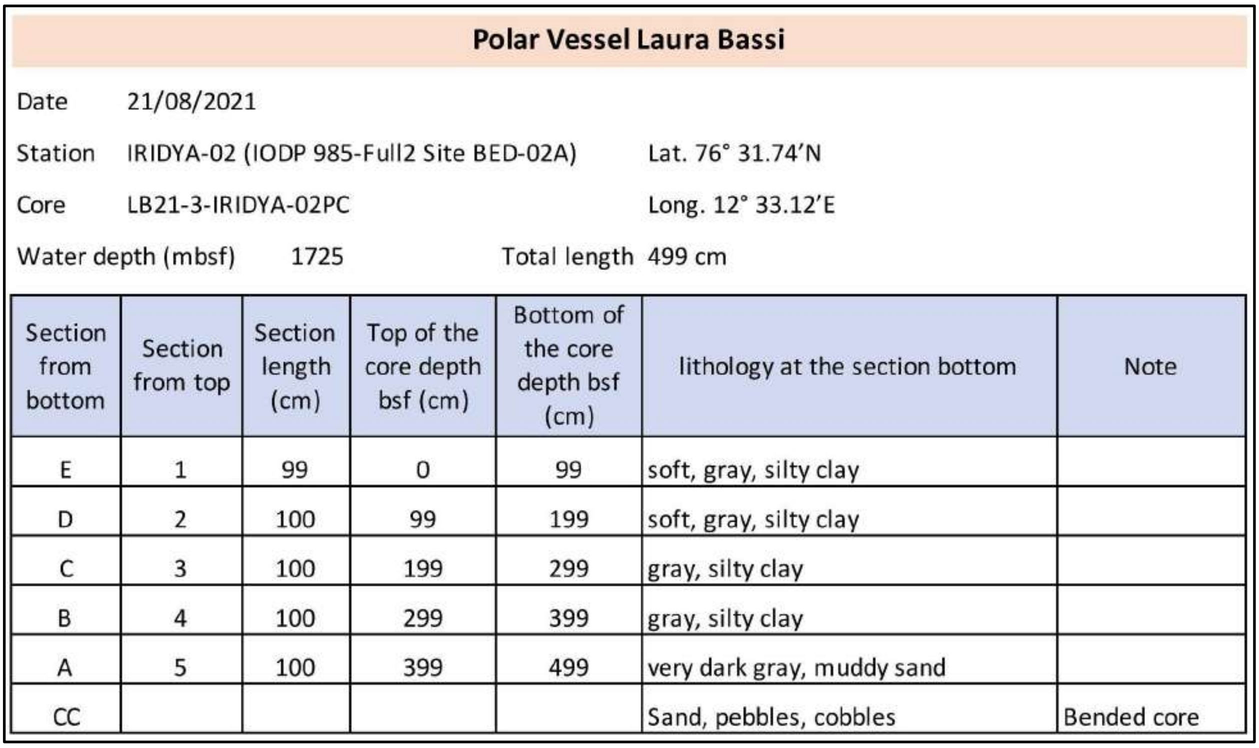
Date 24/08/2021

Station IRIDYA-01 (IODP 985-Full2 Site ISD-03A) Lat. 77° 29.83’N

Core LB21-3-IRIDYA-01PC Long. 09° 42.18’E

Water depth (mbsf) 1732 Total length 837 cm

Section from bottom	Section from top	Section length (cm)	Top of the core depth bsf (cm)	Bottom of the core depth bsf (cm)	lithology at the section bottom	Note
I	1	38	0	38	very soft, bioturbated, gray, silty clay	
H	2	100	38	138	soft, bioturbated, gray, silty clay	
G	3	100	138	238	soft, bioturbated, gray, silty clay	
F	4	100	238	338	soft, gray, silty clay	
E	5	99	338	437	soft, very dark gray, silty clay	
D	6	100	437	537	soft, very dark gray, silty clay	draining water
C	7	100	537	637	soft, very dark gray, silty clay	draining water
B	8	100	637	737	firm, very dark gray, silty clay	
A	9	100	737	837	soft/wet, very dark gray, claly silt	
CC					empty	



Polar Vessel Laura Bassi

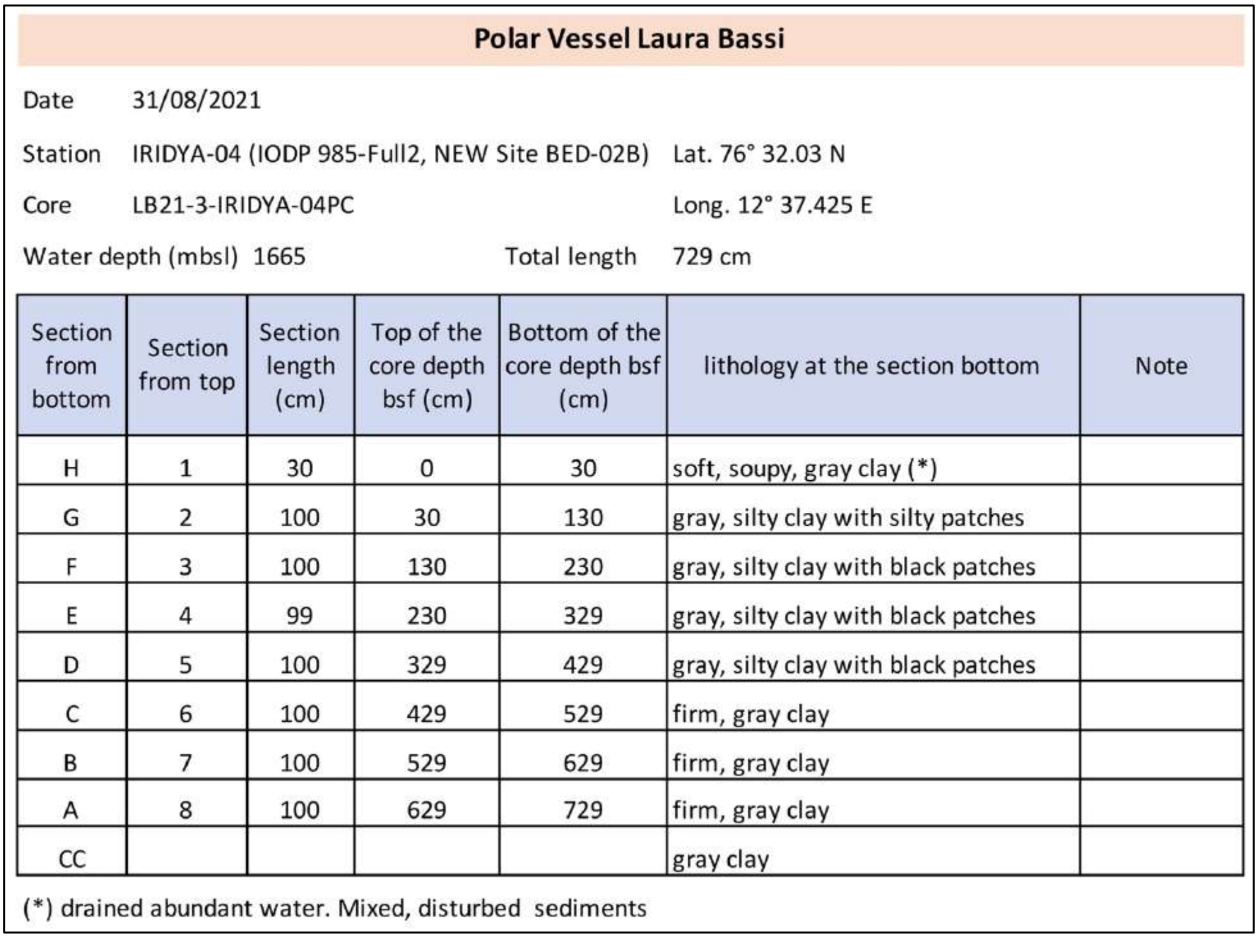
Date 21/08/2021

Station IRIDYA-02 (IODP 985-Full2 Site BED-02A) Lat. 76° 31.74'N

Core LB21-3-IRIDYA-02PC Long. 12° 33.12'E

Water depth (mbsf) 1725 Total length 499 cm

Section from bottom	Section from top	Section length (cm)	Top of the core depth bsf (cm)	Bottom of the core depth bsf (cm)	lithology at the section bottom	Note
E	1	99	0	99	soft, gray, silty clay	
D	2	100	99	199	soft, gray, silty clay	
C	3	100	199	299	gray, silty clay	
B	4	100	299	399	gray, silty clay	
A	5	100	399	499	very dark gray, muddy sand	
CC					Sand, pebbles, cobbles	Bended core



Polar Vessel Laura Bassi

Date 31/08/2021

Station IRIDYA-04 (IODP 985-Full2, NEW Site BED-02B) Lat. 76° 32.03 N

Core LB21-3-IRIDYA-04PC Long. 12° 37.425 E

Water depth (mbsl) 1665 Total length 729 cm

Section from bottom	Section from top	Section length (cm)	Top of the core depth bsf (cm)	Bottom of the core depth bsf (cm)	lithology at the section bottom	Note
H	1	30	0	30	soft, soupy, gray clay (*)	
G	2	100	30	130	gray, silty clay with silty patches	
F	3	100	130	230	gray, silty clay with black patches	
E	4	99	230	329	gray, silty clay with black patches	
D	5	100	329	429	gray, silty clay with black patches	
C	6	100	429	529	firm, gray clay	
B	7	100	529	629	firm, gray clay	
A	8	100	629	729	firm, gray clay	
CC					gray clay	

(*) drained abundant water. Mixed, disturbed sediments

6- COLLABORATIONS

In the course of the 2021 Arctic expedition of the Polar Vessel Laura Bassi, some collaborations were agreed between the PRA projects IRIDYA – CHANGE and IRIDYA – CASSANDRA. In particular, the participants of the project CHANGE will analyse some of the multi-cores collected along the western side of Svalbard looking for inorganic and organic pollutants that in this area can be transported by the warm North Atlantic Current beside being released locally by human activity. At the same time, IRIDYA will contribute to the CASSANDRA project with the paleoceanographic and paleoclimatic reconstruction of the recent and modern depositional record collected along the 75°N at the two sites indicated in Figure 6. The results will be compared with the present day characteristics of the oceanic water masses measured during the CASSANDRA data acquisition,

