MAREANO NORTH SEA/FRISK OSLOFJORD CRUISE (2022118)

Utsira, SVO “North Sea & Skagerrak #4” and Ytre Hvaler.
RV "G.O. Sars" 14.10–30.10 2022

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

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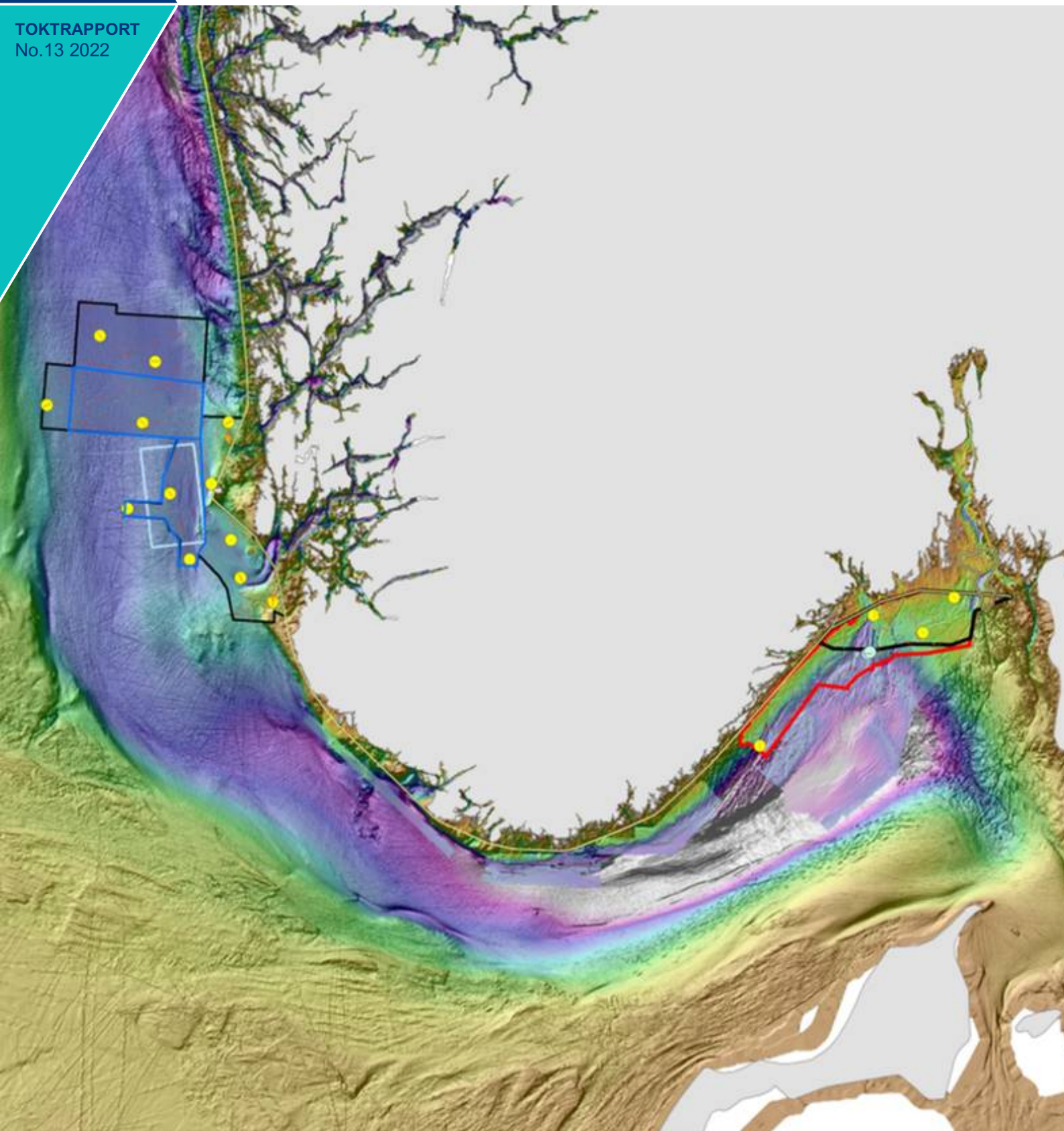

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Content

1 Introduction 4

2 Cruise participants 5

2.1 Sediments and geology 5

2.2 Chemistry 5

2.3 Zoobenthos 5

2.4 Instruments 5

2.5 Data management 5

2.6 Chief Scientist 5

3 Survey design and field methods 6

4 Sampling and data collection 11

5 Recommendations 22

5.1 Wish list 22

6 Summary of all activities 23

1 - Introduction

MAREANO is an interdisciplinary program carried out as a collaboration between the Mapping Authority (*Kartverket*), 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 five directorates and the three above-mentioned executive institutions, while a Steering Group (Ministry of Industry and Fisheries, Oil and Energy, Climate and the Environment, Transport and Municipalities and Modernisation) 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 knowledge that can address the needs identified in the Management Plan for the Barents Sea and the sea areas outside Lofoten, as well as the Management Plan for the Norwegian Sea (St.meld. no. 8 2005-2006/no. 10 2010-2011; no. 37 2008-2009). The data derived from field work and subsequent lab analyses are stored digitally at the Institute of Marine Research in the Marbunn database. Resulting data products are shared on www.mareano.no.

The objectives of this cruise are: (1) to collect baseline data prior to any construction of wind turbines outside Utsira Island (Utsira Nord), including data from the offshore wind area itself and an adjacent control area (Utsira Kontroll), (2) to provide evidence for the selection of the *Særlig Verdigful Område* (SVO) known as “North Sea and Skagerrak 4”, henceforth NS4.

This cruise was carried out in combination with a Frisk Oslofjord (henceforth FriskO)-funded survey at Hvaler National Park, which was conducted on days 24-28 October. The objective of this part of the cruise was to collect data that can be used to determine the distribution of management-relevant habitats (*forvaltningsprioritert natur*).

