



MAREANO - NORTH SEA LEG 2

Cruise report 2025001009 - Sørvest F and
Norskerenna FF

Cruise leader(s): Genoveva Gonzalez-Mirelis (IMR)

TOKTRAPPORT
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Summary (English):

Cruise 2025001009 "Nordsjøen Leg 2" took place from 19.06 to 04.07 (2025) on board RV G. O. Sars in the areas known as Sørvest F and Norskerenna of the North Sea. The cruise was part of the MAREANO Geo-Bio-Chemical cruise series, where the main goal is to collect physical and visual samples from the seafloor environment including fauna and sediments using: towed video (Chimaera), Van Veen grab, box corer, multicorer, beam trawl, and Rothlisberg-Pearcy sledge. Water column data on conductivity and temperature are also collected using a rosette sampler. We also collect stratigraphy data of the top sediment layers using a sub-bottom profiler. During these cruises we conduct two types of stations: stations where we deploy only the video platform, which include a sub-bottom profile (TOPAS) line, referred to as video stations (VS), and so-called full stations (FS) where all the above-mentioned gear types, including video and TOPAS, are deployed.

The specific goals of this cruise were: (1) to collect baseline seafloor data prior to potential offshore wind development in Sørvest F, as a continuation of the winter cruise (2024001021) (2) to provide evidence to support the selection or modify the boundaries of Particularly Valuable Areas (SVO, in Norwegian), and to (3) document the occurrence of Vulnerable Marine Ecosystems (forvaltningsprioritert natur). A set of 136 stations of which 6 were all-gear (FS) stations, classified into three priority levels (1-3), were designated and approved during the survey design phase. In addition, a set of 73 reserve stations were selected in the areas adjacent to our target areas. From these we completed 134 (including all 6 full stations, two of which were also sampled for emerging contaminants). The camera was deployed 141 times. While we could not collect any data or samples from the area known as NSJ2, which had been classified as priority 3, we were able to complete the survey plan for Sørvest F. We also collected two "spontaneous" video stations (stations whose positions were decided once the cruise was started) at an area that had been identified as a gas seepage area. There, we also collected multibeam echosounder data with the EM302 system from Kongsberg. In addition, we collected 23 km of sub-bottom profile line (not including the sub-bottom profiles done along the same lines as the video). The total downtime was approximately 30h.

Summary (Norwegian):

Tokt 2025001009 "Nordsjøen Leg 2" fant sted fra 19.06 til 04.07 (2025) om bord på FF G. O. Sars i områdene kjent som Sørvest F og Norskerenna i Nordsjøen. Toktet var en del av MAREANO Geo-Bio-Kjemi toktseries, hvor hovedmålet er å samle fysiske og visuelle prøver fra sjøbunnsmiljøet, inkludert fauna og sedimenter, ved bruk av: slepevideo (Chimaera), Van Veen-grab, box corer, multicorer, bunntrål (beam trawl) og Rothlisberg-Pearcy slede. Vannkolonnedata om ledningsevne og temperatur blir også samlet ved hjelp av rosettesamplers. Vi samler også stratigrafidata av de øverste sedimentlagene med en sub-bottom profiler. Under disse cruisene gjennomfører vi to typer stasjoner: stasjoner hvor vi kun deployerer videoplattformen, som inkluderer en sub-bottom profile (TOPAS)-linje, omtalt som videostasjoner (VS), og såkalte fullstasjoner (FS) hvor alle de ovennevnte redskapene, inkludert video og TOPAS, blir brukt.

De spesifikke målene for dette toktet var: (1) å samle baseline-data fra sjøbunnen før eventuell utbygging av havvind i Sørvest F, som en videreføring av vintercruiset (2024001021), (2) å levere grunnlag for å støtte valg av eller endring av avgrensninger for Særskilt Verneverdige Områder (SVO), og (3) å dokumentere forekomst av forvaltningsprioritert natur / sårbare marine økosystemer. Et sett på 136 stasjoner, hvorav 6 var alle-redskaps (FS) stasjoner, klassifisert i tre prioriteringsnivåer (1–3), ble fastsatt og godkjent i planleggingsfasen. I tillegg ble et sett på 73 reservestasjoner valgt i områdene rundt våre målområder. Av disse gjennomførte vi 134 stasjoner (inkludert alle 6 fullstasjoner, to av disse ble også prøvetatt for fremvoksende miljøgifter). Kameraet ble satt ut 141 ganger. Selv om vi ikke kunne hente data eller prøver fra området kjent som NSJ2, som var klassifisert som prioritet 3, klarte vi å gjennomføre undersøkelsesplanen for Sørvest F. Vi samlet også to «spontane» videostasjoner (stasjoner hvor posisjonene ble besluttet etter at cruiset var startet) i et område som var identifisert som gasslekkasjeområde. Der samlet vi også multistråleekkolodddata med EM302-systemet fra Kongsberg. I tillegg samlet vi 23 km med sub-bottom profiler (ikke inkludert sub-bottom profiler som ble gjort langs samme linjer som video). Total nedetid var omtrent 30 timer. Oversatt av UiO GPT (GPT 5 mini).

Content

1	Introduction	5
1.1	Sampling methods of GBK cruises	5
1.2	Cruise objectives	11
1.3	Participants	11
2	Achievement of objectives	13
3	Technical issues and downtime	17
4	Changes in routines	18
4.1	Digital video log	18
4.2	Time capture	18
4.3	Migration to SFO	18
5	Sneak peek of results	19
6	Annex I. Additional tables	21
7	Anex II.- Additional figures	37

1 - Introduction

MAREANO is an interdisciplinary, seabed data collection program carried out as a collaboration between the Norwegian Mapping Authority, the Geological Survey of Norway (NGU, in Norwegian) and the Norwegian Institute of Marine Research (IMR). The Program implementation is led by the Program Group, with representatives from four Directorates (Environment, Fisheries, Water Resources and Energy, and Offshore), the Norwegian Coastal Administration, and The Polar Institute, as well as the three above-mentioned executive institutions. A Steering Group (Ministry of Industry and Fisheries, Ministry of Energy, Ministry of Climate and the Environment, Ministry of Local Government and Regional Development) determines the mandate of the Program. The MAREANO Program started in 2005 with the first survey conducted in 2006.

The mandate of MAREANO is to provide data and/or knowledge that can address the needs identified in the management plans for all three Norwegian management regions, namely the Barents Sea and the sea areas outside Lofoten, the Norwegian Sea (St. meld. no. 8 2005-2006/no. 10 2010-2011; no. 37 2008-2009), and since 2022 the North Sea, responding to the needs of offshore wind development. The data derived from field work and subsequent lab analyses are stored digitally at the Institute of Marine Research in the Marbunn, MarVid and MarChem databases. Resulting data products are shared on www.mareano.no.

Data collection in MAREANO is a three-stage process, as follows:

1. Remote sensing surveys. Multibeam Echosounder (MBES) data is collected by the Norwegian Mapping Authority, who provide high-resolution digital terrain models (bathymetry) from these data.
2. Sampling design. The MBES data is processed at NGU, who in turn produces maps of bottom reflectivity. Based on the bottom reflectivity data, the detailed bathymetry, and a preliminary environmental classification for the relevant survey area, a specific survey design is prepared. About 20% of the stations are selected based on subjective criteria, where bottom types and terrain formations are decisive for the station location. For the remaining sampling effort, the emphasis is on representativeness, randomness, and spatial arrangement. They are selected using Generalized Random Tesselation Stratified (GRTS) sampling. This survey design (set of positions and corresponding sampling) must be approved by all partners.
3. Geological, biological and chemical (GBK in Norwegian) survey. The final ground-truthing survey is carried out by IMR and NGU. In this survey(s), sediments and benthic fauna are sampled using video and physical sampling (see section below for more details).

1.1 - Sampling methods of GBK cruises

The following types of sampling gear are used in GBK cruises, including the present one: towed video (*Chimaera*), Van Veen grab (VV), box corer (BC), multicorer (MC), beam trawl (BT), Rothlisberg-Pearcy sledge (RP), and conductivity, temperature, and depth (CTD) rosette sampler.