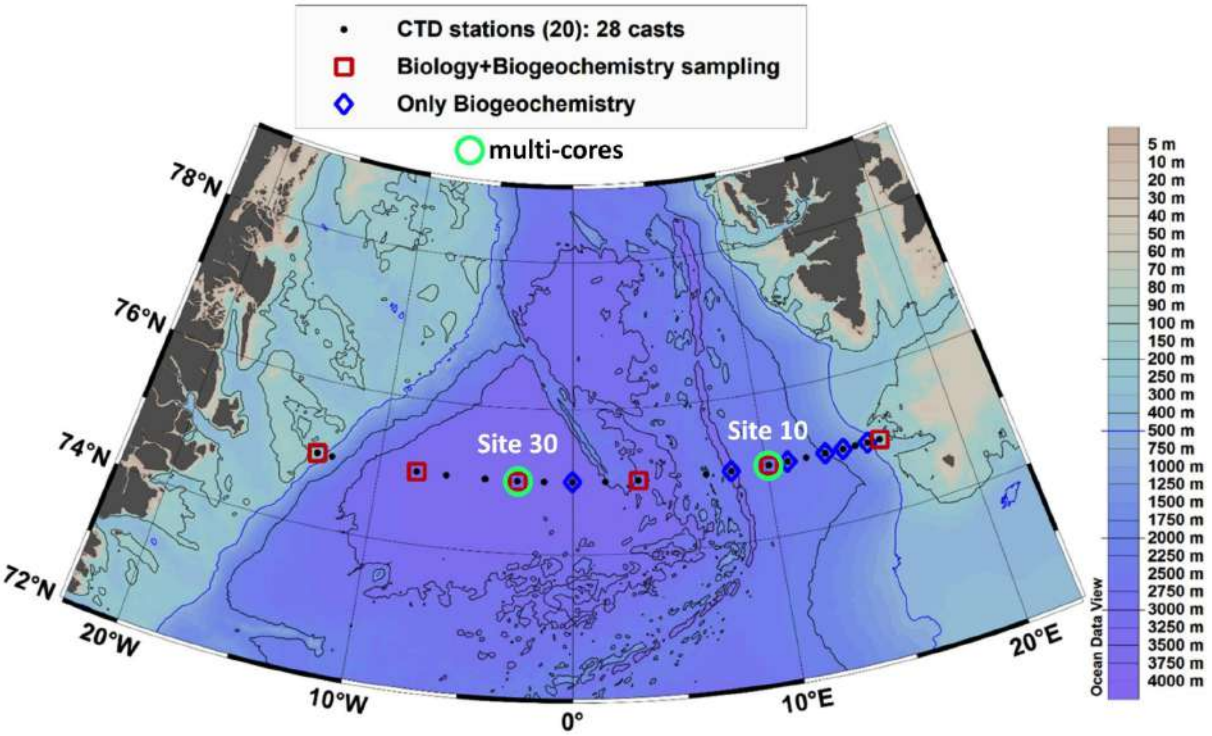
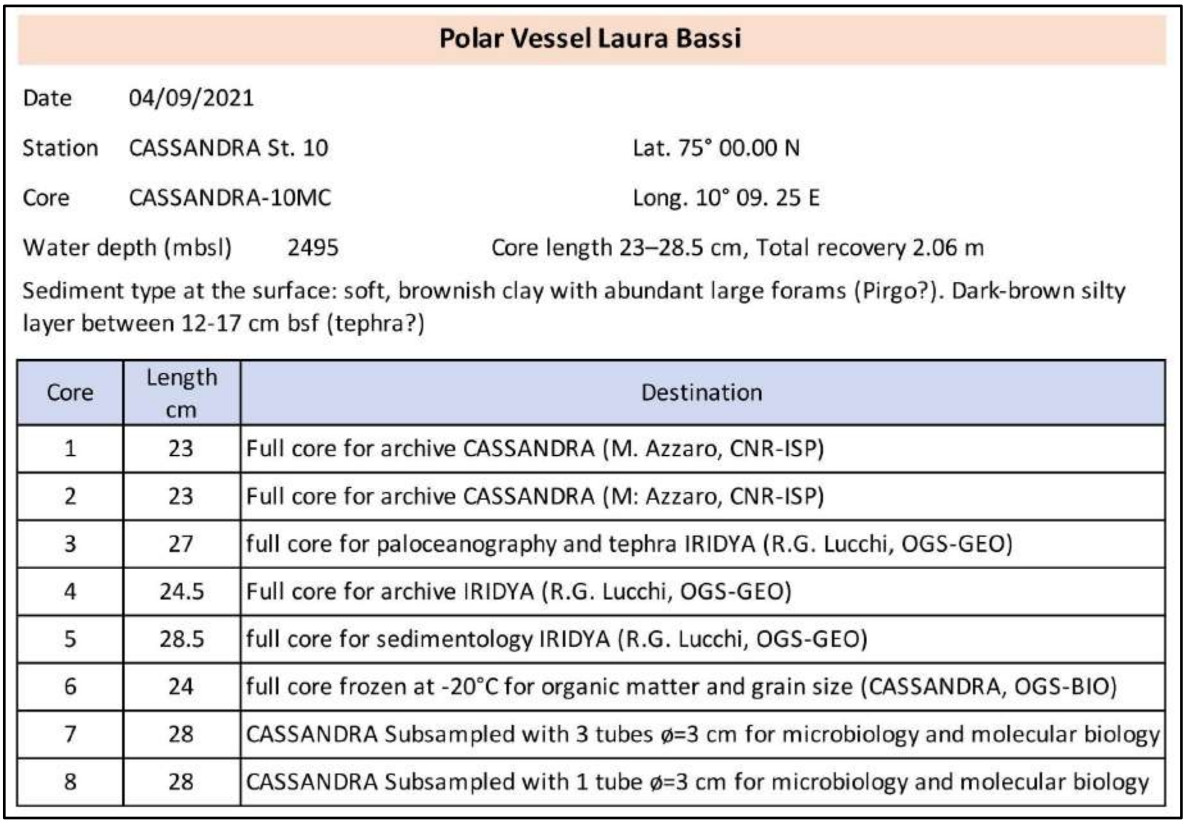


Figure 6. *Study area of the project CASSANDRA with indicated the sites of multi-coring*

During the CASSANDRA project the multi-corer was assembled with 8 and 12 core tubes down to a maximum water depth of 3800 m, with the 100% of sediment recovery.

Detailed information on the multicores location, sediment recovery and samples destination for analyses are reported in the following tables:



Polar Vessel Laura Bassi

Date 04/09/2021

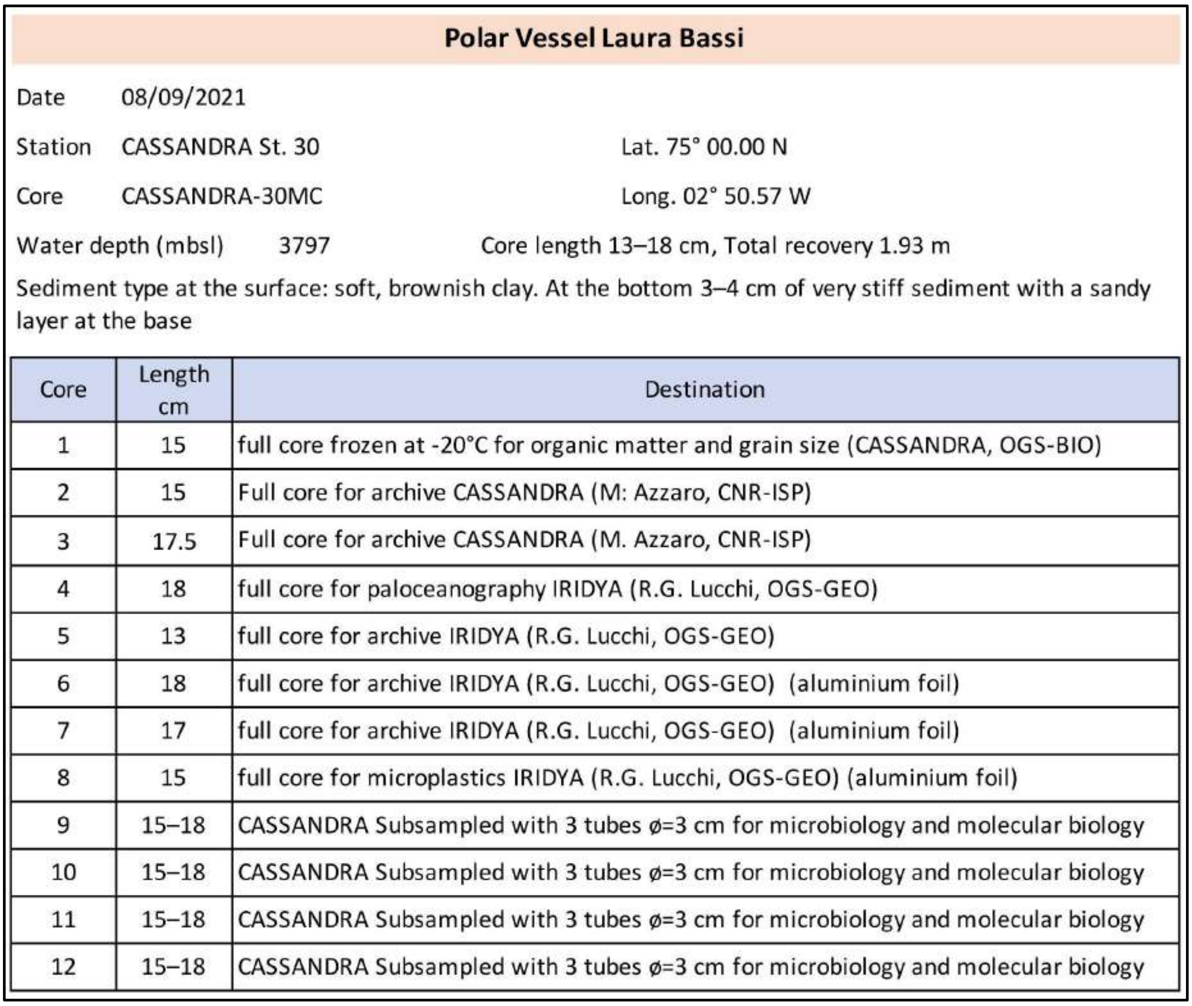
Station CASSANDRA St. 10 Lat. 75° 00.00 N

Core CASSANDRA-10MC Long. 10° 09. 25 E

Water depth (mbsl) 2495 Core length 23–28.5 cm, Total recovery 2.06 m

Sediment type at the surface: soft, brownish clay with abundant large forams (Pirgo?). Dark-brown silty layer between 12-17 cm bsf (tephra?)

Core	Length cm	Destination
1	23	Full core for archive CASSANDRA (M. Azzaro, CNR-ISP)
2	23	Full core for archive CASSANDRA (M: Azzaro, CNR-ISP)
3	27	full core for paloceanography and tephra IRIDYA (R.G. Lucchi, OGS-GEO)
4	24.5	Full core for archive IRIDYA (R.G. Lucchi, OGS-GEO)
5	28.5	full core for sedimentology IRIDYA (R.G. Lucchi, OGS-GEO)
6	24	full core frozen at -20°C for organic matter and grain size (CASSANDRA, OGS-BIO)
7	28	CASSANDRA Subsampled with 3 tubes ø=3 cm for microbiology and molecular biology
8	28	CASSANDRA Subsampled with 1 tube ø=3 cm for microbiology and molecular biology



Polar Vessel Laura Bassi

Date 08/09/2021

Station CASSANDRA St. 30 Lat. 75° 00.00 N

Core CASSANDRA-30MC Long. 02° 50.57 W

Water depth (mbsl) 3797 Core length 13–18 cm, Total recovery 1.93 m

Sediment type at the surface: soft, brownish clay. At the bottom 3–4 cm of very stiff sediment with a sandy layer at the base

Core	Length cm	Destination
1	15	full core frozen at -20°C for organic matter and grain size (CASSANDRA, OGS-BIO)
2	15	Full core for archive CASSANDRA (M: Azzaro, CNR-ISP)
3	17.5	Full core for archive CASSANDRA (M. Azzaro, CNR-ISP)
4	18	full core for paloceanography IRIDYA (R.G. Lucchi, OGS-GEO)
5	13	full core for archive IRIDYA (R.G. Lucchi, OGS-GEO)
6	18	full core for archive IRIDYA (R.G. Lucchi, OGS-GEO) (aluminium foil)
7	17	full core for archive IRIDYA (R.G. Lucchi, OGS-GEO) (aluminium foil)
8	15	full core for microplastics IRIDYA (R.G. Lucchi, OGS-GEO) (aluminium foil)
9	15–18	CASSANDRA Subsampled with 3 tubes ø=3 cm for microbiology and molecular biology
10	15–18	CASSANDRA Subsampled with 3 tubes ø=3 cm for microbiology and molecular biology
11	15–18	CASSANDRA Subsampled with 3 tubes ø=3 cm for microbiology and molecular biology
12	15–18	CASSANDRA Subsampled with 3 tubes ø=3 cm for microbiology and molecular biology

7- ACKNOWLEDGEMENTS

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9- SUPPLEMENTARY INFORMATION

(A) LOGBOOK

Geodetic Parameters:
SYSTEM: WGS 84 - UTM Zone 33N

ELLIPSOID: WGS84
Semi-Major Axis:6378137
Inv. Flattening:298.2572235693
Squared eccentricity:0.00669437999
DATUM TRANSFORMATION: No Datum transformation on: WGS84
Datum Transformation from WGS84:
Method: Bursa/Wolfe(7 Parameters)
Shift X(m): 0
Shift Y(m): 0
Shift Z(m): 0
Rotation X(sec): 0
Rotation Y(sec): 0
Rotation Z(sec): 0
Scale factor[ppm]: 0
Prime meridian sh(deg): 0
Satellite ellipsoid: WGS84
Local ellipsoid: WGS84
Description:
UNIT: Meters
Metric Conversion Factor:1
Suffix: m
PROJECTION: UTM Zone-33N
Method: Universal Transverse Mercator
Unit: Meters
Longitude of the Central Meridian:015°00'00.0000000"E
Latitude of Origin:000°00'00.0000000"N
False Easting:500000
False Northing:0
Scale Factor at the Central Meridian:0.99960
Grid Skew:0
UTM-Zone: Zone 33 (15 E)
Hemisphere: Northern
TIME: UTC