2 - Cruise participants

2.1 - Sediments and geology

Aivo Lepland, NGU/Terje Thorsnes, NGU (chief geologist)

Liv Plassen, NGU

Shyam Chand, NGU

Berrit Bredemeier, NGU

2.2 - Chemistry

Grethe Tveit

2.3 - Zoobenthos

Barbro Taraldset Haugland, IMR

Heidi Gabrielsen, IMR

Lene Christensen, IMR (on training)

Marco Colossi Brustolin, IMR

Maria Josefina Johansson, IMR

Sten-Richard Birkely, IMR

Yngve Klungseth Johansen, IMR

2.4 - Instruments

Egil Frøyen, IMR

Jan Arne Vågenes, IMr

Leif Johan Ohnstad (on training), IMR

Sindre Nygård Larsen, IMR

2.5 - Data management

Marte Louise Strømme, IMR

2.6 - Chief Scientist

Genoveva Gonzalez Mirelis, IMR

3 - Survey design and field methods

In MAREANO geological, biological and chemical sampling cruises are conducted according to the following scheme:

1. The mapping agency supplies detailed depth data based on measurements with multi-beam sonar for the area which will later be mapped in terms of biology, geology and chemistry.

2. NGU processes data from multibeam sonar and produces maps of bottom reflectivity. Based on the bottom reflectivity data, the detailed depth data and a preliminary habitat type modelling/classification, this forms the basis for station planning.

3. The Institute of Marine Research and NGU select points (stations) where collection of field data is carried out, i.e. sediments and benthic fauna using video and physical sampling.

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 group of stations, the emphasis is on representativeness for the relevant field areas.

The following types of sampling gear were used in this cruise: 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 a 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 the 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.

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.

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.

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.

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 logged using Campodlogger v. 3.0. The video rig is towed at a speed of 0.5 knots and with a camera distance to the bottom of approx. 1.5 m.

We conduct generally, two types of stations: video stations, where only the video system is deployed, and so-called full stations (FS) where all the above-mentioned gear types are deployed. In this cruise we have also conducted a station where only sediment cores were taken, both with the BC and the MC. This is a station where chemical data is available from 1992 and there was interest in revisiting it.


SWL3T





Towed camera system Multicorer Boxcorer







Van Veen Grab RP-sledge Beamtrawl

4 - Sampling and data collection

A total of 18 (Utsira Kontroll), 18 (Utsira Nord), 39 (NS4), and 35 (Hv) were planned for this cruise (total, 110 stations). This included 1 FS at UK, 3 at UN, and 3 at NS4. From these, 104 video stations and all 7 FS were completed. Four video stations were dropped for not being suitable for a towed camera, to minimize the risk of damaging the equipment. These were P145, F18, F20 and F16. F23 was started and aborted halfway through, so this one has a Reference number.

Station P152 (MAREANO) and F30 (FriskO) had been planned separately and turned out to be only 700 m apart. I decided to take only P152, but I still need to make sure that the data is available in both projects. In total this makes 104 stations completed, out of those planned.

In addition to these, we did 3 video stations at NS4 from the reserve stock. I picked those that were closest to the boundary of the 2022 area for geographic consistency reasons. In addition to that we did a MC station (associated to planned FS P7, but 1.5 km away), also because of its geographic position and time available. Note that by doing this, P7 got assigned a Reference number (3183).

We conducted a special survey of the Tisler reef, in Hv, which consisted of 11 specially designed video lines (amounting to 5300 m of towed video, so roughly equivalent to 26 regular video stations). This was not part of the original cruise plan.

We were able to sample a specimen of a seapen (*Styatula* sp. cf.) with the VV grab. This is currently being investigated.

An unregistered shipwreck was found at the following position: 58.7650, 10.3247. It was about 40 m in length, laying in a north-south direction. It seems to have been split down the middle. Since it was outside the 12 nautical mile line, we took multibeam data of the site.

We reported it to Kystverket by email to Knut Markus Arnhus, who forwarded the information to The Norwegian Mapping Authority and The Norwegian Defense Research Establishment.

We also forwarded all our data (footage and multibeam) to Frode Kvalø, at the Norwegian Maritime Museum.