Biological samples of the benthic fauna are taken using VV, BT and RP, all of which complement each other by collecting fauna in different vertical levels and sub-ecosystems. To achieve the most complementary data collection possible, only decanted fauna (crustaceans; hyperfauna) are taken from the sled hauls. Biological auxiliary parameters are taken from BC samples, alternatively from VV. Geological samples are taken using a VV, alternatively using a 0.1 m² BC. Chemical samples are taken using MC and using a 0.1 m² BC.



Figure 1 The multicorer equipment used in MAREANO for collecting chemical samples



Figure 2 The boxcorer equipment used in MAREANO for collecting sediment samples to measure grainsize as well as ancillary biological parameters

Infauna, or animals that live in the bottom sediments, are collected using VV with a collection surface of 0.1 m² shallower than 500 m, while a larger grab, 0.25 m², is used at greater depths. Animals larger than 1 mm are seaved on board and preserved for further use in MAREANO. Five and two samples are taken respectively per station so that the total area is 0.5 m², which is in line with recommendations given by Norwegian Standards and the Norwegian Environment Agency. Samples for analyses of the biological auxiliary parameters TOC, TOM, TN and grain size are mainly taken from BC samples.



Figure 3 The 0.1 m² Van Veen grab, used in MAREANO for collecting sediment, including infauna, samples

Epifauna is collected using a 2-meter-wide BT with a 4 mm mesh size. The towing time on the bottom is 5 minutes at a speed of 1.5 knots.



Figure 4 The beamtrawl equipment used in MAREANO for collecting epifauna samples

Hyperbenthos – which mainly consists of crustaceans living on and just above the bottom – is collected using a 1 m wide epibenthic sled (RP) with a mesh size of 0.5 mm. The towing time on the bottom is about 15 minutes at a speed of 1 knot.



Figure 5 The RP sledge equipment used in MAREANO for collecting hyperfauna samples

Megafauna, which are relatively easily visible and large animals, as well as geological observations of the bottom and bottom terrain, are documented using towed video that collects data over a straight line of 200 m. Direct observations such as bottom type, species, trawl tracks, litter, and GPS data are continuously annotated/logged using SFO v 1.1.0. The video rig is towed at a speed of 0.3-0.4 knots and with a camera distance to the bottom of approx. 1.5 m.



Figure 6 The towed camera system Chimaera, used in MAREANO to capture video footage of the seabed

We generally conduct two types of stations: stations where we deploy only the video platform, which include a sub-bottom profile (TOPAS) line, referred to as video stations (VS), and so-called full stations (FS) where all the above-mentioned gear types, including video and TOPAS, are deployed.

1.2 - Cruise objectives

The specific goals of this (GBK) cruise were: (1) to collect baseline data prior to potential offshore wind development in Sørvest F, as a continuation of the winter cruise (2) to provide evidence to support the selection or modify the boundaries of Particularly Valuable Areas (SVO, in Norwegian), and to (3) document the occurrence of Vulnerable Marine Ecosystems (*forvaltningsprioritert natur*). These data were collected in two main sampling areas: Nordsjøen Sørvest F, SVO Norskerenna (NS3 B1), with some stations located in the area between the two, within the SVO "Tobisfelt".

1.3 - Participants

The cruise participants are listed below:

Name	Role
Nicole Beaten, NGU (chief geologist)	Sediments and geology
Terje Thorsnes, NGU	Sediments and geology

Liv Plassen, NGU	Sediments and geology
Celine Golda, NGU	Sediments and geology
André Bienfait	Chemistry
Èric Jordà Molina, IMR	Zoobenthos
Anne Kari Sveistrup, IMR	Zoobenthos
Andrey Voronkov, IMR	Zoobenthos
Penny Lee Liebig, IMR	Zoobenthos
Maria Josefina Johansson, IMR	Zoobenthos
Yngve Klungseth Johansen, IMR	Zoobenthos
Egil Frøyen, IMR	Instrumentation
Jan Arne Vågenes, IMR	Instrumentation
Sindre Nygård Larsen, IMR	Instrumentation
Marte Louise Strømme, IMR	Data management
Genoveva Gonzalez Mirelis, IMR	Chief scientist

2 - Achievement of objectives

A set of 136 stations of which 6 were all-gear (FS) stations, classified into three priority levels (1-3), were designated and approved during the survey design phase. In addition, a set of 73 reserve stations were selected in the areas adjacent to our target areas. From these we completed 134 (including all 6 full stations, two of which were also sampled for emerging contaminants). The camera was deployed 141 times.

While we could not collect any data or samples from the area known as NSJ2, which had been classified as priority 3, we were able to complete the sampling for Sørvest F. The detailed split is shown in Tables 1-4.

Table 1.- Planned stations, classified by priority

<i>PLANNED</i>	<i>Video-only</i>	<i>Full stations</i>
<i>Priority 1</i>	104	3
<i>Priority 2</i>	13	2
<i>Priority 3</i>	19	1
<i>Reserve</i>	73	8
Total	209	14

Table 2.- Achieved (i.e. successful) stations, classified by priority

<i>ACHIEVED</i>	<i>Video-only</i>	<i>Full stations</i>
<i>Priority 1</i>	103 (99%)	4 (100%)
<i>Priority 2</i>	13 (100%)	2 (100%)
<i>Priority 3</i>	8 (42%)	0 (0%)
<i>Reserve</i>	10 (13%)	0 (0%)
Total	134	6

Table 3.- Planned stations, classified by area

<i>PLANNED</i>	<i>Video-only</i>	<i>Full stations</i>
<i>Sørvest F</i>	45	0
<i>Norskerenna</i>	138	12
<i>NSJ</i>	26	2
Total	209	14

Table 4.- Achieved stations (i.e. successful), classified by area

<i>ACHIEVED</i>	<i>Video-only</i>	<i>Full stations</i>
<i>Sørvest F</i>	45 (100%)	0
<i>Norskerenna</i>	79 (57%)	6 (50%)
<i>NSJ</i>	10 (38%)	0
Total	134	6

We also collected two “spontaneous” video stations (stations whose positions were decided once the cruise was started) at an area that had been identified as a gas seepage area. There, we also collected multibeam

echosounder data with the EM302 system from Kongsberg.

In addition, we collected 23 km of sub-bottom profile line (not including the sub-bottom profiles done along the same lines as the video).