20/08/2021

6:00 In area del progetto IRIDYA
WIND NW 4
SEA STATE NW 3
AIR TEMP 3°C
06:16 **SOL** IRIDYA001.C.L HDG 226 Lat 77°45.66'N Long 10°48.84'E
SBP (Topas) file: Transfer2IRIDYA001_000
PDS2000 file: Laura Bassi-Multi-purpose survey-IRIDYA001.C.L-20210820-061645.pds
EM304 file : 0058_20210820_060925
10:00 WIND NNW 4
SEA STATE NNW 3
SWELL 2m

11:32	**EOL** IRIDYA001.C.L	HDG 226	Lat 77°20.27'N Long 09°04.16'E
	SBP (Topas) file: Transfer2IRIDYA001_017		
	PDS2000 file: Laura Bassi-Multi-purpose survey-IRIDYA001.C.L-20210820-1132405.pds		
	EM304 file : 0076_20210820_112203		
11:47	Inizio MMO in WD 2070m		Lat 77°19.52'N Long 09°01.68'E
12:04	SVP_IRIDYA_001 in acqua WD 2075		Lat 77°19.49'N. Long 09°01.33'E
13:05	SVP_IRIDYA_001 sul fondo (1300m cavo filato) WD 2075m		Lat 77°19.43'N Long 09°00.94'E
14.04	SVP_IRIDYA_001 onboard		
14.06	MMO Avvistamento Cetacei Poppa via (Sguazzi=Spruzzi)		
14:14	**SOL** IRIDYA001.C.L da ODP986 a IRIDYA01MC	HDG 46	Lat 77°19.80'N Long 09°02.48'E
	Topas: Modalità Multiping		
	SBP (Topas) file: IRIDYAODP986PC3_000		
	PDS2000 file: Laura Bassi-Multi-purpose survey-IRIDYA001.C.L-20210820-141422.pds		
	EM304 file: 0086_20210820_ 141227		
	Linea abortita per eccesso rumore dovuto a multiping topas		
14.51	MMO Avvistamento Cetacei Soffio 2-3 miglia		
15:30	Fine Turno MMO		
16:31	**EOL** IRIDYA001.C.L ODP986 a IRI01_MC (runout sul punto di 300m)		Lat 77°29.98'N Long 09°42.72'E
	SBP (Topas) file: IRIDYAODP986PC3_005		
	PDS2000 file: Laura Bassi-Multi-purpose survey-IRIDYA001.C.L-20210820-141422.pds		
	EM304 file: --- acquisizione per eccesso rumore dovuto a multiping topas		
16:48	Preparazione MCorer **IRIDYA-01MC**		
16:52	MCorer **IRIDYA-01MC** in acqua WD 1732m		Lat 77°29.83'N Long 09°42.17'E
16:54	Inizio calata WD 1732m		Lat 77°29.83'N. Long 09°42.18'E
	Velocità calata 90m/minuto		
17:30	MCorer **IRIDYA-01MC** sul fondo WD 1732m		Lat 77°29.83'N Long 09°42.06'E
18:00	WIND N 3		
	SEA STATE N 3		
	SWELL 1m		
	AIR TEMP 5°C		
18:33	MCorer **IRIDYA-01MC** a bordo		
18:40	**SOL** linea TransittoIRIPC1_0.C.L-20210820-184036		
	EM304		
	TOPAS	HDG 114	Lat 77°29.88'N. Long 09°43.65'E
20:54	**EOL** TransittoIRIPC1_1.C.L-20210820- 200342		
	SOL transittoIRIPC1_2C.L-20210820- 205331	HDG 180	
	Em304 0096-20210820-205416		Lat 77°26.91'N. Long 10°21.06'E
22:13	EOL TransittoIRIPC1_2.C.L-20210820- 212242		
	SOL transit2IRIPC1_3C.L-20210820- 221412	HDG 103	
	Em304 0096-20210820-205416		Lat 77°14.57'N. Long 10°42.82'E

21/08/2021

00:37	**EOL** transit2IRIPC1_3C.L-20210821-001422		
	SOL transit2IRIPC1_4C.L-20210821- 003704	HDG 139	Lat 76°57.78'N Long 11°28.40'E
04:48	**EOL** transit2IRIPC1_4C.L-20210821- 014108		
	EOL Topas line Iridya002-20210821- 020	HDG 255	
	Em304 0120-20210821-043422		
04:53	**SOL** UserLine(1).C.L-20210821-045332		
	SOL Topas line Iridya003-20210821- 001	HDG 256	Lat 76°34.06'N Long 13°06.91'E
6:00	WIND NW 2		
	SEA STATE NW 2		
	SWELL 1m		
	AIR TEMP 5°C		
06:15	**EOL** userline(1).C.L-20210821- 045332	HDG 256	
	EOL Topas line Iridya003-20210821- 003		Lat 76°31.6'N Long 12°31.37'E
06:30	Preparazione MCorer **IRIDYA-02MC**		
06:40	MCorer **IRIDYA-02MC** in acqua WD 1723m		

06:41	Inizio calata	WD 1728m		Lat 76°31.74’N Long 12°33.11’E
	Velocità calata 90m/minuto			
07:20	MCorer **IRIDYA-02MC** sul fondo	WD 1725m		Lat 76°31.74’N Long 12°33.12’E
08:07	MCorer **IRIDYA-02MC** a bordo			
10:59	Start turno osservazione MMO			Lat 76°31.72'N Long 12°33.13'E
11:05	PCorer **IRIDYA-02PC** in acqua	WD 1724 m		
11:54	PCorer **IRIDYA-02PC** inizio calata			
	Velocità calata 90m/minuto	WD 1729 m		Lat 76°31.75’N Long 12°33.19’E
12:37	PCorer **IRIDYA-02PC** bottom	WD 1724 m		Lat 76°31.75’N Long 12°33.17’E
14:08	PCorer **IRIDYA-02PC** a bordo si presenta piegato a banana			
15:22	Fine Turno MMO			
15:23	**SOL**: Inzio transito verso SITO 03 UserLine(1).C.L-20210821-152557. HDG 75			
	Em304 0122-20210821-152337			Lat 76°32.01’N Long 12°36.82’E
	TOPAS			
16:50	Preparazione MCorer **IRIDYA-03MC**			
16:56	MCorer **IRIDYA-03MC** in acqua	WD 1488m		Lat 76°33.32'N Long 12°55.80'E
16:54	Inizio calata	WD 1488m		Lat 76°33.32'N Long 12°55.80'E
	Velocità calata 90m/minuto			
17:32	MCorer **IRIDYA-03MC** sul fondo	WD 1485m		Lat 76°33.33'N Long 12°55.78'E
18:00	WIND calma			
	SEA STATE SWELL 1m			
	AIR TEMP 6°C			
18:33	MCorer **IRIDYA-03MC** a bordo			
18:30	**SOL** linea IRIDYA04.C.L-20210821-183010			
	EM304 0132_20210821_182451			
	TOPAS IRIDYA-4		HDG235	Lat 76°33.45'N Long 12°56.51'E
19:24	**SOL** linea IRIDYA05.C.L-20210821-192442			
	EM304 0134_20210821_182451			
	TOPAS IRIDYA-4		HDG281	Lat 76°31.24'N Long 12°45.71'E
20:08	**SOL** linea IRIDYA06.C.L-20210821-200822			
	EM304 0132:_20210821_200451			
	TOPAS IRIDYA-4		HDG73	Lat 76°34.12'N Long 12°35.50'E
21:17	**SOL** linea IRIDYA07.C.L-20210821-211723			
	EM304 0132_20210821_210451			
	TOPAS IRIDYA-4		HDG318	Lat 76°35.52'N Long 12°51.50'E

22/08/2021

0:00	in acquisizione MBEs e Topas		
	PDS200 line IRIDYA07.C.L-20210821-235240	HDG 319	Lat 76°48.82’N Long 11°57.64’E
1:43	**EOL** IRIDYA07.C.L-20210822-235240	HDG 319	Lat 76°57.02’N Long 11°23.90’E
	SOL IRIDYA08.C.L-20210822-014340	HDG 331	
	EM304 0154_20210822_014451		
	ToPAS IRIDYA05_009-0147		
04:43	**EOL** IRIDYA08.C.L-20210822-035343(2)	HDG 331	Lat 77°14.92'N Long 10°35.22'E
	SOL IRIDYA09.C.L-20210822-044226	HDG 358	
	EM304 0163_20210822_044451		
	TOPAS IRIDYA06_001-0443		
6:00	WIND ESE 3		
	SEA STATE ESE 2		
	AIR TEMP 4°C		
06:20	Inizio turno MMO (Davide)		
06:30	**EOL** IRIDYA.C.L-20210822-060420(2)	HDG 358	
	SOL IRIDYA.C.L-20210822-062505	HDG 176	Lat 77°29.13’N Long 10°327.09’E

	EM304 067_20210822_060451		
08:25	**EOL** IRIDYA10.C.L-20210822-062505.	HDG 176	Lat 77°20.63'N Long 10°37.50'E
	SOL IRIDYA11.C.L-20210822-082408	HDG 355	Lat 77°21.47'N Long 10°44.38'E
9:57	Interruzione acquisizione Topas		
10:09	**EOL** IRIDYA11.C.L-20210822-095613	HDG 355	Lat 77°30.99'N Long 10°37.76'E
	SOL IRIDYA12.C.L-20210822-100900	HDG 325	
	EM304 0179_20210822_100451		
10:12	**crash realtime acquisizione**		
	EOL IRIDYA12.C.L-20210822-100900	HDG 325	
10:15	riavviato realtime		
10:18	**SOL** IRIDYA12.C.L-20210822-101848	HDG 326	Lat 77°32.52'N Long 10°34.68'E
12:00	Inizio osservazione MMO		
12:06	Termine test Topas e riavvio del sistema file IRIDYA7.000		
12:27	Branco di Lagenorinchi (dal rostro bianco) ore 11 da imbarcazione		
12:51	**EOL** IRIDYA12.C.L-20210822-124303	HDG 355	Lat 77°45.92'N Long 09°44.57'E
	SOL IRIDYA13.C.L-20210822-125345	HDG 145	
	EM304 189_20210822_130949		
15:41	**EOL** IRIDYA13.C.L-20210822-132734	HDG 145	Lat 77°47.03'N Long 09°48.85'E
	SOL IRIDYA14.C.L-20210822-154145	HDG 174	Lat 77°33.02'N Long 10°42.22'E
15:31	Fine Turno MMO		
17:33	**EOL** IRIDYA14.C.L-20210822-173222	HDG 174	
	SOL IRIDYA15.C.L-20210822-173310	HDG 353	Lat 77°21.10'N Long 10°55.20'E
17:44	**Crash SVP su SIS persa parte di acquisizione MBEMS 304**		
18:00	WIND SE 5		
	SEA STATE SE 4		
	AIR TEMP 7°C		
18:28	Re-inizio acquisizione SIS 0205_20210822_182853		Lat 77°25.95'N Long 10°56.68'E
19:36	**EOL** IRIDYA15.C.L-20210822-193641	HDG 353	
	SOL IRIDYA16.C.L-20210822-193655	HDG 325	Lat 77°33.41'N Long 10°49.55'E
22:19	**EOL** IRIDYA16.C.L-20210822-220548	HDG 325	Lat 77°48.30'N Long 09°53.27'E
	SOL IRIDYA17.C.L-20210822- 221946	HDG 145	Lat 77°48.90'N Long 09°53.77'E