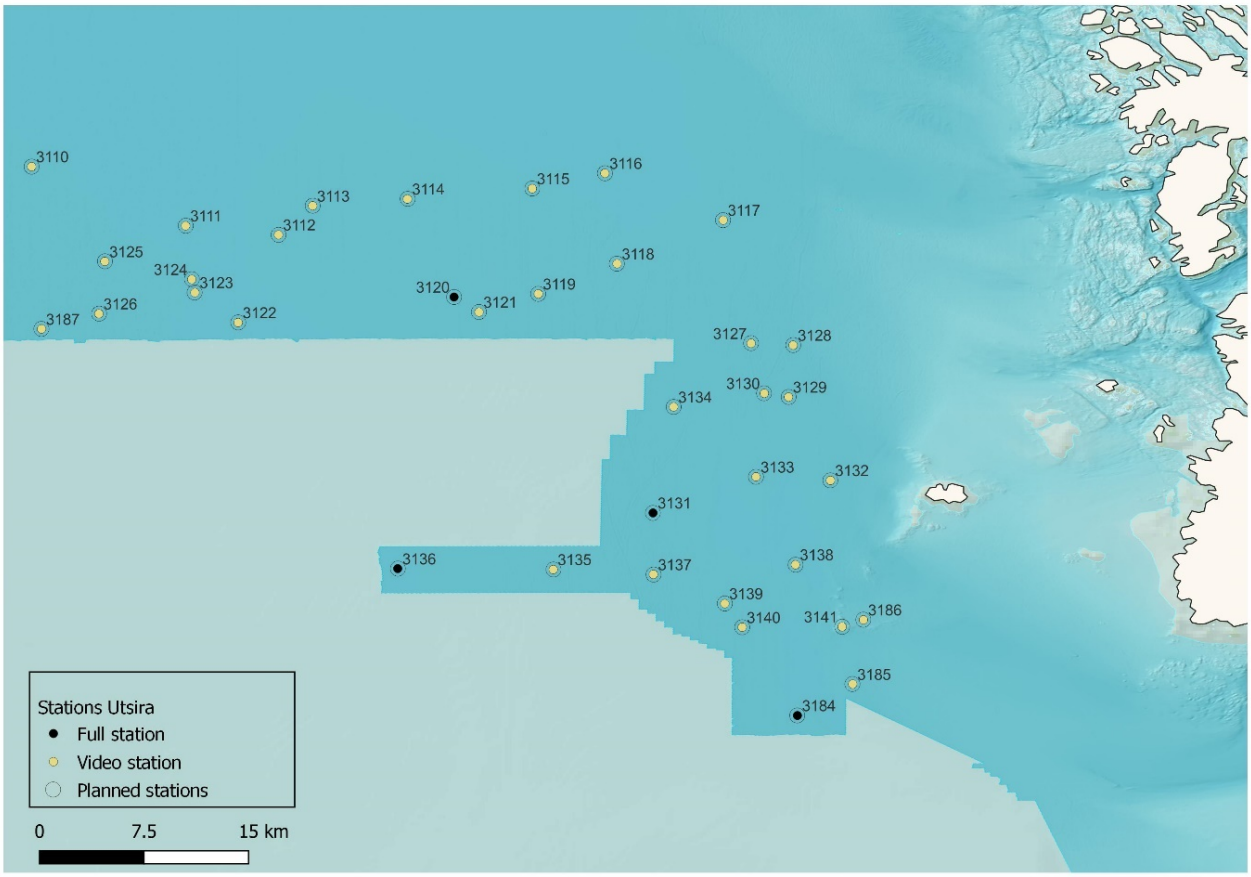

Figure 1 . Map showing all data collected at the Utsira area, including Utsira Kontroll and Utsira Nord. All planned stations were completed.

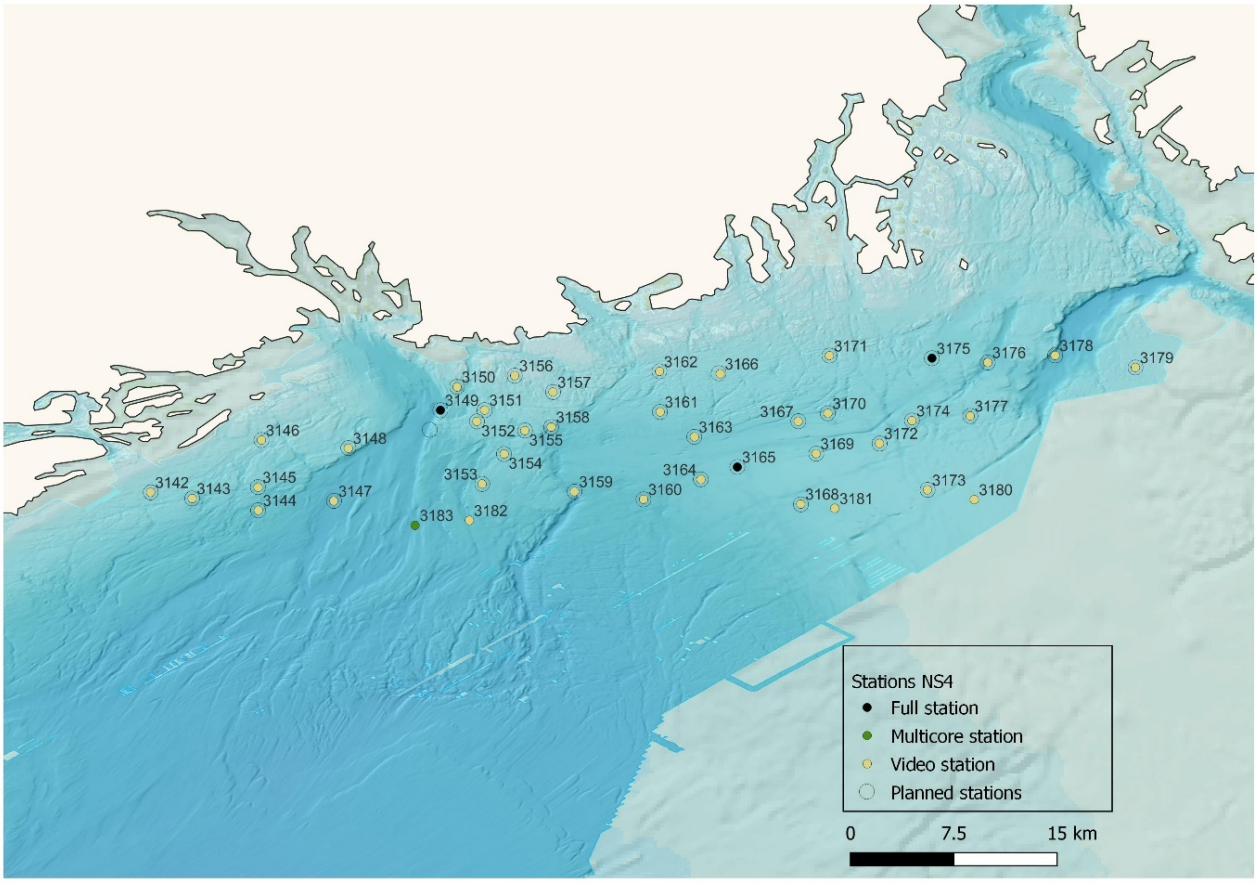

Figure 2 . Map showing all data collected at NS4. One video station was dropped (empty ring), three video stations were done which had been planned for year 2023 (yellow dots without ring around them), and the MC station (also planned for 2023) was completed in this cruise.