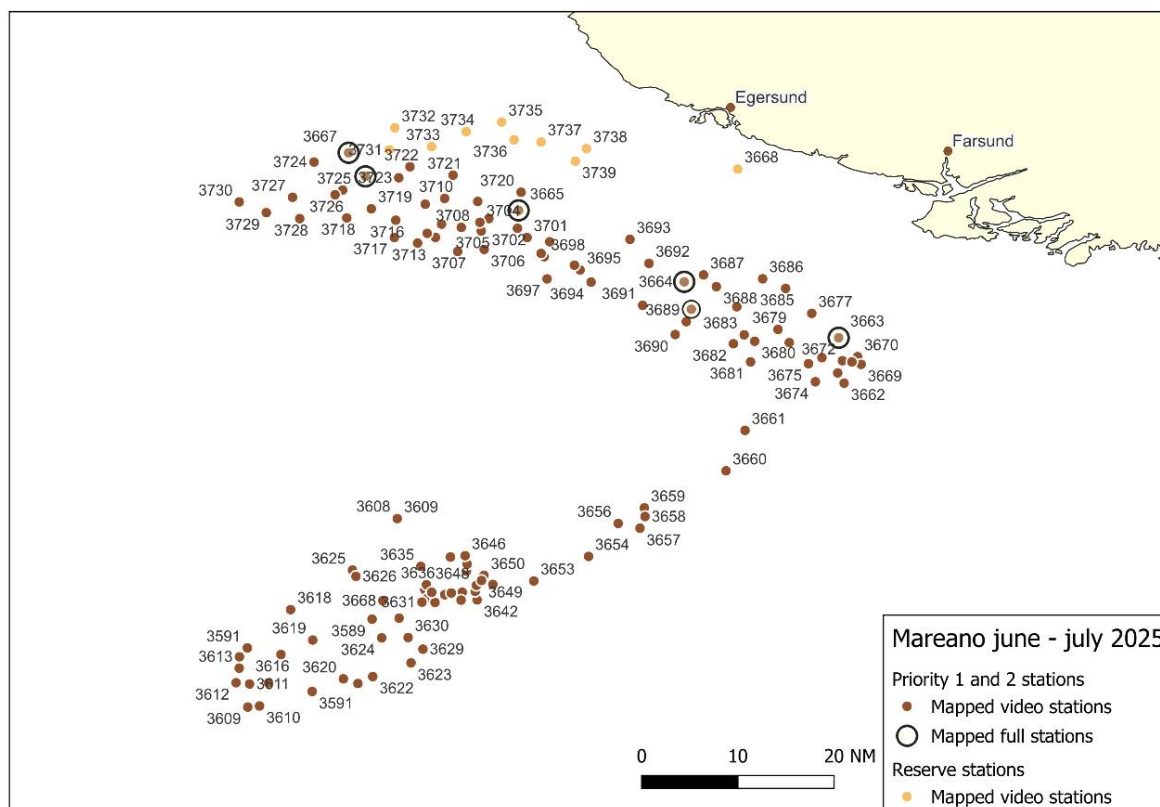


Figure 7 Overview of sampling completed during the cruise

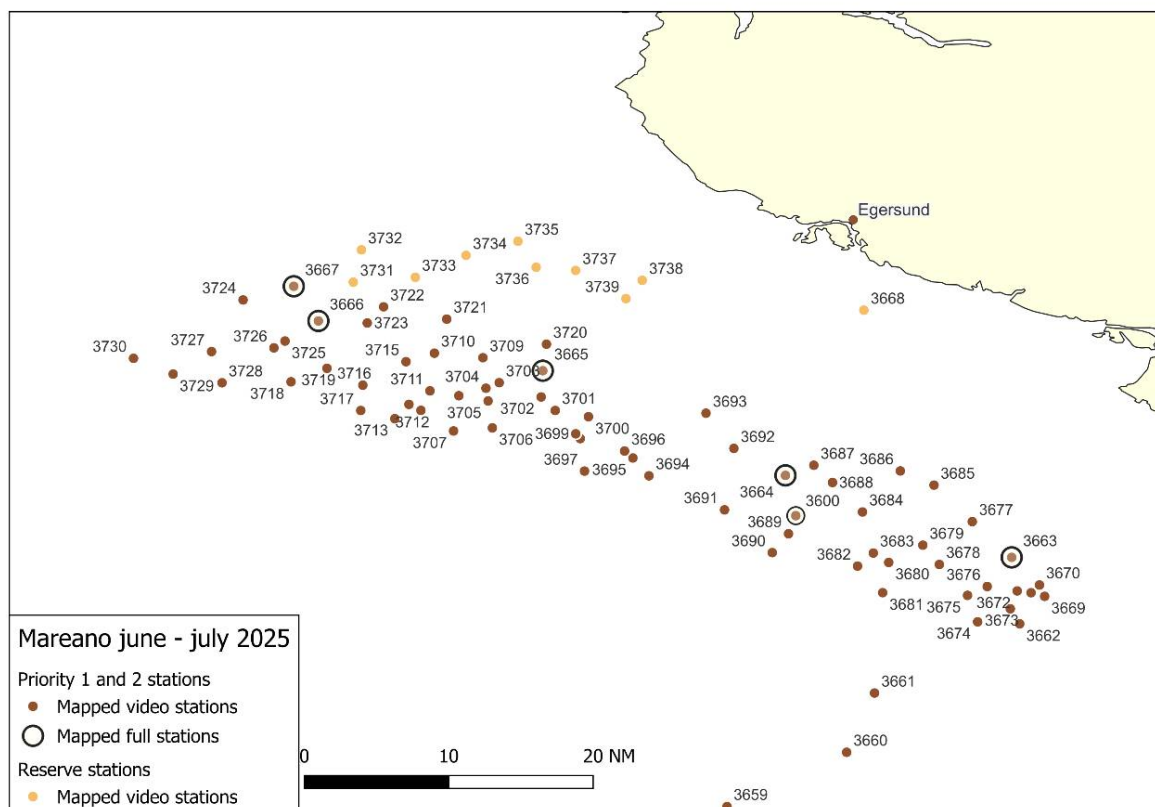


Figure 8 Detail of the northern part of the survey area

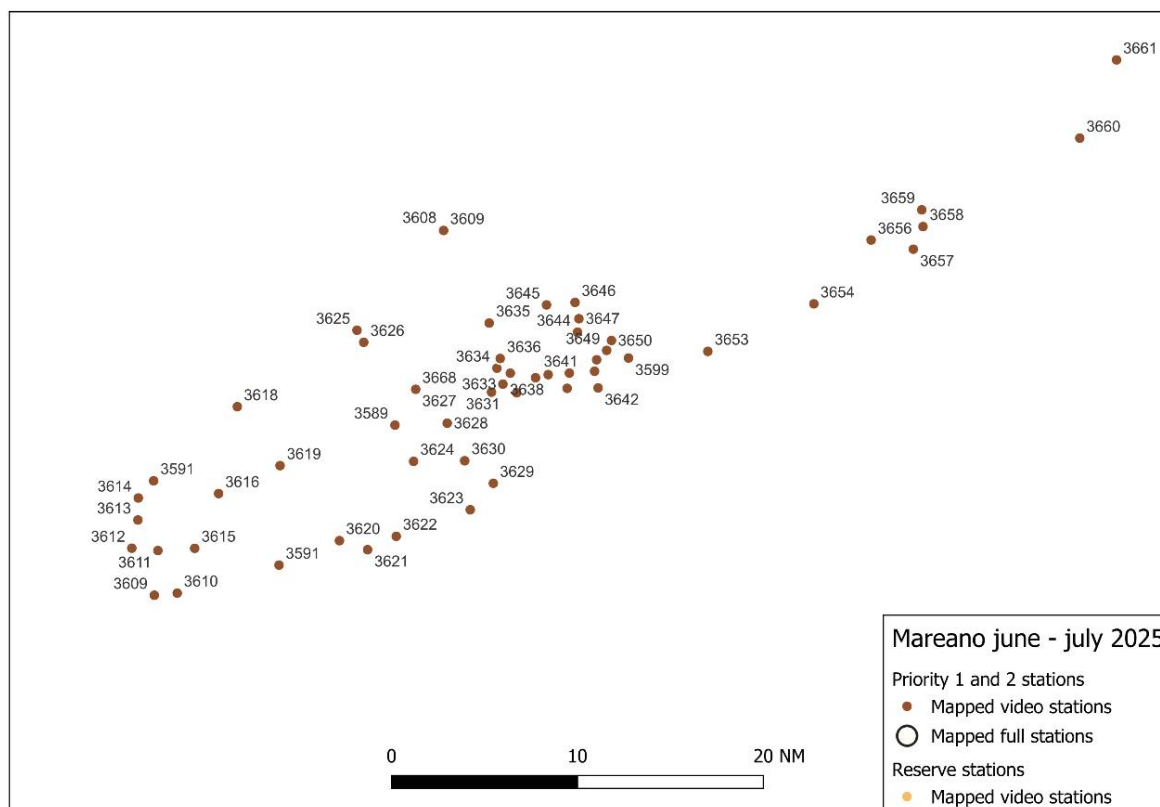


Figure 9 Detail of the southern part of the survey area

3 - Technical issues and downtime

The Chimaera had a critical technical issue that resulted in about 24h downtime as well as the extra cost of having to buy and deliver by express courier the spare part needed, and the gas required to go to shore to collect it.

The Seaguard broke down on 28 June.

Finally, the cable holding Chimaera also gave out on the final day of the cruise, but we were able to recover it. At this point we had already started to collect “reserve” stations.