23/08/2021

00:00	In acquisizione linea IRIDYA17.C.L-20210822-231046 HDG 145		
	WIND SSE 5		
	SEA STATE SSE 4		
	AIR TEMP 4°C		
1:17	**EOL** IRIDYA17.C.L-20210822-010706	HDG 145	Lat 77°34.16'N Long 10°52.72'E
	SOL IRIDYA18.C.L-20210823-011743	HDG 170	
02:28	**EOL** IRIDYA18.C.L-20210823-015223	HDG 170	Lat 77°26.03'N Long 11°02.40'E
	SOL IRIDYA19.C.L-20210823-023850	HDG 347	Lat 77°26.24'N Long 11°06.04'E
03:52	**EOL** IRIDYA19.C.L-20210823-034630	HDG 347	
	SOL IRIDYA20.C.L-20210823-034557	HDG 326	Lat 77°34.38'N Long 10°57.16'E
05:10	**EOL** IRIDYA20.C.L-20210823-034557	HDG 326	
	SOL IRIDYA01.C.L-20210823-051121	HDG 226	Lat 77°41.43'N Long 10°31.43'E
05:52	**EOL** IRIDYA01.C.L-20210823- 055437	HDG 226	
05:52	Test valutazione stabilità per carotaggio, causa condizioni meteo l'operazione con carotiere viene rimandata.		
	Wave 2.5 m, vento 24 nodi		
	Si torna sul punto di EOL IRIDYA20		
06:34	MMO (DAVIDE)		
06:14	**SOL** IRIDYA21.CL-20210823-061401	HDG 324	Lat 77°41.73'N Long 10°30.21'E
8:00	WIND SE 6		
	SEA STATE S 5		
	AIR TEMP 6°C		
08:03	**EOL** IRIDYA21.C.L-20210823-073924		Lat 77°49.44'N Long 10°00.01'E
	SOL IRIDYA22.C.L-20210823- 080316	HDG 144	Lat 77°49.24'N Long 10°03.29'E

09:33	**EOL** IRIDYA22.C.L-20210823-092645		Lat 77°42.02'N Long 10°32.45'E
	SOL IRIDYA23.C.L-20210823- 093326	HDG 146	Lat 77°41.79'N Long 10°34.41'E
10:55	**EOL** IRIDYA23.C.L-20210823-101626		
	SOL IRIDYA24.C.L-20210824- 105617	HDG 166	Lat 77°35.21'N Long 10°58.51'E
11:12	Start osservazione MMO		
11:42	Avvistati soffi presumibilmente di capodoglio a 2 Nm dalla nave, 3 capodogli 1 balenottera		
12:45	**EOL** IRIDYA24.C.L-20210823-124019		Lat 77°22.82'N Long 11°15.06'E
	SOL IRIDYA19.C.L-20210824- 124256	HDG 348	
13:18	**EOL** IRIDYA19.C.L-20210823-131812		Lat 77°26.24'N Long 11°06.04'E
	SOL IRIDYA25.C.L-20210824- 132605	HDG 169	Lat 77°26.00'N Long 11°03.00'E
	Transito interrotto durante l'accostata per prova stabilità nave per carotaggi		
13:33	Si riprende l'acquisizione con EM304 per condi-meteo non adeguate ai carotaggi		
14:00	Test Periodico accensione compressore inizio 14.00 fine 14.30		
14:30	**EOL** IRIDYA- IRIDYA25.C.L-20210824- 132605 Infill	HDG 169	Lat 77°21.73'N Long 11°07.48'E
14:31	Avvistamento MMO: Balenottera		Lat 77°21.73'N Long 11°07.48'E
14:51	EOINFILL		
	SOL IRIDYA26.C.L-20210823-145113	HDG 1	Lat 77°20.50'N Long 10°56.89'E
15:27:44	Rumore elettrico, **EM304 smette di pingare** e contemporaneamente si registra rumore su TOPAS (linea iRIDIA16_001 fatto screenshot). Su terrain model del 304 mancano blocchi di grid, continua la acquisizione con PDS ma salta la copertura EM304		
15:39	**EOL** IRIDYA26.C.L-20210823-152537(2)		
	SOL IRIDYA15.C.L-20210823-153959	HDG 274	Lat 77°26.14'N Long 10°55.85'E
16:38	Riavviato pc EM304EM304. Ad inizio registrazione si nota forte rumore. Rumore riscontrato anche su TOPAS. Fatti screenshot (Noise1,2,3 su desktop), il grid model si presenta mancante degli stessi blocchi pre-riavvio, blocchi del terrain model del progetto spariscono e riappaiono. **I dati sono acquisiti correttamente**, vengono visualizzati seabed, waterfall e watercolumn e sono attivi, contrariamente al riavvio in cui apparivano congelati.		
16:40	**EOL** IRIDYA15.C.L-20210823-153959	HDG 274	
	SOL -IRIDYA27.C.L-20210823-163640	HDG 157	Lat 77°21.56'N Long 11°08.60'E
18:00	WIND S4 SEA STATE S 3/4 AIR TEMP		
18:44	**EOL** IRIDYA27.C.L-20210823-183307(2)		
	SOL IRIDYA28.C.L-20210823-184047	HDG 152	Lat 77°09.23'N Long 11°35.51'E
19:53	**EOL** IRIDYA28.C.L-20210823- 194801(2)		
	SOL IRIIDYA29.C.L-20210823-194856	HDG 137	Lat 77°02.55'N Long 11°53.22'E
22:08	**EOL** IRIDYA29.C.L-20210823- 215428		
	SOL IRIDYA30 C.L-20210823-220820	HDG 139	Lat 76°51.44'N Long 12°42.99'E

24/08/2021

00:00	In acquisizione linea IRIDYA30.C.L-20210823-221725	HDG 139	
	WIND S 3 SEA STATE S 3/4 AIR TEMP		
00:47	**EOL** IRIDYA30.C.L-20210824-004638		
	SOL IRIDYA29.C.L-20210824-004736	HDG 241	Lat 76°38.63'N Long 13°37.13'E
	Acquisizione TOPAS su linea slide-inizio/slide-fine		
01:27	**EOL** IRIDYA29.C.L-20210824-005359		
	SOL IRIDYA31.C.L-20210824-012724	HDG 217	Lat 76°36.87'N Long 13°23.67'E
02:40	**EOL** IRIDYA-IRIDYA31.C.L-20210824-01272	HDG 217	Lat 76°30.92'N Long 13°05.52'E
02:50	**SOL** IRIDYA-IRIDYA32.C.L-20210824-025021	HDG 310	Lat 76°30.92'N Long 13°05.52'E
	Acquisizione Topas Multping		
03:38	**EOL** IRIDYA32.C.L-20210824-025305(2)	HDG310	Lat 76°33.97'N Long 12°52.43'E
03:53	**SOL** IRIDYA33.C.L-20210824-035130	HDG 257	Lat 76°33.87'N Long 12°52.97'E
04:33	**EOL** IRIDYA33.C.L-20210824-042001	HDG 257	Lat 76°32.80'N Long 12°35.67'E

04:42	**SOL** IRIDYA34.C.L-20210824-044226		HDG 170	Lat 76°32.80'N	Long 12°36.58'E
04:47	**EOL** IRIDYA34.C.L-20210824-043311		HDG 170	Lat 76°30.83'N	Long 12°38.32'E
05:05	**SOL** IRIDYA35.C.L-20210824-050540		HDG 16	Lat 76°30.68'N	Long 12°38.45'E
05:24	**EOL** IRIDYA35.C.L-20210824-050540		HDG 16	Lat 76°32.10'N	Long 12°39.54'E
05:24	**SOL** IRIDYA36.C.L-20210824-052421		HDG 280	Lat 76°31.93'N	Long 12°40.17'E
05:31	**EOL** IRIDYA36.C.L-20210824-052421		HDG 280	Lat 76°32.16'N	Long 12°33.79'E
06:20	Preparazione del carotiere				
06:24	MMO inizio turno (DAVIDE) WD1662				
07:23	PCorer **IRIDYA-04PC** in acqua	WD 1662 m			
07:26	PCorer **IRIDYA-04PC** inizio calata				
	Velocità calata 100m/minuto	WD 1662m		Lat 76°32.04’N	Long 12°37.25’E
08:03	PCorer **IRIDYA-04PC** bottom	WD 1662 m		Lat 76°32.05’N	Long 12°37.27’E
08:42	PCorer **IRIDYA-04PC** a pelo ma non ha toccato il fondo (non si è sganciata la leva)				
08:44	PCorer **IRIDYA-04PC** inizio calata 2				
	Velocità calata 100m/minuto	WD 1666m		Lat 76°32.06’N	Long 12°37.24’E
09:15	PCorer **IRIDYA-04PC** bottom	WD 1666 m		Lat 76°32.06’N	Long 12°37.24’E
10:20	PCorer **IRIDYA-04PC** recuperato a bordo. Il carotiere certamente è penetrato perché sporco ma senza lo sgancio della leva.				
11:30	Trasferimento verso terra per necessità di comunicazioni				
18:00	WIND calma				
	SEA STATE calma				
	AIR TEMP 5°C				
21:40	Inizio transito verso WP(24/08/2021 20:16:41) per linea MBEs IRIDYA39 poi transito verso SITO 01 arrivo previsto a ore 08:00 (LT) per carotaggio				

25/08/2021

00:00	In transito verso SOL IRIDYA39				
	WIND				
	SEA STATE				
	AIR TEMP				
02:53	Arrivo in area acquisizione MBEs				
02:54	**SOL** IRIDYA39.C.L-20210825-025421		HDG 142	Lat 77°49.88'N	Long 10°03.88'E
04:23	**EOL** IRIDYA-IRIDYA39.C.L-20210825-02542		HDG142	Lat 77°42.17'N	Long 10°35.81'E
	Transit to iRIDYA-01_PC				
05:59	IRIDYA-01PC, in area acquisizione, inizio operazioni				
06:12	Inizio turno MMO (Davide) WD 1714				
06:00	WIND SW 3				
	SEA STATE SW 3				
	AIR TEMP 4°C				
07:23	PCorer **IRIDYA-01PC** in acqua	WD 1718 m			
07:30	Non si riesce a sganciare il PIN di sicurezza, sono stati tolti 20 Chili dal contrappeso di sgancio per fare meno pressione sulla leva.				
07:52	Non si riesce a sganciare ancora il PIN. Carotiere tirato a bordo per risolvere il problema in piena sicurezza				
08:02	Carotiere a bordo				
08:12	Fine turno MMO				
08:38	Preparazione per la rimessa in acqua, contrappeso di sgancio: 100 chili, Il pin di sicurezza è stato cambiato con una “caviglia dal nostromo”				
08:41	Inizio turno MMO (Davide)				
08:56	Carotiere a pelo				
08:58	PCorer **IRIDYA-01PC** inizio calata				
	Velocità calata 100m/minuto	WD 1718 m		Lat 77°29.84’N	Long 09°42.20’E
09:39	PCorer **IRIDYA-01PC** bottom	WD 1719 m		Lat 77°28.84’N	Long 09°42.22’E
10:19	PCorer **IRIDYA-01PC** a pelo				
10:33	PCorer **IRIDYA-01PC** a bordo				
10:33	Fine turno MMO (Davide)				
12:42	Inizio trasferimento da SITO IRIDYA-1 a inizio linea acquisizione multibeam IRIDYA40				
12:51	**SOL** IRIDYA40.C.L-20210825-125122		HDG 236	Lat 77°30.12’N	Long 09°39.01’E