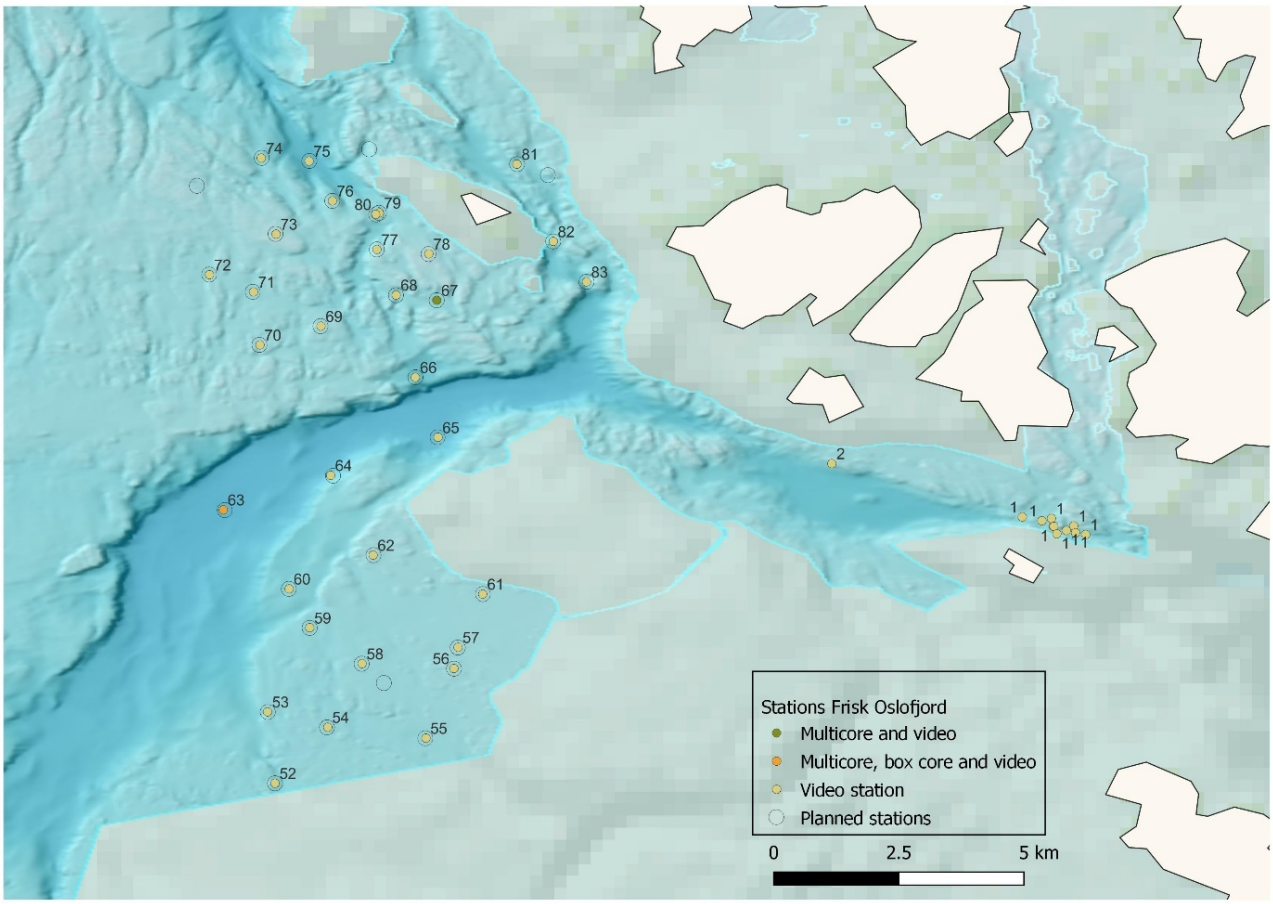

Figure 3 .- Map showing all data collected at Hvaler National Park. Four stations were dropped on account of dangerous terrain (total of 3) or for being too close to a MAREANO station (empty rings). Tisler reef stations 1 and 2 were not planned for this cruise but were nonetheless completed (yellow dots without a ring around them).

Table 1.- Summary of all sampling undertaken under the MAREANO program, sorted by area

Location	Accepted?	Equipment	RefstationNo	SampleNo	Notes
Utsira kontroll	Yes	Video	3110	3191	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3111	3192	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3112	3193	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3113	3194	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3114	3195	Videograb: No. Sample for BM: No.
Utsira kontroll	Yes	Video	3115	3196	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3116	3197	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3117	3198	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3118	3199	Videograb: Yes. Sample for BM: No.

Utsira kontroll	Yes	Video	3119	3200	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	CTD	3120	395	
Utsira kontroll	Yes	Video	3120	3201	Videograb: No. Sample for BM: No.
Utsira kontroll	Yes	Small VV grab	3120	5	Subsample: 100 percent. 1_mm: 1x1 L. (formalin). Photo: 2 (0001-0002).
Utsira kontroll	Yes	Small VV grab	3120	6	Subsample: 100 percent. 1_mm: 1x1 L. (formalin). Photo: 3 (0003-0005).
Utsira kontroll	Yes	Small VV grab	3120	7	Subsample: 100 percent. 1_mm: 1x1 L. (formalin). Photo: 2 (0007-0008).
Utsira kontroll	Yes	Small VV grab	3120	8	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 2 (0009-0010).
Utsira kontroll	Yes	Small VV grab	3120	9	Subsample: 100 percent. 1_mm: 1x1 L. (formalin) Photos: 3 (0011-0013).
Utsira kontroll	Yes	Multicorer	3120	10	4 cores (NGU:3, IMR:1).
Utsira kontroll	Yes	Beamtrawl	3120	11	Subsample: 25 percent. 1_mm: 1x3 L (ethanol), to Bergen Museum. 5_mm: 1x3 L, 1x5 L (formalin), to Tromsø. Photo: 6 (0014-0019).
Utsira kontroll	No	RP-sledge	3120	12	
Utsira kontroll	Yes	RP-sledge	3120	13	Subsample: 100 percent, EtOH. 0.5 mm dec: 1x3L. to Tromsø lab. 4 mm: 1x10L. 1_mm: 1x5L.
Utsira kontroll	Yes	Video	3121	3202	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3122	3203	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3123	3204	Videograb: No. Sample for BM: No.
Utsira kontroll	Yes	Video	3124	3205	Videograb: No. Sample for BM: No.
Utsira kontroll	Yes	Video	3125	3206	Videograb: Yes. Sample for BM: No.
Utsira kontroll	Yes	Video	3126	3207	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Video	3127	3208	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Video	3128	3209	Videograb: No. Sample for BM: No.
Utsira Nord	Yes	Video	3129	3210	Videograb: No. Sample for BM: No.
Utsira Nord	Yes	Video	3130	3211	Videograb: No. Sample for BM: No.
Utsira Nord	Yes	Video	3131	3212	Videograb: No. Sample for BM: No.
Utsira Nord	Yes	Small VV grab	3131	10	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 8 (0020-0027).
Utsira Nord	Yes	Multicorer	3131	11	4 cores (NGU:3, IMR:1).
Utsira Nord	Yes	Beamtrawl	3131	12	Subsample: 50 percent. 5_mm: 1x10L (formalin) + Porifera: 1x5L (ethanol). 1_mm: 1x3L (ethanol). Photo: 7 (0028-0034).