Total downtime: 30h (approximately!)

4 - Changes in routines

4.1 - Digital video log

At the end of successfully completed video transects we fill out a form which we call the “hand-written log”. This form is, as the name indicates, filled out by hand and then scanned and archived. No hand-written logs were generated in this cruise. Instead we generated a digital log, available at this [link](#). Contact Marte Lousie Strømme if you would like more information about implementing this in other cruises.

4.2 - Time capture

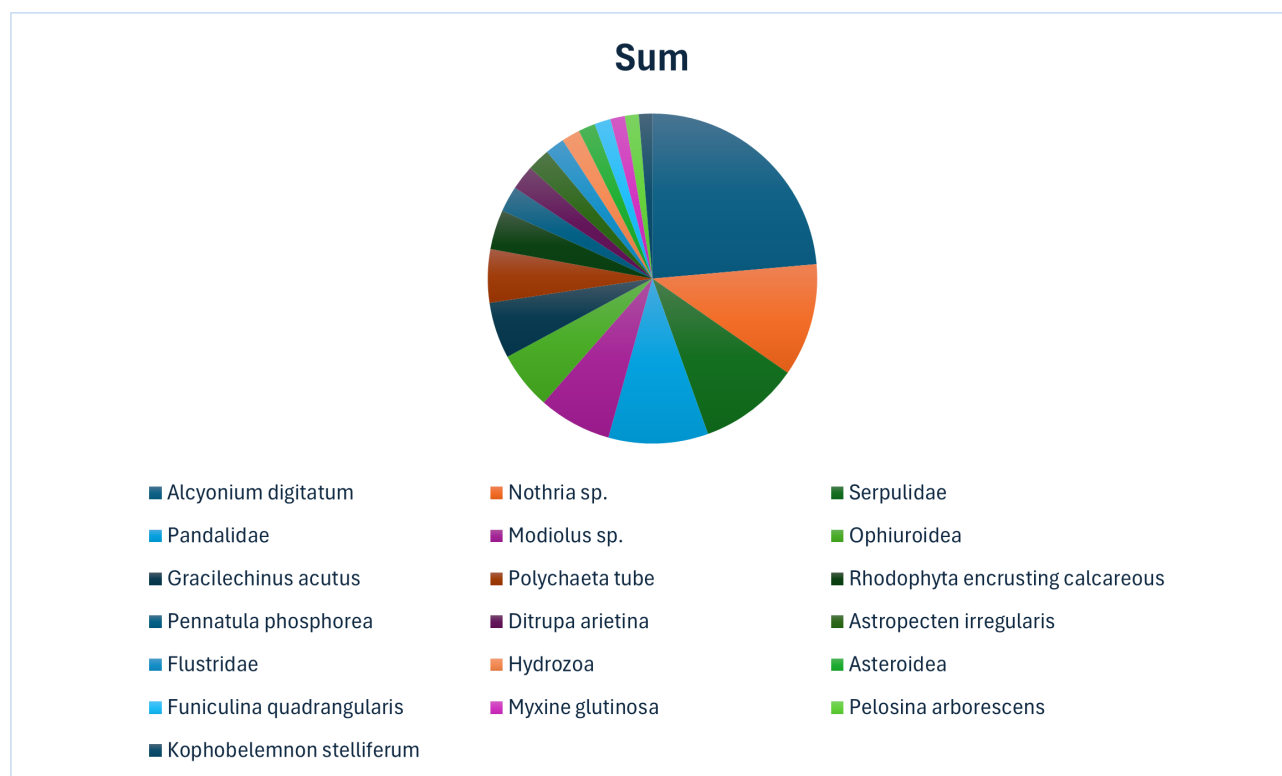
The camera on Chimaera was set up to capture time code (as well as video) for the first time ever in MAREANO using a Tentacle Sync. This means that video frames are stamped with clock time automatically. For details on how this is done, please contact Sindre Nygård Larsen. This should become the new standard.

4.3 - Migration to SFO

This is the first MAREANO cruise where we did not use CampodLogger. For live video annotation we used the version of SFO hosted at <http://docker01-sars.hi.no:3004/>

5 - Sneak peek of results

Below we present the list of the top twenty taxa of epibenthic megafauna registered on video:

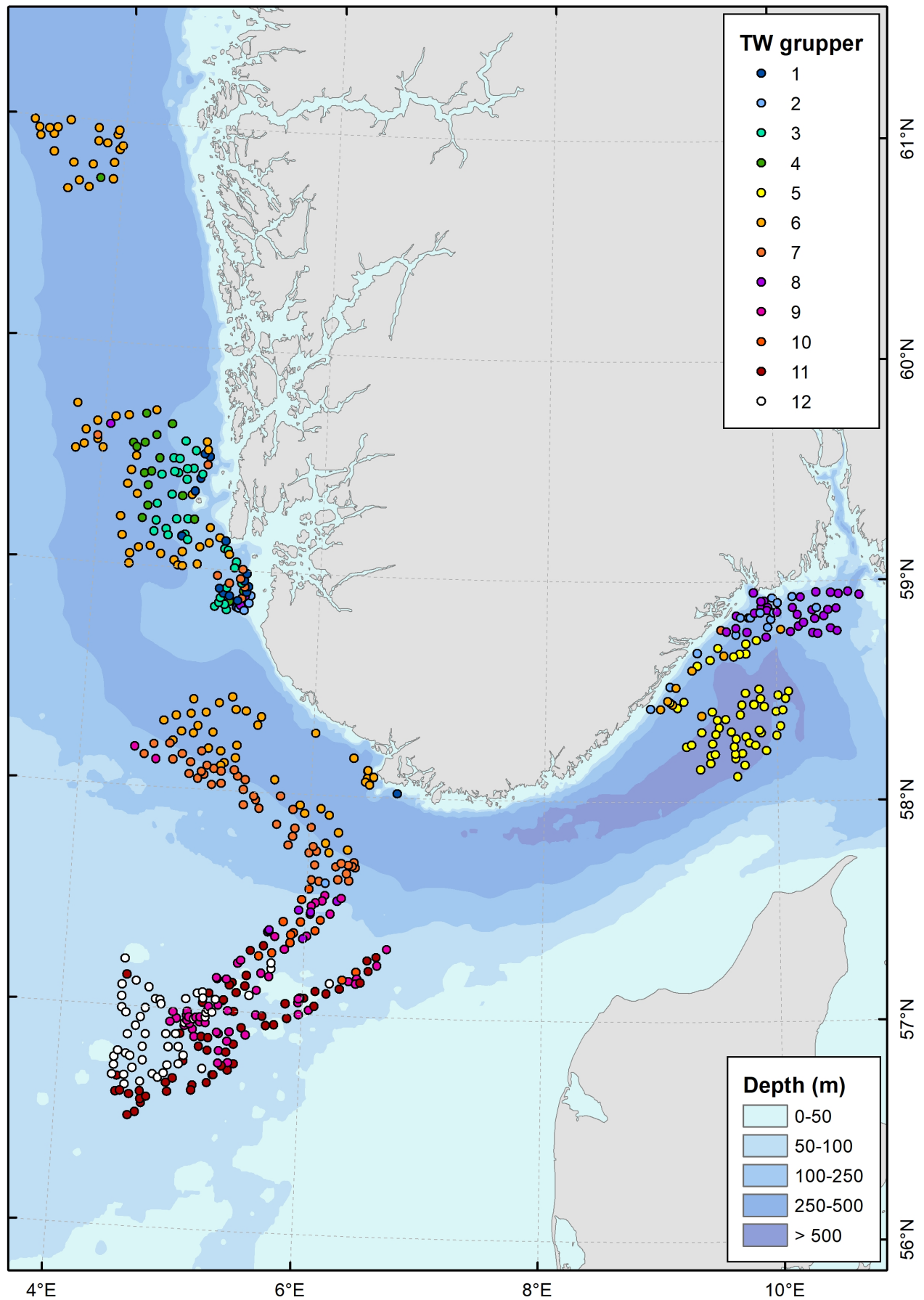


Frequencies of top-twenty taxa registered on video

We confirmed the presence of Vulnerable Marine Ecosystems at multiple locations, but worth highlighting are the bamboo coral garden at R3668, and the *Modiolus* bed at R3651.