12:54	Start osservazione MMO		
13:42	Riavviato SIS last file 0321_20210825_133918.kmall		
	SOL 0322_20210825_134216.kmall		
15:11	**EOL** IRIDYA40.C.L-20210825-150411	HDG 236	Lat 77°21.71'N Long 08°48.67'E
15:49	**SOL** IRIDYA41.C.L-20210825-154803	HDG 100	Lat 77°23.16'N Long 09°05.65'E
15:55	MMO: Avvistamento Lagenorinchi		
16:00	Fine Turno MMO		
16:09	**Crash PDS2000 segnalato salto GPS**, riavviata macchina PDS2000, SIS continua a lavorare e acquisire normalmente		
16:30	Errore nella profondità del TOPAS, viene riavviato il sistema IRIDYA28_00		
16:51	Il problema nel TOPAS permane linea IRIDYA28_00, non si riesce a settare il fondo		
17:08	**EOL** IRIDYA41.C.L-20210825-170538(2)	HDG 100	Lat 77°22.09'N Long 09°15.52'E
17:41	**SOL** IRIDYA42.C.L-20210825-174146	HDG 166	Lat 77°25.38'N Long 09°46.84'E
18:00	WIND SSW 6		
	SEA STATE SSW 4/5		
	TEMP 4°C		
19:51	**EOL** IRIDYA42.C.L-20210825-194029(2)		Lat 77°14.86'N Long 09°45.97'E
20:13	**SOL** IRIDYA43.C.L-20210825-195055	HDG 116	Lat 77°15.92'N Long 09°36.58'E
21:23	**EOL** IRIDYA43.C.L-20210825-195055	HDG 116	
	SOL IRIDYA44.C.L-20210825-211915	HDG 90	Lat 77°13.45'N Long 10°05.65'E
22:11	**EOL** IRIDYA44.C.L-20210825-215952	HDG 90	
	SOL IRIDYA45.C.L-20210825-221106	HDG 153	Lat 77°15.20'N Long 10°24.34'E

26/08/2021

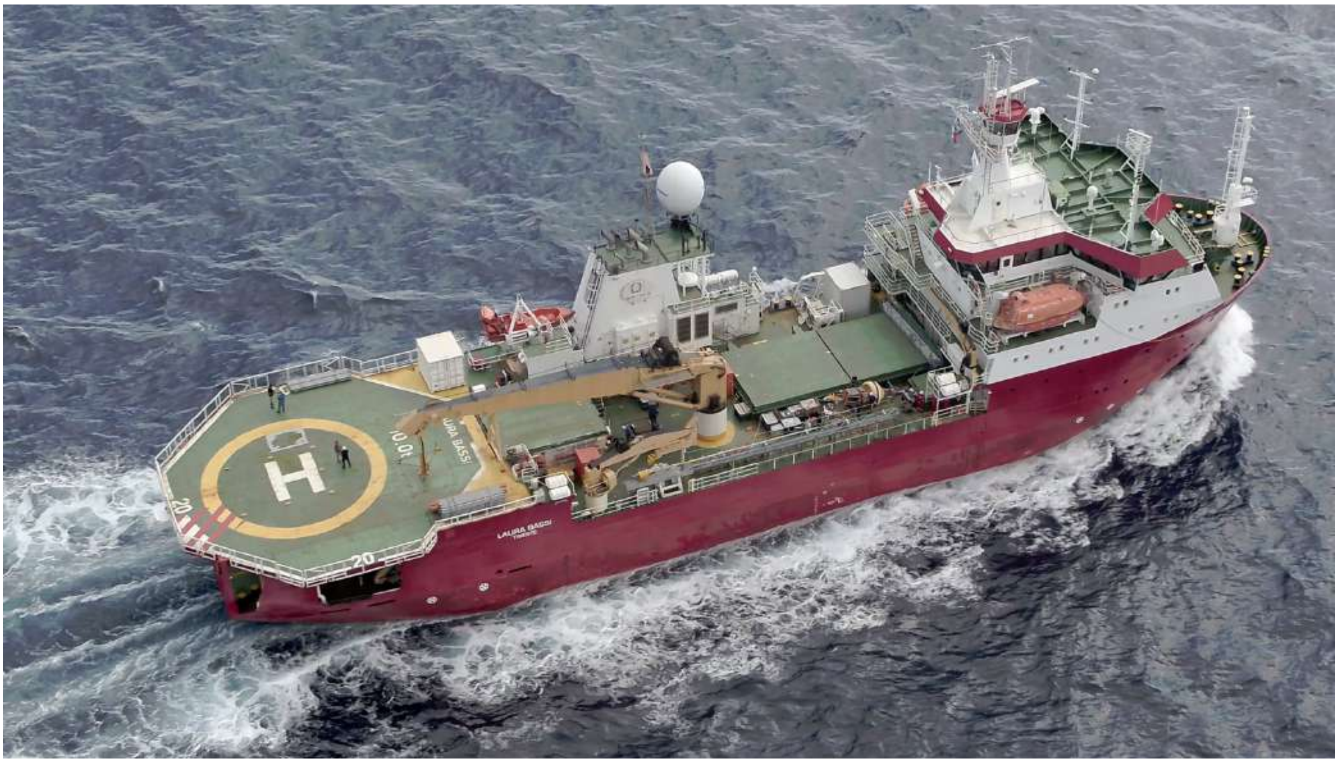
00:00	In acquisizione		
	IRIDYA45.C.L.-20210825-223501	HDG 153	Lat 77°06.34'N Long 10°49.27'E
	WIND SSW 6		
	SEA STATE SSW 5		
	AIR TEMP 4°C		
01:41	**EOL** IRIDYA-IRIDYA45.C.L-20210826-223501	HDG 153	
	SOL IRIDYA-IRIDYA46.C.L-20210826-014014	HDG 140	Lat 76°57.90'N Long 11°12.15'E
05:49	**EOL** IRIDYA-IRIDYA46.C.L-20210826-05332	HDG 140	Lat 76°57.90'N Long 11°12.15'E
06:00	Transito verso ridosso causa condi-meteo		
	WIND SSW 7		
	SEA STATE SSW 6		
	AIR TEMP 4°C		
12:00	WIND SSW 4		
	SWELL 3 AIR TEMP 5°C		
17:00	Berthed in Isfjorden		Lat 78°12.14'N Long 14°25.59'E
18:00	WIND WSW 5		
	SWELL WSW 3		
	AIR TEMP 4°C		

27/08/2021

00:00	Isfjord		Lat 78°12.14'N Long 14°25.59'E
	WIND NNE 3		
	SWELL 2 m		
	T 4°C		
06:00	Isfjord		Lat 78°12.14'N Long 14°25.59'E
	WIND NNE 3		
	SWELL 2 m		

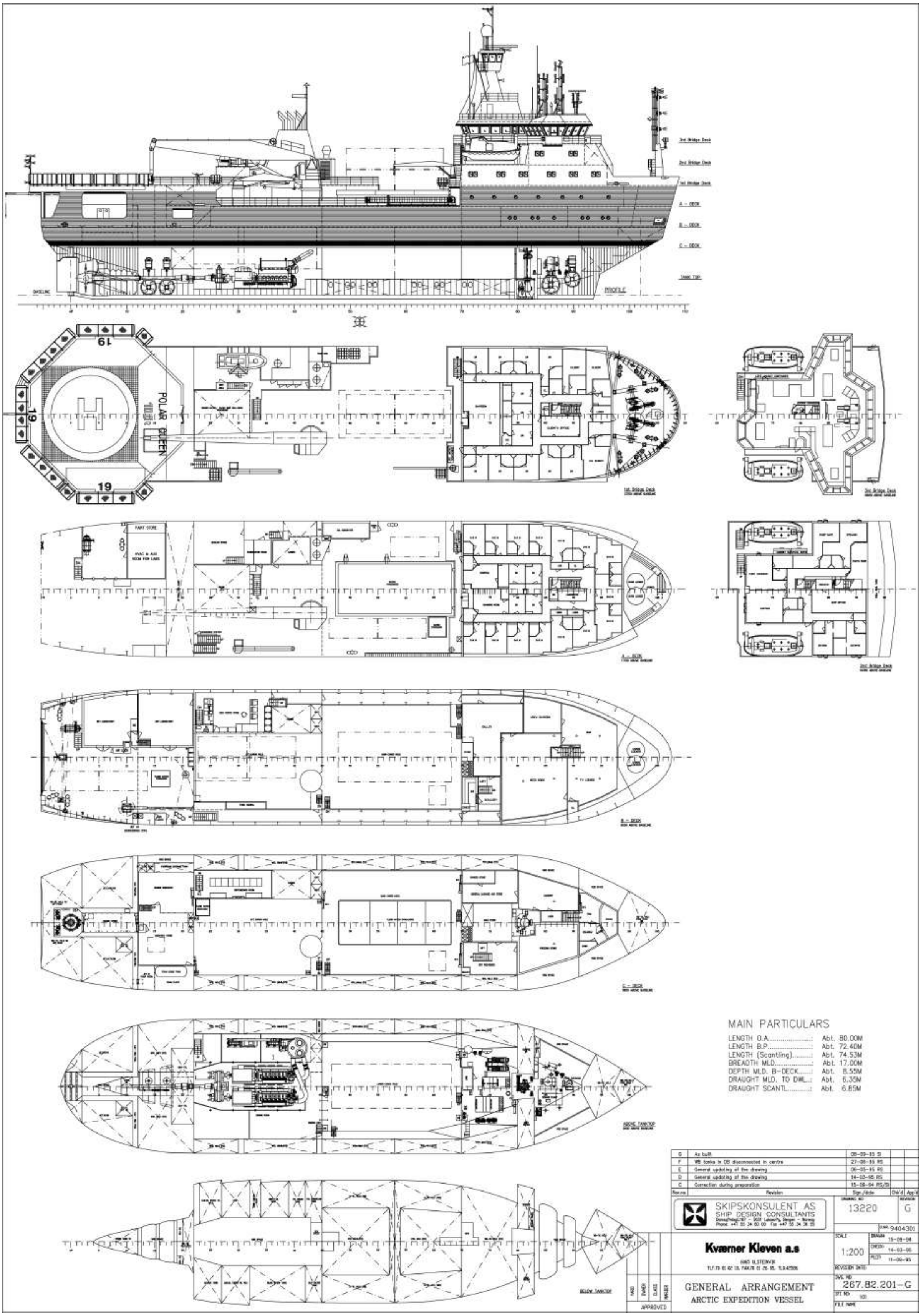
(B) VESSEL'S CHARACTERISTICS

R/V LAURA BASSI	
Yard	Kverner Kleven Leirvik, Norway
Built	1995
Flag	Italy
Call sign	ZDLS1
IMO No.	9114256
Owner	National institute of Oceanography and Applied Geophysics - OGS
Operator	Argo Diamar



Aerial view of the research vessel Laura Bassi

GENERAL ARRANGEMENT



CLASS NOTATION

RINa C ✠

special service - research ship - unrestricted

✠ AUT-UMS; ✠ DYNAPOS DP2 ; HELIDECK

ICE CLASS IA; WINTERIZATION (temp -30 °C)

PRINCIPAL DIMENSIONS

Length O.A.	80.00 m
Length B.P.	72.40 m
Breadth mld.	17.00 m
Depth mld. (to B-deck)	8.55 m
Draught Scantl.	6.85 m
DWT	1910 tonnes
GRT	4028
Port of registry - No	Trieste - 807

CAPACITIES

Fuel Oil	1250 m^3
Fresh Water	165 m^3
Kerosene (Jet A1)	160 m^3

MACHINERY AND PROPULSION

Main Engines

Make	Bergen Diesel
Type	BRG 6
Rated Power	2 x 2280 kW @ 720 rpm

Main propulsion

C/P Propeller:	1 o# in Nozzle
Make	Ulstein
Blades	4
Bollard pull	100% pitch - 75 tonnes
	75% pitch - 62 tonnes
	50% pitch - 44 tonnes

Auxiliary Engines

Make	Mitsubishi
Type	S6R-MPTK
Rated Power	2 x 590 kW/1800 rpm

THRUSTERS

Bowthruster 1	600 kW
Bowthruster 2	800 kW
Azimuth fwd	800 kW (retractable)
Sternthruster 1	600 kW
Sternthruster 2	600 kW

ROLL REDUCTION

2 x integrated roll reduction tanks

HIGHLIGHTS FOR CHARTERER'S SPECIAL USE

Water supply:

- Uncontaminated sea water supply
- Freshwater production: 2 x 25m3 Fresh Water Production

Hydraulic Power Pack:

- 2 x 120 ltr/min – 210 Bar, outlets in cargo holds and on deck

Gate Valve:

- DN400 (16") in fwd HPR trunk

Utility SWB:

Utility SWB's in engine work shop

Utility SWB no1, 450V - 630 A / Conn. 2 x 100A, 2 x 250A and 1 x

Utility SWB no2, 450V - 630 A / Conn. 2 x 100A, 1 x 250A and 1 x

Distribution boxes in cargo holds and aft deck:

Total 450 V - 320A (each box 160 A)

Total 230 V - 160A (each box 160 A)

ELECTRICAL PLANT

Shaft Generators

Make	AVK
Rating	2 x 2 200 kW

Auxiliary Generators

Make	Mitsubishi
Rating	2 x 590 kW

Emergency Generators

Make	Mitsubishi - AVK
Rating	1 x 152 kW, 3 x 450 V, 60 Hz

Emergency generator

El. Distribution

440 V, 230 V and 110 V all 60 Hz

WORKSPACE AND DECK AREAS

Tank top:

Distributed load	5.3 t/m2
Container loads	3 tiers 20 TEU max stack weight 72 t

Cargo handling vehicles with max axle load 15 t and single pneumatic tyres.