Utsira Nord	Yes	RP-sledge	3131	14	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x3 L to TROMSØ. 4_mm: 1x5 L. 1_mm: 1x10 L. Photo: -.
Utsira Nord	Yes	CTD	3131	396	
Utsira Nord	No	Small VV grab	3131	11	
Utsira Nord	No	Small VV grab	3131	12	
Utsira Nord	Yes	Small VV grab	3131	13	Subsample: 100 percent. 1_mm: 1x5 L (formalin). Photo: 2 (0011-0012).
Utsira Nord	Yes	Small VV grab	3131	14	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 2 (0037-0038).
Utsira Nord	No	Small VV grab	3131	15	
Utsira Nord	No	Small VV grab	3131	16	
Utsira Nord	No	Small VV grab	3131	17	
Utsira Nord	Yes	Small VV grab	3131	18	Subsample: 100 percent. 1_mm: 1x5 L (formalin). Photo: 2 (0011-0012).
Utsira Nord	Yes	Small VV grab	3131	19	Subsample: 100 percent. 1_mm: 1x1 L. (formalin). Photo: 2 (0041-0042).
Utsira Nord	Yes	Boxcorer	3131	5	2 x cores for grain size (frozen). 2 photos (0043-0044).
Utsira Nord	Yes	Video	3132	3213	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Video	3133	3214	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Video	3134	3215	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Video	3135	3216	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	CTD	3136	397	
Utsira Nord	Yes	Video	3136	3217	Videograb: No. Sample for BM: No.
Utsira Nord	Yes	Small VV grab	3136	20	Subsample: 100 percent. 1_mm: 1x1 L. (formalin). Photo: 2 (0045-0046).
Utsira Nord	Yes	Small VV grab	3136	21	Subsample: 100 percent. 1_mm: 1x0.5 L. (formalin). Photo: 3 (0047-0049).
Utsira Nord	No	Small VV grab	3136	22	
Utsira Nord	Yes	Small VV grab	3136	23	Subsample: 100 percent. 1_mm: 1x0.5 L. Photo: 2 (0050-0051).
Utsira Nord	Yes	Small VV grab	3136	24	Subsample: 100 percent. 1_mm: 1x0.5 L. (formalin). Photo: 2 (0052-0053).
Utsira Nord	No	Small VV grab	3136	25	
Utsira Nord	No	Small VV grab	3136	26	
Utsira Nord	Yes	Small VV grab	3136	27	Subsample: 100 percent. 1_mm: 1x0.5 L. Photo: 2 (0054-0055).

Utsira Nord	No	Boxcorer	3136	6	
Utsira Nord	No	Boxcorer	3136	7	
Utsira Nord	Yes	Multicorer	3136	12	4 cores (NGU:3, IMR:1).
Utsira Nord	Yes	Boxcorer	3136	28	Photo: 4 (0056-0059).
Utsira Nord	Yes	Large VV grab	3136	28	Photo: 4 (0056-0059).
Utsira Nord	Yes	Beamtrawl	3136	13	Subsample: 100 percent. 5_mm: 1x10 L(formalin) to Tromsø 1_mm: 1x3 L (ethanol) to Bergen Museum. Photo: 24 (0060-0083).
Utsira Nord	Yes	RP-sledge	3136	15	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to TROMSØ. 4_mm: 1x10 L. 1_mm: 1x10 L. Photo: -.
Utsira Nord	Yes	Video	3137	3218	Videograb: No. Sample for BM: No.
Utsira Nord	Yes	Video	3138	3219	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Video	3139	3220	Videograb: No. Sample for BM: No.
Utsira Nord	Yes	Video	3140	3221	Videograb: Yes. Sample for BM: No.
Utsira Nord	No	Video	3141	3222	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Video	3141	3267	Videograb: No. Sample for BM: No.
Utsira Nord	Yes	CTD	3184	401	
Utsira Nord	Yes	Video	3184	3264	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Beamtrawl	3184	17	Subsample: 100 percent. 5_mm: 1x5 L (formalin). 1_mm: 1x3 L (ethanol, BM). Photo: 4 (0174-0177).
Utsira Nord	Yes	RP-sledge	3184	22	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x3 L to TROMSØ. 4_mm: 1x3 L to BERGEN MUSEUM. 1_mm: 1x5 L to BERGEN MUSEUM.
Utsira Nord	Yes	RP-sledge	3184	23	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x3 L to TROMSØ. 4_mm: 1x5 L to BERGEN MUSEUM. 1_mm: 1x10 L to BERGEN MUSEUM.
Utsira Nord	Yes	Small VV grab	3184	49	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0178-0179).
Utsira Nord	Yes	Small VV grab	3184	50	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0180-0181).
Utsira Nord	Yes	Small VV grab	3184	51	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0182-0184).
Utsira Nord	No	Small VV grab	3184	52	
Utsira Nord	No	Large VV grab	3184	52	
Utsira Nord	Yes	Small VV grab	3184	53	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 2 (0185-0186).
Utsira Nord	Yes	Small VV grab	3184	54	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 2 (0187-0188).
Utsira Nord	Yes	Boxcorer	3184	13	