More importantly, the video data collected during this cruise have been merged with video data from all cruises carried out in the North Sea/Skagerrak by MAREANO since 2022 (amounting to seven cruises) to address the urgent need for baseline data put forward by the Norwegian Ministry of Energy (*Energidepartementet*).

Therefore, a separate report is available that summarizes the results of these seven cruises (in prep; link to be added). In that report the reader can find, among other findings, an overview of different biotopes observed on the seabed (derived from megafaunal communities). We reproduce here a figure where video stations are plotted over a background map and symbolized according to their assigned biotope, which gives an overview of station similarity and biotope distribution in the North Sea; for more details the reader is referred to the above report.



Distribution of expected biotope classes (labelled with numbers 1-12) as derived from megafaunal community similarity

6 - Annex I. Additional tables

Table I.- Summary of all benthic sampling activities, as extracted from Marbunn

Location	Gear	Valid?	Ref. No	Samp. No	Date and time	Comments
Gas flares	Video	Yes	3608	3690	20.06.2025 12:11	Videograb: Yes. Sample for BM: No.
Gas flares	Video	Yes	3608	3691	20.06.2025 13:16	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3609	3692	20.06.2025 18:42	Videograb: Sample for BM:
Sørvest F	Video	Yes	3610	3693	20.06.2025 20:04	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3611	3694	20.06.2025 21:26	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3612	3695	20.06.2025 22:24	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3613	3696	20.06.2025 23:37	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3614	3697	21.06.2025 01:06	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3591	3698	21.06.2025 02:16	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3615	3699	21.06.2025 04:09	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3616	3700	21.06.2025 05:50	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3617	3701	21.06.2025 07:49	Videograb: Yes Sample for BM: No

Sørvest F	Video	Yes	3618	3702	21.06.2025 10:22	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3619	3703	21.06.2025 12:00	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3620	3704	21.06.2025 13:46	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3621	3705	21.06.2025 15:09	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3622	3706	21.06.2025 16:14	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3623	3707	21.06.2025 17:52	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3624	3708	21.06.2025 19:29	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3589	3709	21.06.2025 20:49	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3625	3710	21.06.2025 22:48	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3626	3711	22.06.2025 00:01	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3627	3712	22.06.2025 01:49	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3628	3713	22.06.2025 03:24	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3629	3714	22.06.2025 04:55	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3630	3715	22.06.2025 06:15	Videograb: Yes Sample for BM: No

Sørvest F	Video	Yes	3631	3716	22.06.2025 08:04	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3632	3717	22.06.2025 09:11	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3633	3718	22.06.2025 10:32	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3634	3719	22.06.2025 11:57	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3635	3720	22.06.2025 13:19	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3636	3721	22.06.2025 14:38	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3637	3722	22.06.2025 15:48	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3638	3723	22.06.2025 17:06	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3639	3724	22.06.2025 18:15	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3640	3725	22.06.2025 19:41	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3641	3726	22.06.2025 20:55	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3642	3727	22.06.2025 22:11	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3643	3728	22.06.2025 23:40	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3644	3729	23.06.2025 01:04	Videograb: Yes Sample for BM: No

Sørvest F	Video	Yes	3645	3730	23.06.2025 02:10	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3646	3731	23.06.2025 03:14	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3647	3732	23.06.2025 04:22	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3648	3733	23.06.2025 05:54	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3649	3734	23.06.2025 07:02	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3650	3735	23.06.2025 08:06	Videograb: Yes Sample for BM: No
Sørvest F	Video	Yes	3599	3736	23.06.2025 09:18	Videograb: No Sample for BM: No
Sørvest F	Video	Yes	3651	3737	23.06.2025 11:13	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3652	3738	23.06.2025 12:37	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3653	3739	23.06.2025 14:19	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3654	3740	23.06.2025 16:02	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3655	3741	23.06.2025 17:18	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3656	3742	23.06.2025 18:58	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3657	3743	24.06.2025 00:22	Videograb: No Sample for BM: No

Tobisfelt	Video	Yes	3658	3744	24.06.2025 01:39	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3659	3745	24.06.2025 02:52	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3660	3746	24.06.2025 04:49	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3660	3747	24.06.2025 05:49	Videograb: No Sample for BM: No
Tobisfelt	Video	Yes	3661	3748	24.06.2025 07:23	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3662	3749	24.06.2025 09:45	Videograb: No Sample for BM: No
Norskerenna	Small VV grab	No	3663	6	24.06.2025 14:27	
Norskerenna	Small VV grab	No	3663	7	24.06.2025 14:55	
Norskerenna	Small VV grab	Yes	3663	8	24.06.2025 15:09	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 4 (0001-0004).
Norskerenna	Small VV grab	Yes	3663	9	24.06.2025 15:55	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0005-0007).
Norskerenna	Small VV grab	Yes	3663	10	24.06.2025 16:21	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0008-0009).
Norskerenna	Small VV grab	Yes	3663	11	24.06.2025 16:45	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 4 (0010-0013).
Norskerenna	Small VV grab	Yes	3663	12	24.06.2025 17:06	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0014-0015).
Norskerenna	Boxcorer	Yes	3663	9	24.06.2025 17:37	2 x cores for grain size (frozen). 0 foraminifera sample. 2 photos of surface (0017-0018).

Norskerenna	Multicorer	Yes	3663	4	24.06.2025 18:26	6 cores (NGU:4, IMR:2).
Norskerenna	Beamtrawl	Yes	3663	1	24.06.2025 19:07	Subsample: 100 percent. 5_mm: 1x3 L (formalin). 1_mm: 1x3 L (ethanol). Photo: 8 (0019-00024, 0027-0028).
Norskerenna	RP-sledge	Yes	3663	1	24.06.2025 19:50	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x0.5 L to TROMSØ. 4_mm + 1_mm: 1x3 L No photo
Norskerenna	RP-sledge	Yes	3663	2	24.06.2025 20:41	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to Bergen Museum. 4_mm + 1_mm: 1x3 L No photo
Norskerenna	Small VV grab	Yes	3664	13	24.06.2025 23:59	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: 4 (0029-0032).
Norskerenna	Small VV grab	Yes	3664	14	25.06.2025 00:21	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: 4 (0033-0036).
Norskerenna	Small VV grab	Yes	3664	15	25.06.2025 00:44	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: 3 (0037-0039).
Norskerenna	Small VV grab	Yes	3664	16	25.06.2025 01:17	Sediment depth: 0 cm. Sediment type: Mud. Journal/shift leader: Jossan
Norskerenna	Small VV grab	Yes	3664	17	25.06.2025 01:38	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: 6 (0044-0049).
Norskerenna	Boxcorer	No	3664	10	25.06.2025 02:11	
Norskerenna	Boxcorer	No	3664	11	25.06.2025 02:24	
Norskerenna	Boxcorer	No	3664	12	25.06.2025 02:42	
Norskerenna	Boxcorer	Yes	3664	13	25.06.2025 02:55	2 x cores for grain size (frozen). No foraminifera sample. 4 photos of surface (0050-0053).
Norskerenna	Multicorer	Yes	3664	5	25.06.2025 03:31	