C-Deck cargo area:

Distributed load:	1.65 t/m2

Cargo handling vehicles with max axle load 15 t and single pneumatic tyres

B-Deck aft deck

Distributed load	5.0 t/m2

A-Deck

Distributed load	1.65 t/m2
Container loads	1 tiers 20 TEU max weight 24t

Cargo handling vehicles with max axle load 15 t and single pneumatic tyres

DECK EQUIPMENT

Main Crane

Maker:	Norlift
Type	GPCO 900 – 5020 straight boom
Design	LRS, Ch. 3 Section 2
Specification	

Capacity	Outreach	Seastate	Fall	Hook speed loaded	Hook travel
50t	20m	NA	Four	8 m/min	62m
50t	10m	1	Four	8 m/min	62m
50t	8.4m	2-3	Four	8 m/min	62m
34t	8.4m	5-6	Four	8 m/min	62m
25t	20m	-	Two	16 m/min	125m
12.5t	21m	5-6	Single	32 m/min	250m
Aux 5t	19m	NA	Single	60 m/min	40m

Work Crane

Maker	Norlift
Type	GPFO 160 – 0510 folded jib crane
Design	LRS, Ch. 3 Section 2
Specification	

Capacity	Outreach	Seastate	Hook speed empty	Hook speed loaded	Hook travel
5t	10m	6	90m/m	37m/min	35m

Provision crane

Maker	Norlift
Type	GP
Specifcation	2 t / 7 m

Aft deck crane

Maker	Norlift
Type	Telescopic boom
Specifcation	10 t / 5m
Winch capacity	2.75t
hook travel	15 m

Hatches

A-deck	14 x 6 m
B-deck	14 x 5.4 m (flush)
Helideck	7 x 6 m (flush)

HELIDECK

D-Value	19.5 m
Make take off and landing wight	Designed for Super Puma

MANOEUVRING, NAVIGATION AND COMMUNICATION

Dynamic Position System:

- Kongsberg K-Pos 21 + CJOY Remote Joystick
- Simrad LTW MK 8-15S Modified (500m)
- Seatex Seapath 200
- Seatex DPS 132
- STARFIX RTCM Correction Receiver
- MBX-4 IALA RTCM Correction Receiver
- MDL Fanbeam MK 4.2 Position Sensor
- HPR HiPAP 501
- HPR 410 Standard
- Interface to APos System
- Interface to DGPS NO.2
- 3 x Seatex MRU-5
- 3 x Anschutz Gyro
- Serial NMEA outputs Available
- Dief Wind Sensor Anemometer – 879
- 2 x Gill Sonic DP Wind Sensor
- Rudder, Thruster & Propulsion Control
- Propulsion Control
- Rudder Control
- Thruster Control
- ERN 99, 99, 96

Navigation

Integrated Bridge System – Kelvin Hughes IBS Paperless Bridge

- Kelvin Hughes IBS
- Kelvin Hughes - X Band Manta Digital Radar
- Kelvin Hughes - S Band Sharpeye Radar
- Kelvin Hughes MDP-A2-ABAA ECDIS System (not certified)
- Bridge Watch Monitoring System
- 3 x Anschutz STD 20 Gyros
- Skipper GDS 101 Echo Sounder
- Kelvin Hughes MDP-A1 Slave radar
- Furuno Doppler Current indicator CI-600G
- Kelvin Hughes MDP-A2 Route Planning Station
- DGPS 1 - Furuno GPS90 GPS/ Seatex DPS 123
- DGPS 2 - Seatex Seapath 200
- Kelvin Hughes SEM 200 Autopilot
- Sperry Naviknot 350 E Speed Log
- Seatex HMS 100 Helicopter Motion and Weather
- Helicopter Transponding System
- Maneuvering Joystick System: Ulstein PosCon
- Navigation Information Network - ADB / LAN

1 X Becker Rudder Tenfjord Steering gear

Scientific Bridge Equipment

- Simrad EA 600 Hydrographic Echo Sounder
- AME 2006 Shipbourne Three Component Magnetometer
- Automatic Weather Reporting Station
- UK Meteorological Measuring Equipment

Navigation Information Network

LAN: 4 access CISCO switch working at ISO/OSI level 2

1 CISCO switch level 3 + 1 Palo Alto Firewall

WIFI: 6 access point - one for each bridge and in the dry lab.

COMMUNICATION

Communication and Radio Equipment including GMDSS for Area 4

- Console N
- HF Radio 2
- Taiyo Auto RDF
- Watch Receiver
- Weather Fax
- Console Q1
- Sailor Inmarsat C - LRIT Compliant
- HF Radio 1
- Console Q2
- Console C
- VHF No. 1
- Console A
- Broadgate S-VDR
- Console G
- Kelvin Hughes UAIS
- Console R2
- VHF No. 2
- Console R3
- VHF No.3
- Helicopter Beacon
- Areonautical VHF
- Console M
- LP2 Domestic Supply
- EMP2 Emergency Switchboard Supply
- UPL1 Eaton 3KVA MKV
- UPL2 Eaton 3KVA MK

- Immarsat Fleet 77 Satellite Communications
- VSAT C-band Satellite Communications
- Iridium Certus Satellite Communications
- Immarsat FleetBB Satellite Communications (Optional)

ACCOMODATION

High standard accommodation comprising facilities such as: Reception area, ships office, change room, recreation area, trim room, sauna, mess, TV/Crew dayroom, charterer's lounge, launderettes, laundry, client office

Crew: 24 berths

Available for charterers

2 single client rep. cabin = 2

4 cabins x 2 berths = 8

9 cabins x 3 berths = 27

6 cabins x 4 berths = 24

Total 61 berths

All cabins with toilet and shower

Hospital: 1 berth

LIFESAVING AND RESCUE EQUIPMENT

Lifesaving and rescue equipment according to SOLAS

Life boats: 2 x Harding MCB24CR - 40 persons

Life boat davits: 2 x Vestdavit H-7000

M.O.B. Boat: 1 x Norsafe Magnum 7.5

M.O.B. Boat davit: 1 x Vest Davit P-3000, with shock damper.

Life rafts: 8 x RFD (each 20 men).

Survival suits: 80 off

Lifejackets: 80 off

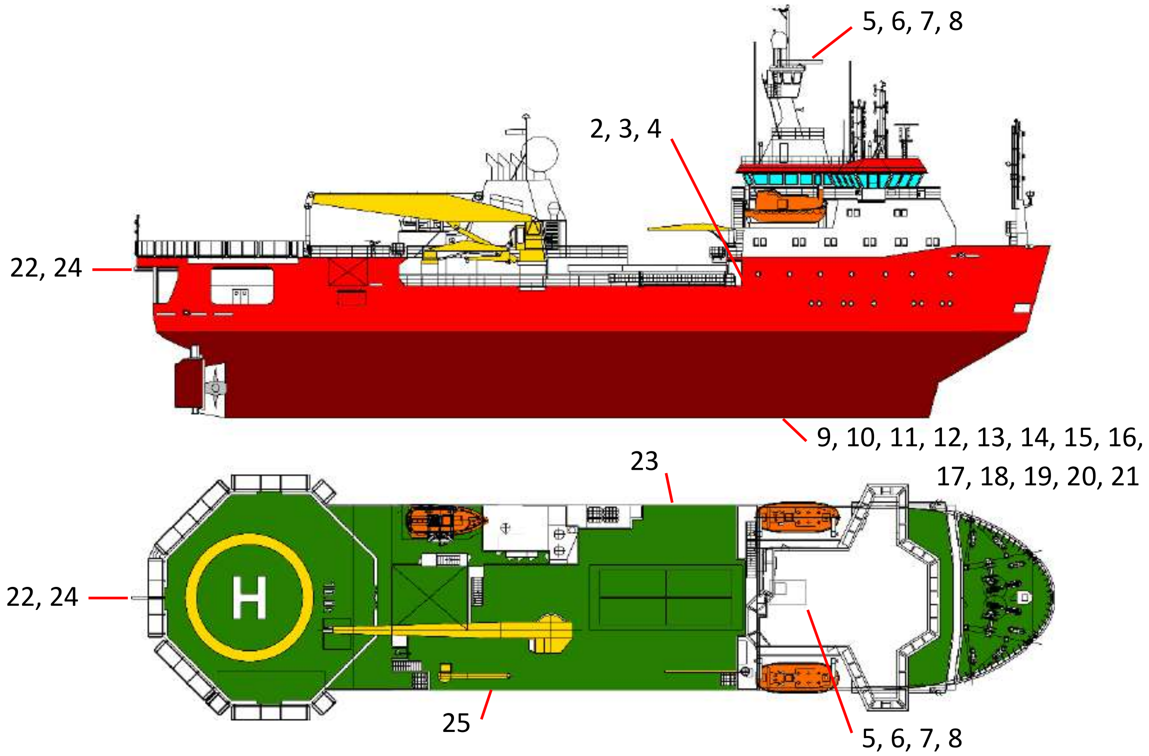
EEBD's: 6 off

Smoke Hoods: 38 o# (2 per SPP Cabin)

Fire Extinguishing:

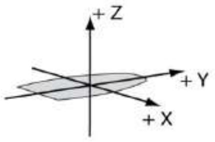
Accommodation	Flexifog Fixed Fire Dampening System CO2, Dry Powder and AFF Extinguishers
Galley, Paint store, and Sw Board	CO2
Cargo Holds	AFF Hi Ex Foam
Engine Room	AFF Hi Ex Foam
Helideck	AFF Low Ex Foam