Utsira Nord	Yes	Multicorer	3184	19	4 cores (NGU:3, IMR:1).
Utsira Nord	Yes	Video	3185	3265	Videograb: Yes. Sample for BM: No.
Utsira Nord	Yes	Video	3186	3266	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3142	3223	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3143	3224	Videograb: Yes. Sample for BM: Yes.
NS4	Yes	Video	3144	3225	Videograb: Yes. Sample for BM: No
NS4	Yes	Video	3145	3226	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3146	3227	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3147	3228	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3148	3229	Videograb: No. Sample for BM: No.
NS4	Yes	CTD	3149	398	
NS4	Yes	Video	3149	3230	Videograb: No. Sample for BM: No.
NS4	No	Small VV grab	3149	29	
NS4	Yes	Small VV grab	3149	30	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 2 (0084, 0086).
NS4	Yes	Small VV grab	3149	31	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 3 (0087-88, 0091).
NS4	No	Small VV grab	3149	32	
NS4	No	Small VV grab	3149	33	
NS4	Yes	Boxcorer	3149	34	2 cores taken for grain size. Photo: 3 (0092, 0093, 0099)
NS4	Yes	Small VV grab	3149	34	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 4 (0092-0093, 0098, 0099).
NS4	Yes	Small VV grab	3149	35	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0100-0101).
NS4	Yes	Small VV grab	3149	36	Subsample: 100 percent. 1_mm: 1x05 L (formalin). Photo: 2 (0102-0103).
NS4	Yes	Multicorer	3149	13	4 cores (NGU:3, IMR:1).
NS4	Yes	Beamtrawl	3149	14	Subsample: 25 percent. 5_mm: 2x10 L (formalin). 1_mm: 1x3 L (ethanol, to BM). Photo: 8 (0104-0111).
NS4	Yes	RP-sledge	3149	16	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x3 L to TROMSØ. 4_mm: 2x10 L to BERGEN MUSEUM. 1_mm: 1x5 L to BERGEN MUSEUM. Photo: -.
NS4	Yes	Video	3150	3231	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3151	3232	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3152	3233	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3153	3234	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3154	3235	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3155	3236	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3156	3237	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3157	3238	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3158	3239	Videograb: Yes. Sample for BM: No.

NS4	Yes	Video	3159	3240	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3160	3241	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3161	3242	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3162	3243	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3163	3244	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3164	3245	Videograb: Yes. Sample for BM: No.
NS4	Yes	CTD	3165	399	
NS4	Yes	Video	3165	3246	Videograb: No. Sample for BM: No.
NS4	Yes	Small VV grab	3165	37	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 2 (0112-0113).
NS4	Yes	Small VV grab	3165	38	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 2 (0114-0115).
NS4	Yes	Small VV grab	3165	39	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 6 (0116-0117, 0123-0126).
NS4	Yes	Small VV grab	3165	40	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 2 (0118-0119).
NS4	Yes	Small VV grab	3165	41	Subsample: 100 percent. 1_mm: 1x1 L (formalin). Photo: 3 (0120-0122).
NS4	No	Boxcorer	3165	8	
NS4	Yes	Boxcorer	3165	9	
NS4	Yes	Multicorer	3165	14	4 cores (NGU:3, IMR:1).
NS4	Yes	Beamtrawl	3165	15	Subsample: 50 percent. 5_mm: 1x5 L (formalin). 1_mm: 1x3 L (ethanol, BM). Photo: 6 (0137-0142).
NS4	No	RP-sledge	3165	17	
NS4	Yes	RP-sledge	3165	18	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x0.5 L to TROMSØ. 4_mm: 1x0.5 L to BERGEN MUSEUM. 1_mm: 1x0.5 L to BERGEN MUSEUM.
NS4	Yes	RP-sledge	3165	19	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x1 L to TROMSØ. 4_mm: 1x3 L to BERGEN MUSEUM. 1_mm: 1x3 L to BERGEN MUSEUM.
NS4	Yes	Video	3166	3247	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3167	3248	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3168	3249	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3169	3250	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3170	3251	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3171	3252	Videograb: Yes. Sample for BM: Yes.
NS4	Yes	Video	3172	3253	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3173	3254	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3174	3255	Videograb: Yes. Sample for BM: No.
NS4	Yes	CTD	3175	400	
NS4	Yes	Video	3175	3256	Videograb: No. Sample for BM: No.
NS4	Yes	Small VV grab	3175	42	Subsample: 100 percent. 1_mm: 1x0.5 L (formalin). Photo: 2 (0143-0144).
NS4	Yes	Small VV grab	3175	43	Subsample: 100 percent. 1_mm: 1x1 L (formalin).
NS4	Yes	Small VV grab	3175	44	Subsample: 100 percent. 1_mm: 1x1 L (formalin).

NS4	No	Small VV grab	3175	45	
NS4	Yes	Small VV grab	3175	46	Subsample: 100 percent. 1_mm: 1x1 L (formalin).
NS4	Yes	Small VV grab	3175	47	Subsample: 100 percent. 1_mm: 1x1 L (formalin).
NS4	No	Boxcorer	3175	10	Boxcorer sample was taken from Grab 48.
NS4	Yes	Large VV grab	3175	48	2 x cores for grain size (frozen). 4 photos of surface (0157-0160).
NS4	Yes	Multicorer	3175	15	4 cores (NGU:3, IMR:1).
NS4	Yes	Beamtrawl	3175	16	Subsample: 100 percent. 5_mm: 1x10 L (formalin). 1_mm: 1x3 L (ethanol, BM). Photo: 13 (0161-0173).
NS4	No (?)	RP-sledge	3175	20	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x0.5 L to TROMSØ. 4_mm: 1x3 L. 1_mm: 1x3 L.
NS4	Yes	RP-sledge	3175	21	Subsample: 100 percent. EtOH. 0.5_mm dec: 1x0.5 L to BERGEN MUSEUM. 4_mm: 1x3 L 1_mm: 1x3 L
NS4	Yes	Video	3176	3257	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3177	3258	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3178	3259	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3179	3260	Videograb: No. Sample for BM: No.
NS4	Yes	Video	3180	3261	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3181	3262	Videograb: Yes. Sample for BM: No.
NS4	Yes	Video	3182	3263	Videograb: Yes. Sample for BM: No.
NS4	No	Boxcorer	3183	12	
NS4	Yes	Multicorer	3183	18	5 cores (NGU:4, IMR:1).

Table 2.- Summary of all sampling undertaken for the Frisk Oslofjord project.