Norskerenna	Beamtrawl	Yes	3664	2	25.06.2025 04:20	Subsample: 100 percent. 5_mm: 1x5 L (formalin). 1_mm: 1x3 L (ethanol). Photo: 6 (0054-0059).
Norskerenna	RP-sledge	Yes	3664	3	25.06.2025 05:11	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x0.5 L to Bergen Museum. 4_mm + 1_mm: 1x3 L No photo
Norskerenna	RP-sledge	Yes	3664	4	25.06.2025 06:21	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to TROMSØ. 4_mm + 1_mm: 1x1 L No photo
Norskerenna	Small VV grab	Yes	3665	18	25.06.2025 10:13	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: 3 (0060-0062).
Norskerenna	Small VV grab	Yes	3665	19	25.06.2025 10:37	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: 3 (0063-0065).
Norskerenna	Small VV grab	Yes	3665	20	25.06.2025 10:59	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: 4 (0066-0069).
Norskerenna	Small VV grab	Yes	3665	21	25.06.2025 11:21	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: 3 (0070-0072).
Norskerenna	Small VV grab	Yes	3665	22	25.06.2025 11:53	Subsample: 100 percent. 1_mm: 1x0.3 L (formalin). Photo: (0073-0074).
Norskerenna	Boxcorer	No	3665	14	25.06.2025 12:23	
Norskerenna	Multicorer	Yes	3665	6	25.06.2025 13:24	
Norskerenna	Beamtrawl	Yes	3665	3	25.06.2025 14:23	Subsample: 100 percent. 5_mm: 1x3 L (formalin). 1_mm: 1x3 L (ethanol). Photo: 11 (0080-0090).
Norskerenna	RP-sledge	Yes	3665	5	25.06.2025 15:16	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to TROMSØ. 4_mm + 1_mm: 1x1 L No photo
Norskerenna	RP-sledge	Yes	3665	6	25.06.2025 16:21	Subsample: 100 percent. EtOH. 0.5_mm dec: - 4_mm + 1_mm: 1x3 L No photo
Norskerenna	Small VV grab	No	3666	23	25.06.2025 21:12	

Norskerenna	Small VV grab	No	3666	24	25.06.2025 21:26	
Norskerenna	Small VV grab	Yes	3666	25	25.06.2025 21:49	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0091-0093).
Norskerenna	Small VV grab	Yes	3666	26	25.06.2025 22:11	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0094-0095).
Norskerenna	Small VV grab	Yes	3666	27	25.06.2025 22:33	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0096-0098).
Norskerenna	Small VV grab	Yes	3666	28	25.06.2025 22:55	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0099-0101).
Norskerenna	Small VV grab	Yes	3666	29	25.06.2025 23:27	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0102-0103).
Norskerenna	Boxcorer	No	3666	15	25.06.2025 23:58	
Norskerenna	Boxcorer	No	3666	16	26.06.2025 00:14	
Norskerenna	Boxcorer	Yes	3666	17	26.06.2025 00:33	2 x cores for grain size (frozen). No foraminifera sample. photos of surface (0104).
Norskerenna	Multicorer	Yes	3666	7	26.06.2025 01:32	
Norskerenna	Beamtrawl	Yes	3666	4	26.06.2025 02:15	Subsample: 100 percent. 5_mm: 1x10 L (formalin). 1_mm: 1x3 L (ethanol). Photo: 11 (0105-0115).
Norskerenna	RP-sledge	Yes	3666	7	26.06.2025 03:14	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to TROMSØ. 4_mm + 1_mm: 1x1 L No photo
Norskerenna	RP-sledge	Yes	3666	8	26.06.2025 04:14	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to Bergen Museum. 4_mm + 1_mm: 1x1 L No photo
Norskerenna	Small VV grab	No	3667	30	26.06.2025 06:10	

Norskerenna	Small VV grab	Yes	3667	31	26.06.2025 06:25	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0116-0117).
Norskerenna	Small VV grab	Yes	3667	32	26.06.2025 07:01	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0118-0119).
Norskerenna	Small VV grab	Yes	3667	33	26.06.2025 07:24	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0120-0121).
Norskerenna	Small VV grab	Yes	3667	34	26.06.2025 07:49	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0122-0123).
Norskerenna	Small VV grab	No	3667	35	26.06.2025 08:12	
Norskerenna	Small VV grab	Yes	3667	36	26.06.2025 08:25	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0124-0125).
Norskerenna	Boxcorer	Yes	3667	18	26.06.2025 08:54	2 x cores for grain size (frozen). No foraminifera sample. 4 photos of surface (0126-0129).
Norskerenna	Multicorer	Yes	3667	8	26.06.2025 09:30	
Norskerenna	Beamtrawl	Yes	3667	5	26.06.2025 10:08	Subsample: 100 percent. 5_mm: 1x5 L, 1x3 L (formalin). 1_mm: 1x3 L (ethanol). Photo: 9 (0130-0138).
Norskerenna	RP-sledge	Yes	3667	9	26.06.2025 11:14	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to TROMSØ. 4_mm + 1_mm: 1x0.5 L No photo
Norskerenna	RP-sledge	Yes	3667	10	26.06.2025 12:16	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to Bergen Museum. 4_mm + 1_mm: 1x1 L No photo
Norskerenna	Small VV grab	Yes	3600	37	26.06.2025 17:46	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 4 (0139-0142).
Norskerenna	Small VV grab	No	3600	38	26.06.2025 18:12	
Norskerenna	Small VV grab	Yes	3600	39	26.06.2025 18:23	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0143-0144).

Norskerenna	Small VV grab	Yes	3600	40	26.06.2025 18:41	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0145-0146).
Norskerenna	Small VV grab	Yes	3600	41	26.06.2025 19:00	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0148-0150)
Norskerenna	Small VV grab	Yes	3600	42	26.06.2025 19:30	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0151-0152)
Norskerenna	Boxcorer	Yes	3600	19	26.06.2025 19:56	2 x cores for grain size (frozen). No foraminifera sample. 4 photos of surface (0153-0156).
Norskerenna	Multicorer	Yes	3600	9	26.06.2025 20:26	
Norskerenna	Beamtrawl	Yes	3600	6	26.06.2025 21:00	Subsample: 100 percent. 5_mm: 1x5 L (formalin). 1_mm: 1x3 L (ethanol). Photo: 8 (0157-0164).
Norskerenna	RP-sledge	Yes	3600	11	26.06.2025 21:48	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x0.5 L to Bergen Museum. 4_mm + 1_mm: -. No photo
Norskerenna	RP-sledge	Yes	3600	12	26.06.2025 22:40	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to TROMSØ. 4_mm + 1_mm: 1x1L. No photo
Norskerenna	Video	Yes	3668	3750	27.06.2025 17:07	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3662	3751	27.06.2025 21:59	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3669	3752	27.06.2025 23:21	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3670	3753	28.06.2025 03:05	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3671	3754	28.06.2025 04:35	Videograb: No Sample for BM: No
Norskerenna	Video	No	3672	3755	28.06.2025 06:01	

Norskerenna	Video	Yes	3672	3756	28.06.2025 06:31	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3673	3757	28.06.2025 07:36	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3674	3758	28.06.2025 09:00	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3675	3759	28.06.2025 10:25	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3676	3760	28.06.2025 11:40	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3663	3761	28.06.2025 12:59	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3677	3762	28.06.2025 14:31	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3678	3763	28.06.2025 16:21	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3679	3764	28.06.2025 17:37	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3680	3765	28.06.2025 18:56	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3681	3766	28.06.2025 20:20	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3682	3767	28.06.2025 21:40	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3683	3768	28.06.2025 22:54	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3684	3769	29.06.2025 00:32	Videograb: No Sample for BM: No

Norskerenna	Video	Yes	3685	3770	29.06.2025 02:15	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3686	3771	29.06.2025 03:43	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3687	3772	29.06.2025 05:53	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3688	3773	29.06.2025 07:29	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3664	3774	29.06.2025 08:55	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3600	3775	29.06.2025 10:22	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3689	3776	29.06.2025 11:40	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3690	3777	29.06.2025 20:35	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3691	3778	29.06.2025 22:17	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3692	3779	30.06.2025 00:00	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3693	3780	30.06.2025 01:29	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3694	3781	30.06.2025 03:27	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3695	3782	30.06.2025 04:38	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3696	3783	30.06.2025 05:54	Videograb: Yes Sample for BM: No