VESSEL'S OFFSETS



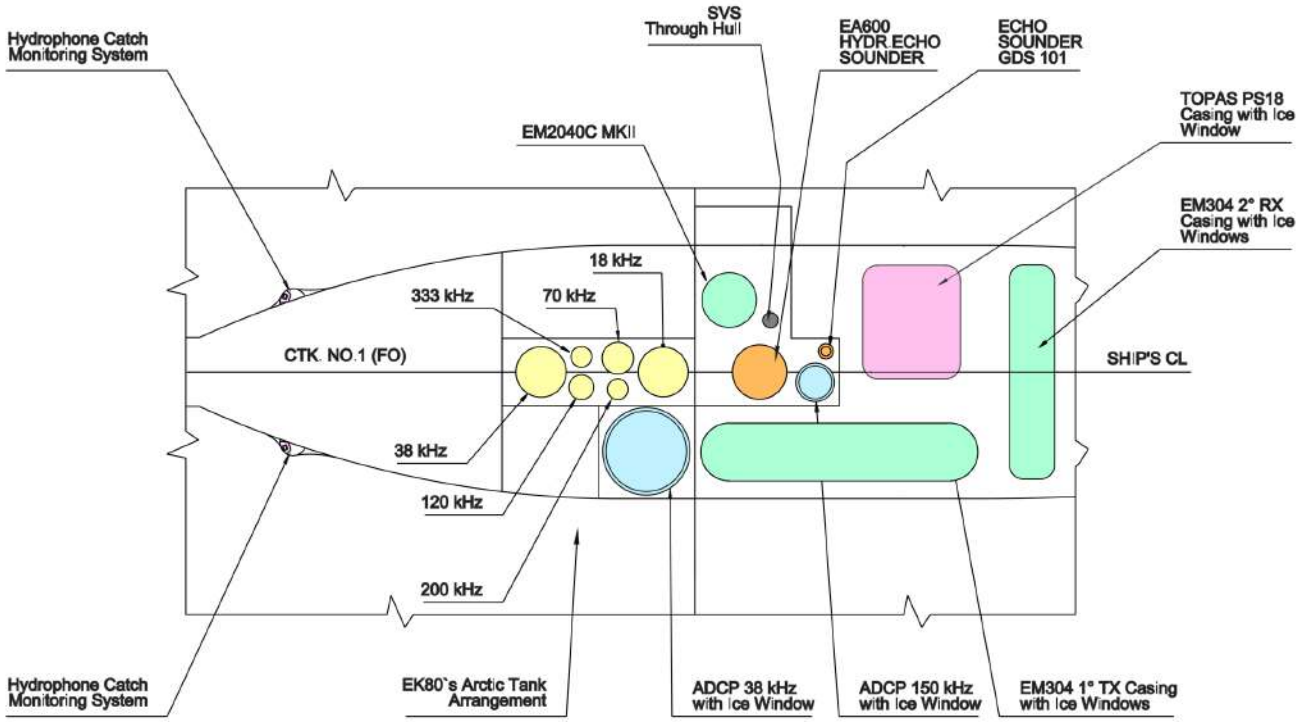
#	Equipment	x	y	z
1	Zero offset	0.000	0.000	0.000
2	MRU1	-0.375	0.025	0.103
3	MRU2	0.279	0.029	-0.043
4	MRU3	0.739	0.047	0.100
5	SEAPATH200 bow	1.992	2.861	29.006
6	SEAPATH200 stern	1.914	0.354	28.953
7	SEAPATH380 bow	2.053	3.612	28.945
8	SEAPATH380 stern	1.925	-0.405	28.861
9	EM2040	0.574	-0.767	-7.978
10	TX EM304	2.777	0.828	-7.433
11	RX EM304	1.624	3.628	-7.420
12	EK80 18 kHz	1.614	-1.729	-7.443
13	EK80 38 kHz	1.613	-3.501	-7.471
14	EK80 70 kHz	1.416	-2.385	-7.495
15	EK80 120 kHz	1.832	-2.915	-7.501
16	EK80 200 kHz	1.865	-2.387	-7.502
17	EK80 333 kHz	1.393	-2.916	-7.504
18	TOPAS	0.899	1.878	-7.407
19	EA600	1.614	-0.326	-7.442
20	ADCP 150 kHz	1.771	0.4820	-7.495
21	ADCP 38 kHz	2.763	-1.969	-7.481
22	STERN	0.000	-54.200	-
23	SVP 1	8.400	-35.000	-
24	SVP 2	0.000	-54.200	-
25	CORING	-4.000	-15.000	-

SIGN CONVENTION



(C) SCIENTIFIC EQUIPMENT

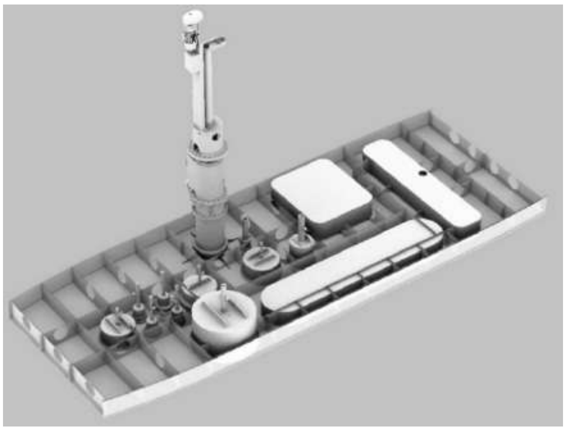
ACOUSTICS SYSTEMS



Top: Plan view of the view of the keel block where the transducers are hosted. In yellow the scientific equipment; in orange the ship echosunders.

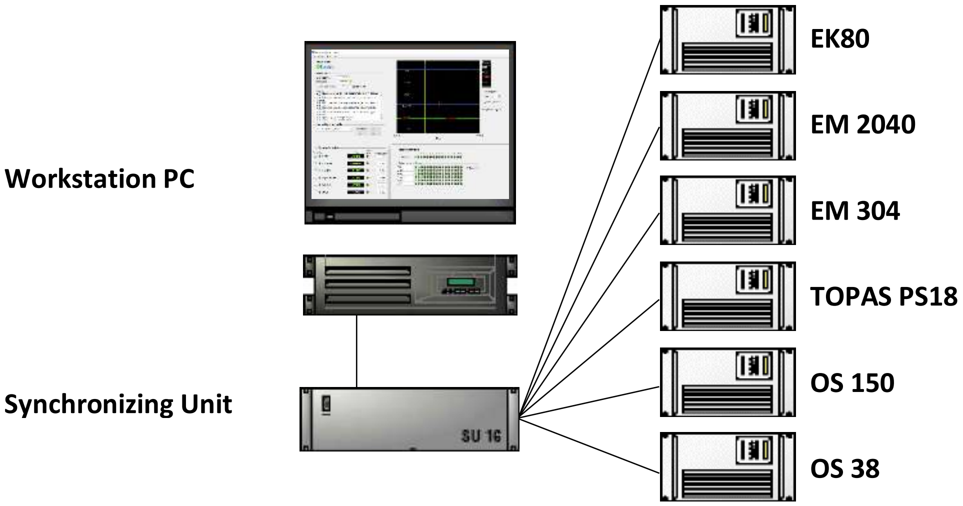
Bottom right: the keel after the installation of the transducers was completed.

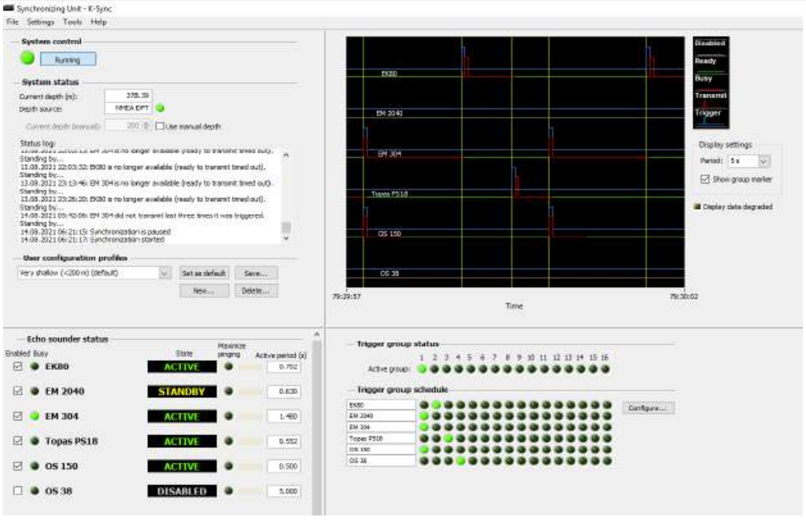
Bottom left: 3D model of the block



ACOUSTIC SYSTEMS SINCHRONIZATION

Equipment	Sinchronizing Unit			
Manufacturer	Kongsberg Maritime			
Model	K-Sync			
Installation	Rack mounted			
Max No. of systems	16			
Trigger period calculation	From external depth			
List of controlled equipment	Type	Model	Frequency range (KHz)	Group
	SBES	EK80	18-38-70-120-200-333	2
	MBES	EM2040	200-400	1
	MBES	EM304	26-34	1
	SBP	TOPAS PS18	1-6	3
	ADCP	OS 150	150	1
	ADCP	OS 18	38	4





System status

Current depth (m): 378.39

Depth source: NMEA DPT

Current depth (manual): 200 ☐ Use manual depth

Status log:

```
Standing by...
13.08.2021 22:03:32: EK80 is no longer available (ready to transmit timed out).
Standing by...
13.08.2021 23:13:46: EM 304 is no longer available (ready to transmit timed out).
Standing by...
13.08.2021 23:28:20: EK80 is no longer available (ready to transmit timed out).
Standing by...
14.08.2021 05:40:06: EM 304 did not transmit last three times it was triggered.
Standing by...
14.08.2021 06:21:15: Synchronization is paused
14.08.2021 06:21:17: Synchronization started
```

User configuration profiles: Very shallow (<200 m) (default)

Period: 5 s

Echo sounder status

Enabled	Busy		State	Maximize pinging	Active period (s)
☑	●	EK80	ACTIVE	●	0.702
☑	●	EM 2040	STANDBY	●	0.630
☑	●	EM 304	ACTIVE	●	1.480
☑	●	Topas PS18	ACTIVE	●	0.552
☑	●	OS 150	ACTIVE	●	0.500
☐	●	OS 38	DISABLED	●	5.000

Trigger group status

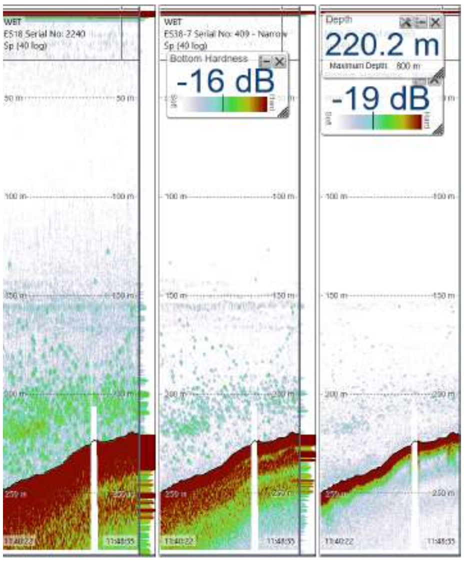
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Active group:	🟢	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

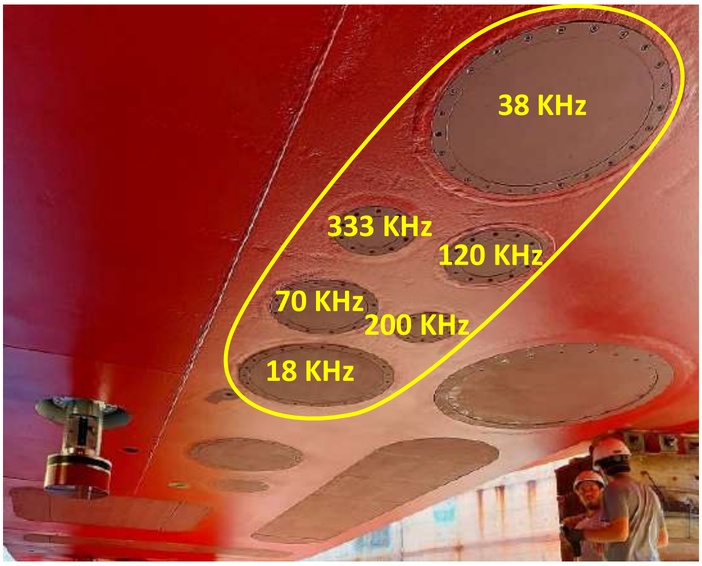
Trigger group schedule

EK80	●	🟢	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EM 2040	🟢	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EM 304	🟢	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Topas PS18	●	●	🟢	●	●	●	●	●	●	●	●	●	●	●	●	●
OS 150	🟢	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
OS 38	●	●	●	🟢	●	●	●	●	●	●	●	●	●	●	●	●

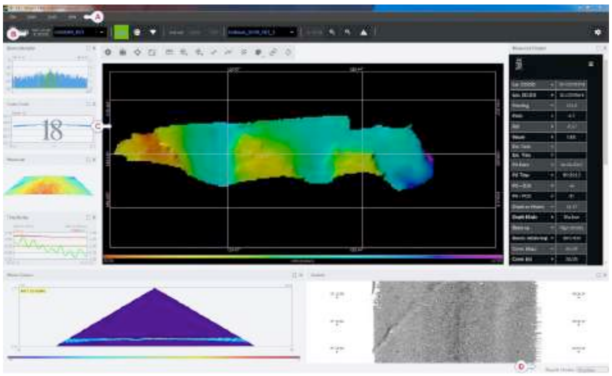
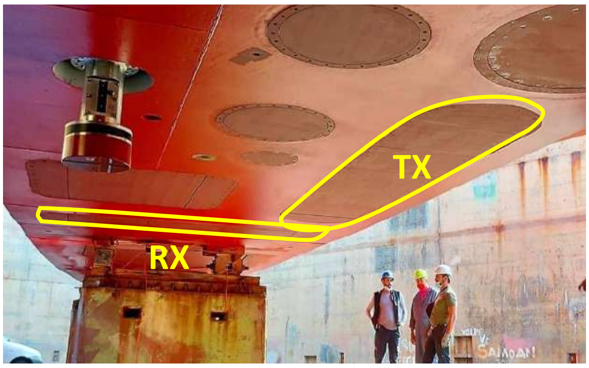
SCIENTIFIC ECHOSOUNDING FOR FISHERIES