Location	Accepted?	Equipment details	Superstation	Sample No.	Videograb?
Hvaler	Yes	video	52	041	Yes
Hvaler	Yes	video	53	042	No
Hvaler	Yes	video	54	043	Yes
Hvaler	Yes	video	55	044	Yes
Hvaler	Yes	video	56	045	No
Hvaler	Yes	video	57	046	Yes
Hvaler	Yes	video	58	047	Yes
Hvaler	Yes	video	59	048	Yes
Hvaler	Yes	video	60	049	Yes
Hvaler	Yes	video	61	050	
Hvaler	Yes	video	62	051	Yes
Hvaler	Yes	BC	63	11	
Hvaler	Yes	video	63	052	Yes
Hvaler	Yes	MC	16	016	
Hvaler	Aborted	video	64	053	Yes
Hvaler	Yes	video	65	054	Yes

Hvaler	Yes	video	66	055	
Hvaler	Yes	video	67	056	Yes
Hvaler	Yes	MC	67	17	
Hvaler	Yes	video	68	057	
Hvaler	Yes	video	69	058	No
Hvaler	Yes	video	70	059	No
Hvaler	Yes	video	71	060	Yes
Hvaler	Yes	video	72	061	No
Hvaler	Yes	video	73	062	No
Hvaler	Yes	video	74	063	Yes
Hvaler	Yes	video	75	064	Yes
Hvaler	Yes	video	76	065	Yes
Hvaler	Yes	video	77	066	Yes
Hvaler	Yes	video	78	067	No
Hvaler	Yes	video	79	068	No
Hvaler	Yes	video	80	069	Yes
Hvaler	Yes	video	81	070	Yes
Hvaler	Yes	video	82	071	No
Hvaler	Yes	video	83	072	No
Hvaler-Tisler	Yes	video long	T2	01	No
Hvaler-Tisler	Yes	video long	T1	02	No
Hvaler-Tisler	Yes	video long	T1	03	No
Hvaler-Tisler	Yes	video long	T1	04	No
Hvaler-Tisler	Yes	video long	T1	05	No
Hvaler-Tisler	Yes	video long	T1	06	No
Hvaler-Tisler	Yes	video long	T1	07	No
Hvaler-Tisler	Yes	video long	T1	08	No
Hvaler-Tisler	Yes	video long	T1	09	No
Hvaler-Tisler	Yes	video long	T1	10	No
Hvaler-Tisler	Yes	video long	T1	11	No

5 - Recommendations

The new *toktlogger* system allows great flexibility of use and a high degree of automation in reporting. It is recommended that we initiate the station ourselves.

It would be good to have an additional computer in the video room where we could either run our own Olex, and/or a GIS that can read a feed of GPS data. This is to avoid having to request the bridge to change their Olex screen for us, particularly in the North Sea where there is a lot of maritime traffic. A computer with GPS-enabled GIS (e.g. QField) would enable real time data capture and field verification, which would also save time when needs for maps arise in the field.

The RP sledge needs its net replaced.

Need maintenance on all nine cod-ends.

When we drive the Chimaera, we sit in the video lab and observe fauna on two TVs. One is stuck on board G. O. Sars and the other is one that we carry with us for each cruise in a separate box. When there are particles in the water, these are dragged across the screen, and it is very difficult to see what we are supposed to observe. During this cruise, instrument tried to change settings on the TV on multiple times. This screen has become too old and should be replaced.

As it is today, there is almost no use in the screen, and we mainly used the one that is stuck on board for our observations. Nevertheless, there is a strong need for this screen during the dives in order for everyone who sits annotating fauna and geology to have good working conditions (the room is not large and when everyone has to look towards the same screen we quickly get in the way of each other).

We used the Seabed Field Observer to collect data at the Tisler reef and were satisfied with the result. We mostly made use of its ability to record seabed features continuously, but also used it to annotate individual species. It shows great potential for targeted surveys like the Tisler reef survey. However, it is recommended that it be used on a computer, rather than on an ipad. Video work is conducted in a lab with all scientists sitting down and plenty of desk space available. There is no need for a portable device like an ipad. Also, the ipad screen is rather prone to making mistakes, as we need to keep our gaze on the main monitor, and therefore it is easier to click with a mouse, than to tap on a screen (we found our fingers slipped easily to the wrong button!).

5.1 - Wish list

Laser pointers for video room (4 units)

Soft, wide silicon hose for syphoning

Hose with kule (?)

Mouse mats

Hand rest support for keyboards, etc

Another trunk to store literature

New monitor (see above)

Fishing net needles

6 - Summary of all activities

A summary of all activities carried out at sea is presented in the following table, where each completed station is summarized by its planning number (P number), which gear types were used (“v” = regular video line, “v-long” special video line, “all” = CTD, video, VV grab, BC, MC, BT, RP), whether a sample was taken for emerging contaminants, its depth when known, the Reference and Video Line numbers assigned, and anything else that was noteworthy. Keep in mind that all other details can be extracted from Marbunn. The approximate time (CET) at which the activity was finished is included for some activities for calibration purposes. All exact (UTC) times can be extracted from the *toktlogger* files.

Table 3.- Summary of all activities completed, in chronological order

P number	Gear	Contam.	Depth (m)	R	VL	Time completed	Notes
P58	v		-273	3110	3191	14.10.2022 22:30	
P59	v		-275	3111	3192		
P178	v		-274	3112	3193		
P88	v		-270	3113	3194		
P85	v		-265	3114	3195		
P87	v		-271	3115	3196	15.10.2022 10:00	
P90	v		-278	3116	3197		
P82	v		-269	3117	3198		
P83	v		-264	3118	3199	15.10.2022 16:00	
P79	v		-262	3119	3200		
P89	All		-264	3120	3201	16.10.2022 03:00	Box core not taken because considered damaged. Found out later it worked fine. Only 1 sledge sample instead of two due to currents being too strong
P93	v		-264	3121	3202		
P80	v		-276	3122	3203	16.10.2022 09:00	Winch broke down
Downtime (3 h)						16.10.2022 12:00	Winch fixed
P92	v		-275				
P179	v		-275				
P73	v		-272	3125	3206		
P78	v		-269	3126	3207		
P107	v		-260	3127	3208		
P98	v		-252	3128	3209		
P175	v		-261	3129	3210		
P109	v		-263	3130	3211	17.10.2022 07:00	
Stop at Utsira (1.5 h)						17.10.2022 09:30	
P104	v, 1 grab, MC, BT, 1 sledge		-273	3131	3212		