Norskerenna	Video	Yes	3697	3784	30.06.2025 07:12	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3698	3785	30.06.2025 08:35	Videograb: Yes Sample for BM: No
Norskerenna	Video	No	3699	3786	30.06.2025 09:41	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3700	3787	30.06.2025 10:59	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3701	3788	30.06.2025 12:07	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3702	3789	30.06.2025 13:19	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3665	3790	30.06.2025 14:29	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3703	3791	30.06.2025 15:51	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3704	3792	30.06.2025 16:59	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3705	3793	30.06.2025 18:01	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3706	3794	30.06.2025 19:13	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3707	3795	30.06.2025 20:17	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3708	3796	30.06.2025 21:36	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3709	3797	30.06.2025 23:06	Videograb: Yes Sample for BM: No

Norskerenna	Video	Yes	3710	3798	01.07.2025 00:24	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3711	3799	01.07.2025 01:45	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3712	3800	01.07.2025 03:06	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3713	3801	01.07.2025 04:31	Videograb: Yes Sample for BM: No
Norskerenna	Video	No	3714	3802	01.07.2025 05:57	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3715	3803	01.07.2025 10:45	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3716	3804	01.07.2025 12:06	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3717	3805	01.07.2025 13:19	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3718	3806	01.07.2025 14:56	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3719	3807	01.07.2025 16:19	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3666	3808	01.07.2025 17:51	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3667	3809	01.07.2025 19:10	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3714	3810	01.07.2025 21:30	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3720	3811	01.07.2025 23:35	Videograb: Yes Sample for BM: No

Norskerenna	Video	Yes	3721	3812	02.07.2025 01:20	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3722	3813	02.07.2025 02:55	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3723	3814	02.07.2025 04:13	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3724	3815	02.07.2025 06:10	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3725	3816	02.07.2025 07:43	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3726	3817	02.07.2025 08:52	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3727	3818	02.07.2025 10:09	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3728	3819	02.07.2025 11:36	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3729	3820	02.07.2025 12:52	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3730	3821	02.07.2025 14:06	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3731	3822	02.07.2025 16:51	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3732	3823	02.07.2025 18:16	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3733	3824	02.07.2025 19:53	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3734	3825	02.07.2025 21:24	Videograb: Yes Sample for BM: No

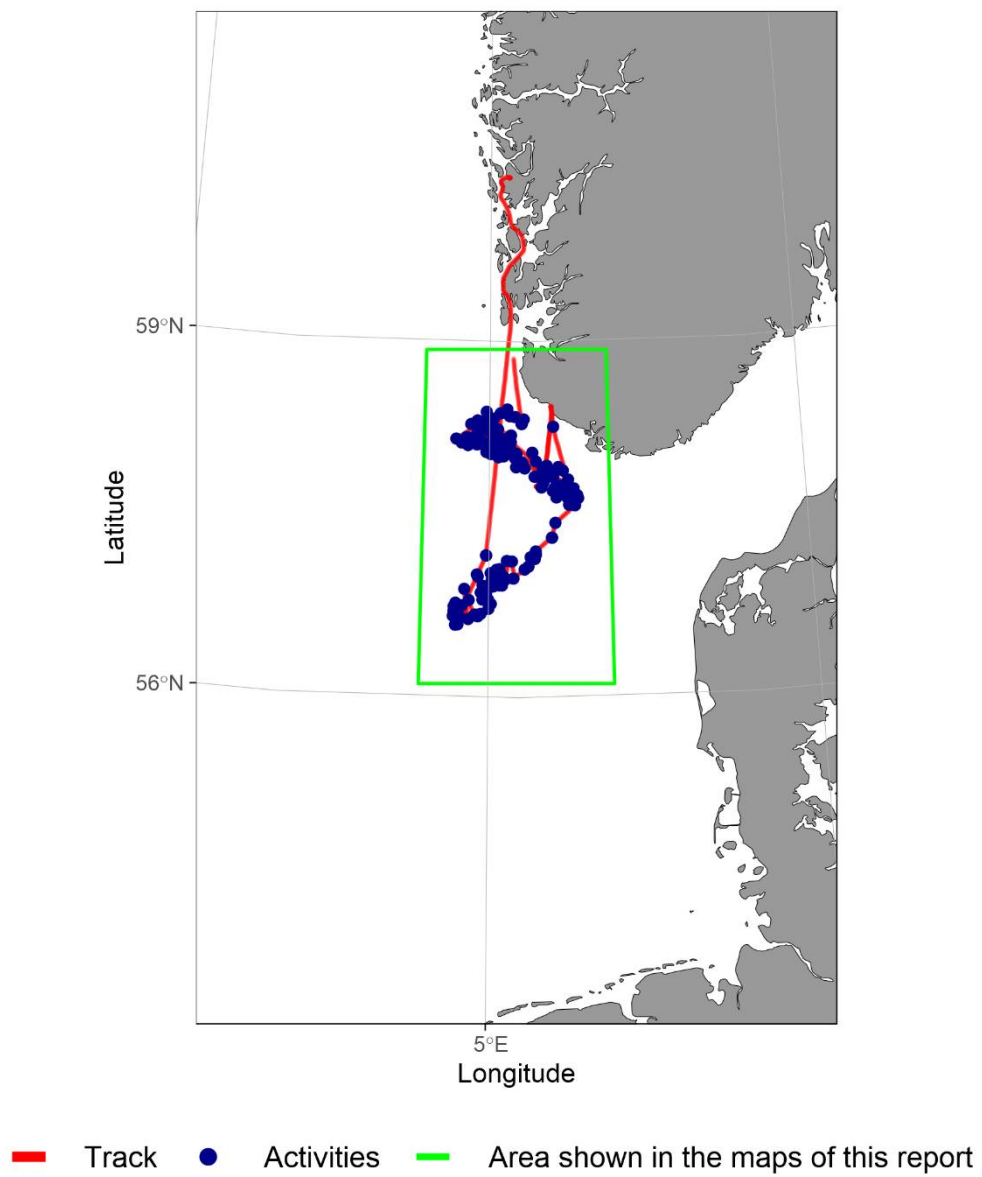
Norskerenna	Video	Yes	3735	3826	02.07.2025 22:47	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3736	3827	03.07.2025 00:13	Videograb: No Sample for BM: No
Norskerenna	Video	Yes	3737	3828	03.07.2025 01:27	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3738	3829	03.07.2025 03:06	Videograb: Yes Sample for BM: No
Norskerenna	Video	Yes	3739	3830	03.07.2025 04:41	Videograb: Yes but lost Sample for BM: No