Equipment	Multifrequency Single Beam Echosounder					
Manufacturer	Kongsberg Simrad					
Model	EK 80 scientific echosounder					
Installation	Keell mounted					
No. of transducers	6					
Model	ES18	ES38-7	ES70-7C	ES120-7C	ES200-7C	ES333-7
Resonant frequency	18 KHz	38 KHz	70 KHz	120 KHz	200 KHz	333 KHz
Circular beamwidth	11°±2°	7°	7°	7°	7°	7°
Directivity	D: 300±20%	NA	D: 650	D: 650	D: 650	NA
	10 log D: 25±1 dB	NA	10 log D: 28 dB	10 log D: 28 dB	10 log D: 28 dB	NA
Equiv. two-way beam angle	Ψ: 0.020	NA	Ψ: 0.009	Ψ: 0.009	Ψ: 0.009	Ψ: 0.009
	10log Ψ: -17±1dB	NA	10 log Ψ: -21 dB	10 log Ψ: -21 dB	10 log Ψ: -21 dB	10 log Ψ: -21 dB
Side lobes	< - 18 dB	-21 dB	< - 23 dB	< - 23 dB	< - 23 dB	-16 dB
Back radiation	< -35 dB	- 35 dB	< -40 dB	< -40 dB	< -40 dB	-30 dB
Transmitting response (dB re 1 µPa per V@1m)	182±2	184	185	185	185	180
Receiving sensitivity (dB re 1 V per µPa@1m)	-174±2	-176	-190	-190	-190	-194
Max source level (dB re 1 µPa@1m)	NA	230	NA	NA	NA	217
Max input pulse power	2000 W	2000 W	1000 W	1000 W	1000 W	100 W
Max cont. input power	100 W	100 W	10 W	10 W	10 W	NA

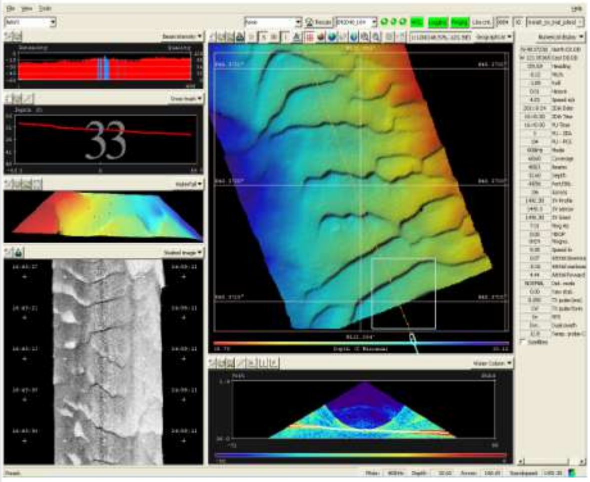




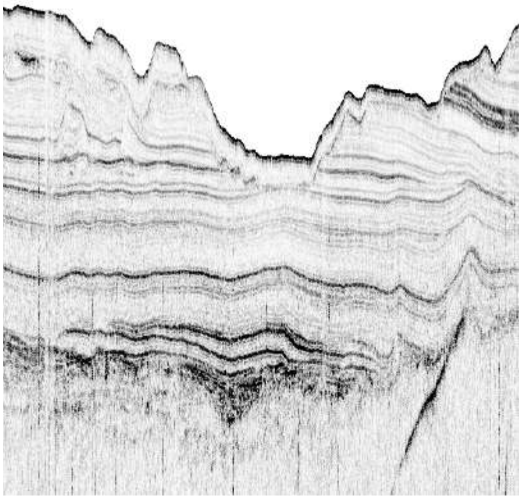
MORPHOBATYMETRY – DEEP WATER

Equipment	Multibeam echosounder
Manufacturer	Kongsberg
Model	EM 304
Installation	Keel mounted
Nominal frequency	30 KHz
Operating frequency	26-34 KHz
Swath width	Typically 5.5 times the depth, or more than 9 km
Number of swath	2 swaths per ping
Pulse length	0.4 ms CW to 200 ms FM effective pulse length
Number of transmit sectors	16 frequency coded transmit sectors per ping / 8 per swath
Available models	0.5 degree, 1 degree, 2 degrees and 4 degrees
Number of receiver beams (per ping)	1600 beams, 0.5 degree RX and 1 degree RX 1024 beams, 2 degree RX 512 beams, 4 degree RX
Beam focusing	On transmit and receive
Realtime motion stabilization	Roll: ± 15 ° Pitch: ± 15 ° Yaw: ± 15 °
Sounding pattern	Equidistant and equiangular
Gain control	Automatic
Mammal protection	Gradual start up transmit ramp
Deliverables	Bathymetric data Seabed imagery data Water column data Extra depth detections
	

MORPHOBATYMETRY – SHALLOW WATER

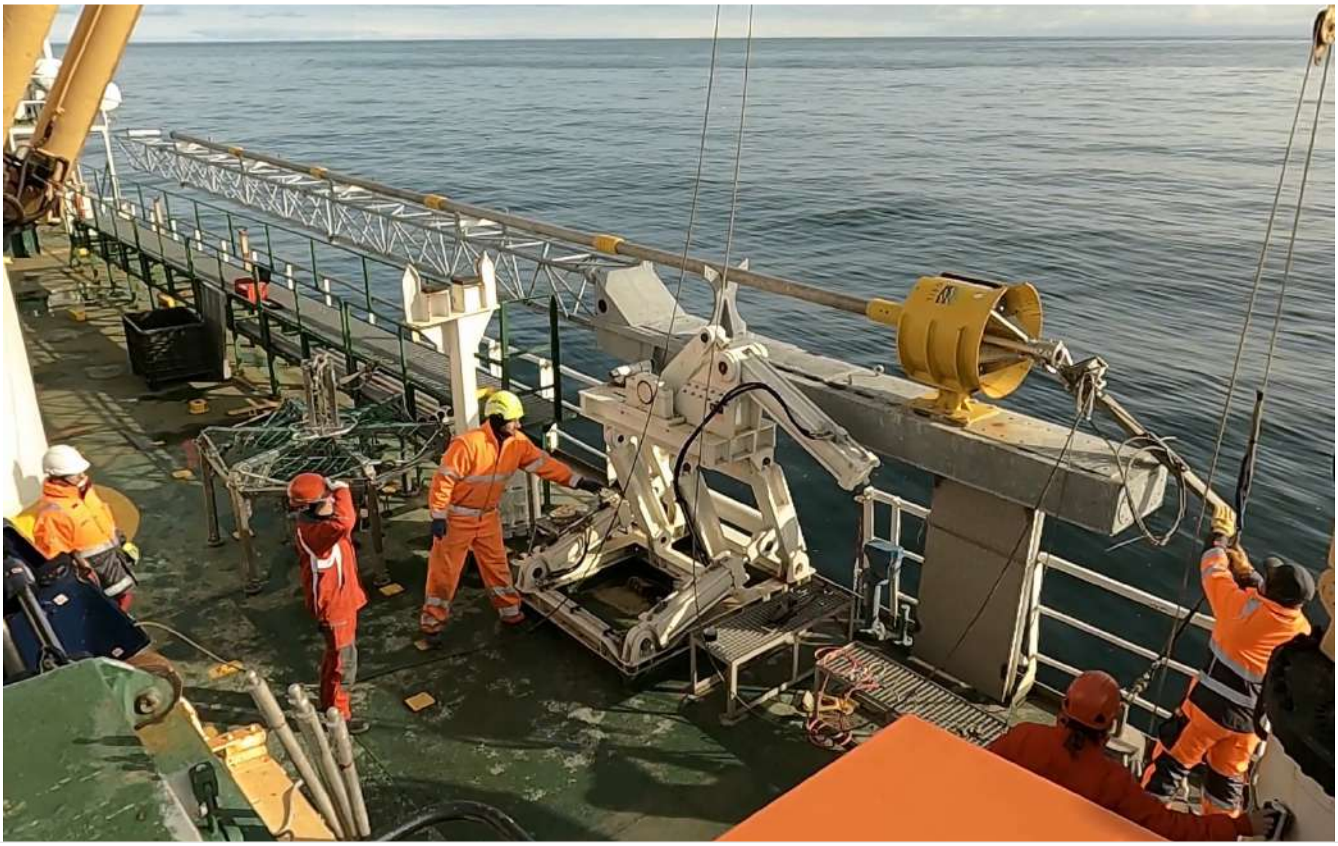
Equipment	Multibeam echosounder
Manufacturer	Kongsberg
Model	EM 2040c MKII
Installation	Drop pole mounted
Frequency range	200 to 400 kHz in steps of 10 Hz
Beam width	1° x 1 ° at 400 kHz
Max ping rate	50 Hz
Swath coverage	Up to 140° (5.5 times water depth)
Beam patterns	Equiangular, equidistant and high density
No. of beams per ping	400
Roll stabilized beams	± 15°
Pitch stabilized beams	± 10°
Yaw stabilized beams	± 10°
Depth range	Up to 520 m at 200 kHz
Pulse type	Continuous Wave (CW) / Frequency Modulated (FM – chirp)
Pulse lengths	
CW	14, 27,54, 135, 324 and 918 µ
FM	3 and 12 ms
Water columns logging	Yes
	

SUB BOTTOM PROFILING

Equipment	Sub bottom profiler
Manufacturer	Kongsberg - Geoacoustic
Model	Topas PS18
Installation	Keel mounted
Primary frequency	15-21 KHz
Secondary frequency	0.5 – 6 KHz
Output power	>32 KW
Beamwidth primary	~3.5°
Beamwidth secondary	~4.5° x 4.5°
Source level	~209 dB ref. to 1 μPa@1m
Dynamic range	>110 dB
Range resolution	<0.15 m
Available pulse types	Continuous Wave (CW), Ricker, Frequency Modulated (FM -Chirp)
Depth range	<20 - >11000m
Beam steering	80° across / 20° along
Navigation input	NMEA 0183 (UDP)
Depth / slope input	NMEA 0183 (UDP)
Real time processing	TVG, Digital band pass filter, Deconvolution, Matching filters, etc.
Synchronization unit	K-sync
	

SEABED SAMPLING

Equipment	OSIL piston corer operated with trigger arm
Maximum core length	15 m using 3 m and 5 m long barrels
Barrel diameter (ID-OD)	102 mm Inner Diameter (ID) and 114 mm Outer Diameter (OD)
Plastic liner OD	100 mm
Corer Head	350 kg, variable by adding/removing layers of lead weights
Trigger weight	100 kg
Trigger pilot (gravity core)	1 m long,with variable weight
Total weight	1500 Kg
Winch	Ibercisa
Cable length	6000 m
Cable diameter	12 mm



SEABED SAMPLING

Equipment	OKTOPUS multicorer SL piston corer operated with trigger-arm
Core tube quantity	12 15 m using 3 m and 5 m long barrels
Tube OD/length	100 mm / 610 mm 102 mm inner diameter (ID) and 114 mm outer diameter (OD)
Tube wall thickness	2.5 mm 100 mm
Tube sampling area	75 cm² 210 kg
Tube sampling volume	4304 cm² 1802 kg
Weight without sample	700 kg 1 m long,
Max. instrument tilting during sampling:	± 10° Ibercisa
Max. instrument tilting	6000 m ± 22.5°
Max. water depth	12 mm Full Ocean Depth
Winch	Ibercisa
Cable length	6000 m
Cable diameter	12 mm