Stop at Utsira from 15:00 to 17:00 (1 h)							Doesn't count towards downtime 100% because deck work (decanting sledge sample) was being carried out at the same time
P104	CTD, 4 grabs, BC		-273	3131		17.10.2022 21:00	Only 1 sledge sample instead of two due to currents being too strong
P113	v			3132	3213		
P101	v		-273	3133	3214		
P96	v		-269	3134	3215		
P170	v		-256	3135	3216	18.10.2022 10:00	
P169	All		-276	3136	3217	18.10.2022 21:00	2 BC attempts, both failed. No contam. sample taken (although planned). 1 extra grab (large) taken for carbon and grain size. Only 1 sledge sample instead of two due to currents being too strong
P97	v		-258	3137	3218		
P102	v		-279	3138	3219		
P112	v		-265	3139	3220		
P100	v		-268	3140	3221		
P168	only still rec		-176	3141	3222		Need to come back to this one!
Camera failure (total black out) on 19.10.2022 07:00						19.10.2022 15:30	Pan/tilt not working, but possible to use the grab cable to make at least one of the two work). Running next transenct with only pan function available (no tilt, no grab)?
Camera continues to fail (12 h, total)							Camera out of service. Decided to head to Skagerrak now!
Transit to Outer Oslo Fjord (19.10.2022 19:00:00) (20 h)						20.10.2022 15:00	
P35	v		-113	3142	3223		Test camera. All functions working again. Nephrops galore
P140	v		-180	3143	3224	20.10.2022 18:30	
P141	v		-234	3144	3225		
P32	v		-183	3145	3226		
P33	v		-121	3146	3227		
P12	v		-419	3147	3228		
P142	v		-144	3148	3229		
P27	All		-281	3149	3230	21.10.2022 13:00	Only 1 sledge sample instead of two due to currents being too strong. ~500 sea urchins caught in BT (Heidi takes the price!)
P18	v		-146	3150	3231		
P38	v		-135	3151	3232		
P144	v		-134	3152	3233		
P143	v		-184	3153	3234		
P40	v		-178	3154	3235		
P39	v		-161	3155	3236		
P36	v		-43	3156	3237		Video grab lost on seabed
P37	v		-84	3157	3238		
P30	v		-189	3158	3239		
P146	v		-292	3159	3240		

P3	v		-240	3160	3241	22.10.2022 08:00	
P15	v		-180	3161	3242		
P155	v		-126	3162	3243		New grab mounted on video rig
P29	v		-200	3163	3244		
P20	v		-198	3164	3245		
P156	All	Yes	-171	3165	3246	23.10.2022 00:30	Started 22.10.2022 15:30 (duration 9h, until next video line - though still some work left on deck). Dredge in the direction of current partly successful (kept short because of disturbed sediment).
P31	v		-125	3166	3247		
P16	v		-184	3167	3248		
P147	v		-169	3168	3249		Shipwreck, 40m in length, chimney from WWII period, but not military ship (probably cargo). Color blue.
N/A	Multibeam					23.10.2022 08:00	Have ran with the multibeam over the area for a better impression
P23	v		-178	3169	3250	23.10.2022 09:00	
P149	v		-182	3170	3251		
P34	v		-123	3171	3252		Ran without tilt function
P19	v		-156	3172	3253		Tilt fixed again
P148	v		-121	3173	3254	23.10.2022 16:00	
P150	v		-148	3174	3255		
P154	All		-160	3175	3256		
P1	v		-256	3176	3257		
P151	v		-155	3177	3258		
P153	v		-347	3178	3259	24.10.2022 07:00	Extreme trawling here!
Stop at Larvik (7h)						24.10.2022 14:00	
P152	v		-77	3179	3260	24.10.2022 16:00	Jan Arne will now look at the zoom, which has become too jumpy/slow responding
F35	v		-122	52	041		
F31	v		-126	53	042		
F34	v		-103	54	043		
F33	v		-105	55	044		
F32	v		-58	56	045		
F28	v		-71	57	046		
F29	v		-78	58	047		
F26	v		-123	59	048		
F25	v		-165	60	049		
F27	v		-60	61	050		
F36	v		-62	62	051	25.10.2022 08:00	

F24	v, MC		-460	63	052		A trawler has just gone by the sampling station. Took BC but was overfull. Did video, then MC for chemical analyses
F23	v		-406	64	053		One of the navigation cameras has been turned to point at the grab, so that we no longer need to use the high-def camera for that. Line aborted half-way because of extremely poor visibility and little ability to capture decent footage due to slope and walls
F22	v		-416	65	054		
F21	v		-197	66	055		Heavily trawled area
F3	v, MC		-112	67	056		
F2	v		-107	68	057	25.10.2022 19:30	
F11	v		-59	69	058		
F10	v		-67	70	059		
F9	v		-104	71	060		
F12	v		-94	72	061		
F8	v		-37	73	062		
F19	v		-139	74	063		
F17	v		-326	75	064		Zoom only works in combination with tilt
F7	v		-92	76	065		Grab got loose. Up with the rig half way through to remove it. Then continued line.
F1	v		-122	77	066		
F13	v		-35	78	067		
F5	v		-115	79	068	26.10.2022 12:00	
F6	v		-124	80	069		
F14	v		-138	81	070		
F16	v		-143	82	071		
F15	v		-117	83	072		
F4	v		-216	84	073	26.10.2022 21:00	
T2	v-long			2	001		
T1	v-long			1	002		
T1	v-long			1	003		
T1	v-long			1	004		
T1	v-long			1	005		
T1	v-long			1	006		
T1	v-long			1	007		
T1	v-long			1	008		
T1	v-long			1	009		
T1	v-long			1	010		
T1	v-long			1	011	27.10.2022 16:00	
P21	v		-113	3180	3261		

P22	v		-161	3181	3262		
P4	v		-322	3182	3263		
P7MC	BC, MC			3183		28.10.2022 02:00	
Transit Oslo Fjord to Utsira (started steaming 28.10.2022 02:00). With a stop at Flødevigen (1h, at 10:00) to pick up some samples that need transporting to Bergen (23 h)						29.10.2022 01:00	
P167	all	Yes	-276	3184	3264		Switch around the order of the gears (drag gears before drop gears) to accommodate the fact that we are short one deckhand
P86	v		-256	3185	3265		
P105	v		-233	3186	3266		
P168	v		-176	3141	3267		
P66	v		-263	3187	3268	30.10.2022 00:00	
Transit Utsira to Bergen						30.10.2022 08:00	

15

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