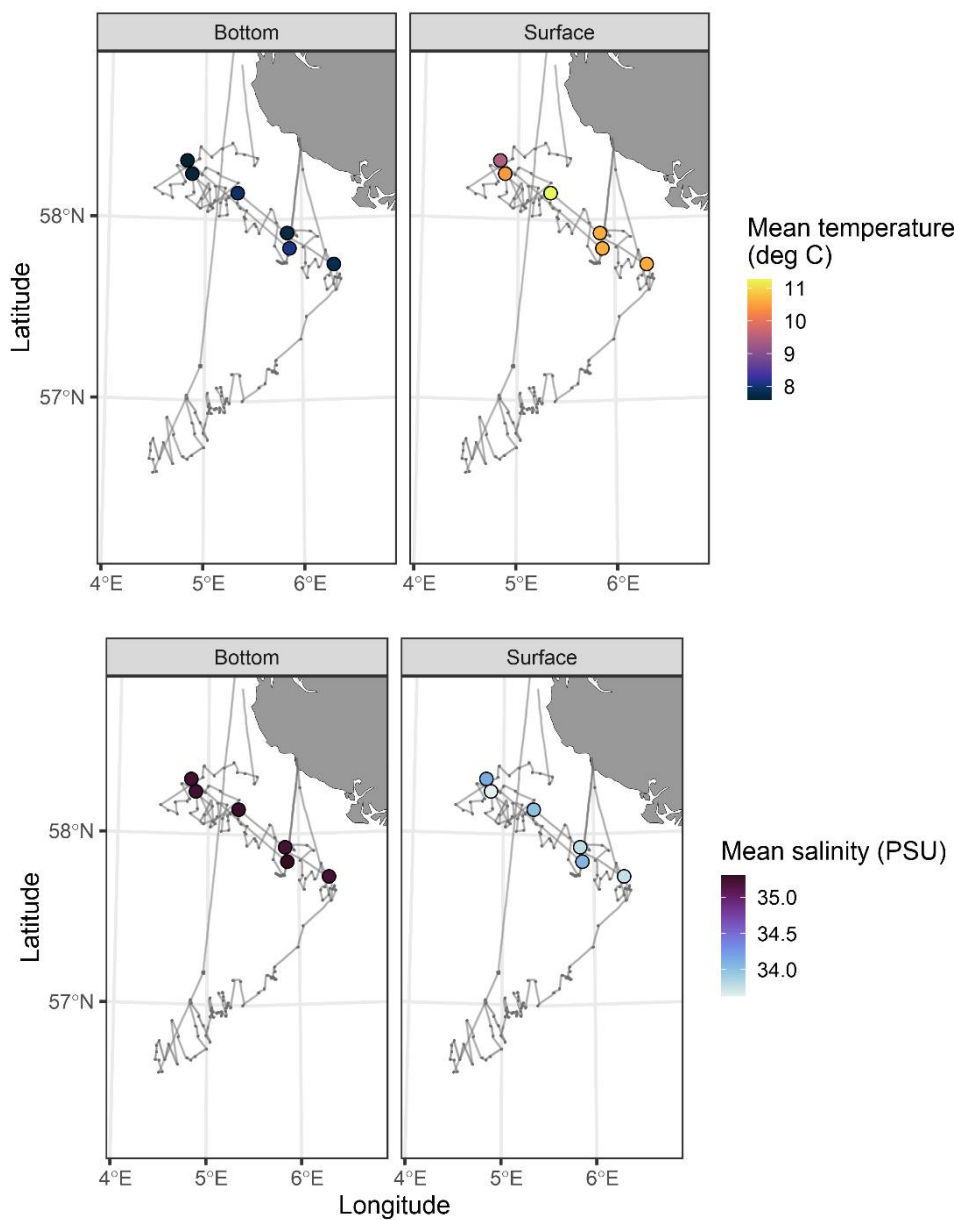
Table II.- summary of CTD casts

Location	Equipment	Ref. No	Sample No	Date and time
Norskerenna	CTD	3663	419	24.06.2025 13:36
Norskerenna	CTD	3664	420	24.06.2025 23:34
Norskerenna	CTD	3665	421	25.06.2025 09:19
Norskerenna	CTD	3666	422	25.06.2025 20:48
Norskerenna	CTD	3667	423	26.06.2025 05:47
Norskerenna	CTD	3600	424	26.06.2025 17:22

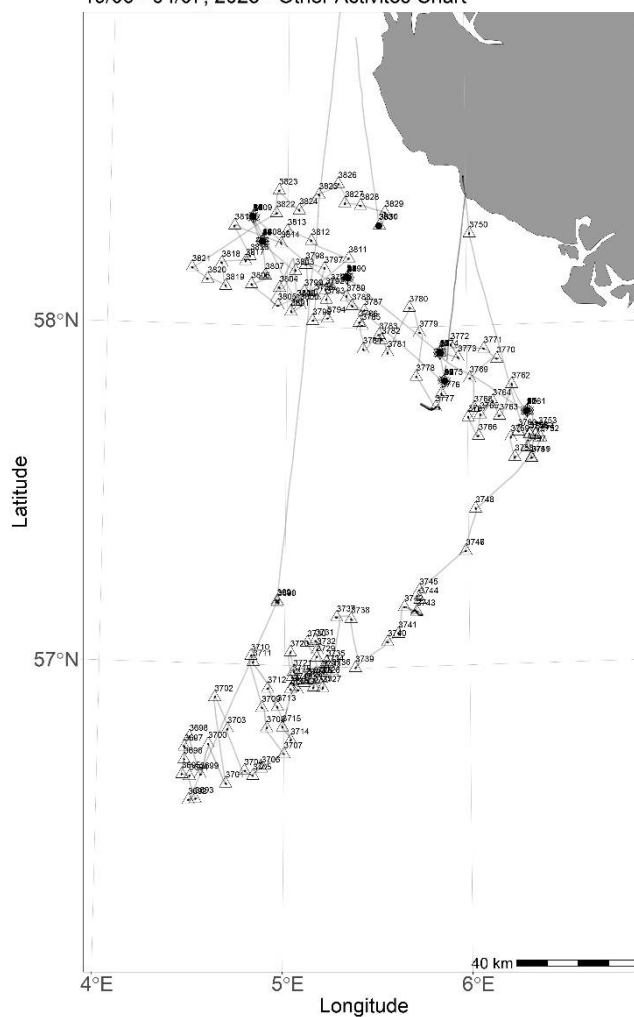
7 - Anex II.- Additional figures

1.



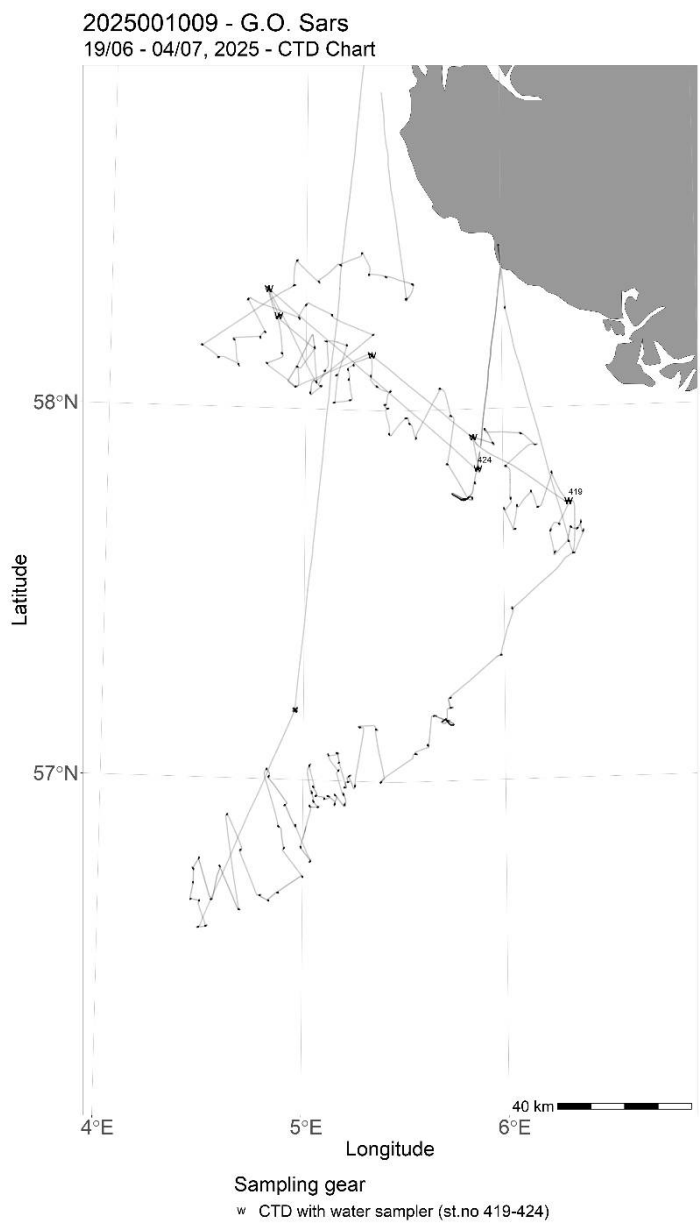


2025001009 - G.O. Sars
19/06 - 04/07, 2025 - Other Activities Chart



Sampling gear

- △ Video station (st.no 3690-3830)
- + Grab (st.no 6-42)
- × Box core (st.no 9-19)
- ◇ Multicorer (st.no 4-9)
- ▽ Beam trawl (st.no 1-6)
- Sled (st.no 1-12)
- Other station (S-S) (st.no 3831)





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