

Institute of Marine Research

CRUISE REPORT NO. **

**R/V *G.O. Sars* Cruise No. 2005108
9th June – 24th June 2005**

Coral survey off Northern Norway

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2005

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ITINERARY

Departed	Tromsø	9 th June 2005
Arrived	Bodø	24 th June 2005

SUMMARY

Thirty-six *Lophelia* reefs off Northern Norway were studied during the cruise no. 2005108 with R/V G.O. Sars in June 2005. These reefs were previously known only as topographic indices on detailed bathymetric maps or information from fishers. Morphology of reefs was studied by visual inspection with both drift camera and ROV. In total 35 h and 17 min of videotape was recorded. Data for description of the reef environment was gathered from bottom located current meter, ADCP, CTD, and direct observation. The elongated reef structure was perfectly aligned with the main current direction, with a live part on the up-current side (“reef head”). Dead coral fragments were sampled along the “reef tail” from the “reef head” to the down-current end at one selected reef. Thirty-two samples for studies of the associated fauna were collected with video assisted van Veen grab and ROV.

OBJECTIVES AND BACKGROUND

The main objective of the cruise was to map and inspect *Lophelia* reefs located off northern Norway. Survey and sampling for other purposes was also conducted during the survey period. Five areas (Lopphavet, Sotbakken, Egga Nord, Vesterålen, and Træna Deep) were selected for coral studies, while one area (Snøvit) was chosen for the purpose of studying sponge grounds (this is a separate project which will not be given much attention in this report). The three first study areas were mapped with multibeam and inspected with the ROV Aglantha or a tethered video platform (drift camera). The Vesterålen and Træna Deep study areas has been mapped previously, and only visual inspection was performed in Vesterålen. The Træna Deep study area was selected for more specialized studies of the physical environment, coral reef morphology and the biodiversity associated with *Lophelia pertusa*. For the description of local physical forcing of *Lophelia* reefs, current meters were deployed for a period of five days, and additional data on currents and water mass characteristics were recorded with ADCP and CTD. Internal reef structure was studied with TOPAS sub-bottom profiler. Bottom samples for faunistic studies and dating of coral fragments were collected with a video assisted van Veen grab.

SAMPLING EQUIPMENT AND METHODS

Video grab

A cable-connected UW-camera with light is mounted in a steel frame on top of a 0.25m² van Veen grab (Fig. 1A). The image of the seabed is monitored on the ship, and used to guide the sampling. This provides full control of the selection of objects/habitats for sampling. The grab is lowered until seabed structures and habitats can be distinguished. The grab is allowed to slowly drift with the ship until the targeted location or suitable habitat is approached. Then the grab is quickly lowered and the sample is brought onboard and stored for later analysis. The video grab was used to sample corals and sediments in reef areas within the LoppHAVet and Træna Deep study areas.

Drift camera

The drift camera (Fig. 1B) use the same UW-camera and light as for the video grab equipment, but in addition the camera is mounted on a pan-and-tilt devise which provide control of the camera's heading and a better overview of the seabed. Similar to the video grab the drift camera is allowed to drift with the ship along a predefined survey line. The height above the seabed is maintained constant manually by a winch operator who has visual contact with the monitor. The drift camera was deployed on 23 locations in all study areas except Snøvit and Egga Nord.

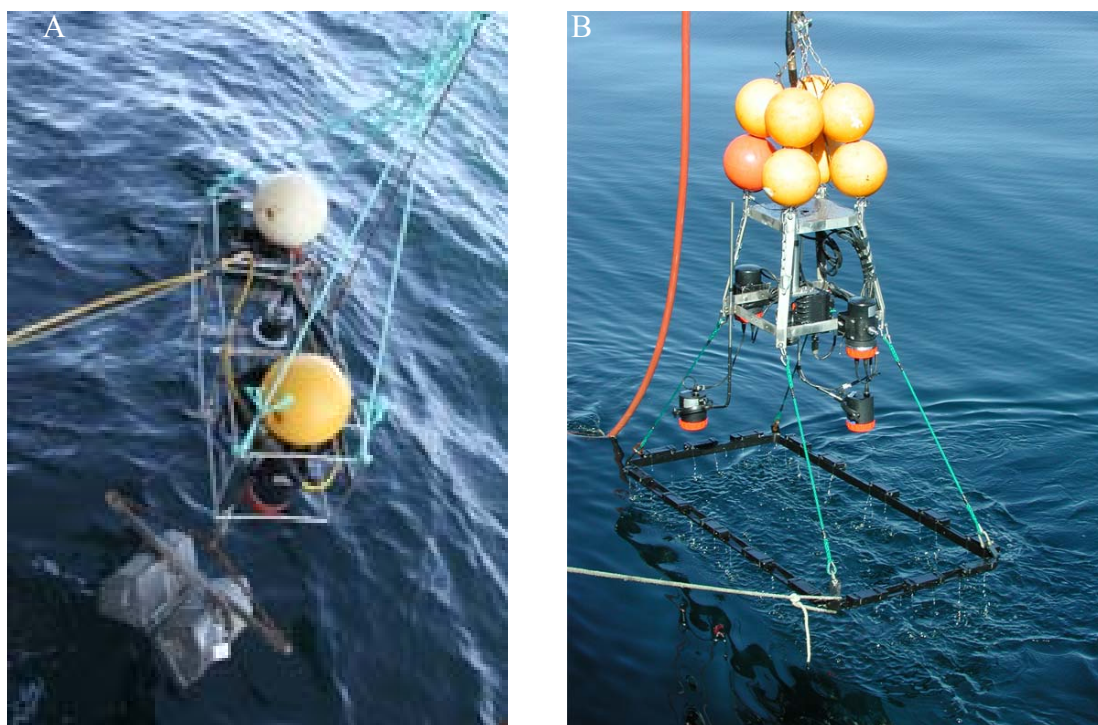


Fig. 1. A: Video assisted van Veen grab for targeted sampling of pre-selected habitats or species. Floating buoys are mounted on the metal frame to prevent the camera for crashing into the seabed when sampling. B: The drift camera being deployed.

ROV AGLANTHA

The Remotely Operated Vehicle Aglantha is equipped with 4 black and white video cameras, one analogue colour video camera and one high definition digital camera. It has five thrusters and can reach a speed of two knots in forward direction. The vehicle is also fitted with a 5-function manipulation arm for sampling and handling of equipment. It has a transponder for hydro-acoustic positioning, and a CTD allowing continuous monitoring of temperature and salinity. During this cruise a container for transportation of biological samples was mounted at the front of the vehicle. Aglantha has an operational depth range of 2000 meters. The ROV was deployed 21 times at different locations in all study areas except Sotbakken and Vesterålen.



Fig. 2. The ROV Aglantha being deployed.

Sub-bottom profiler

The TOPAS parametric sub-bottom profiler provides images of the sediment structure (resolution < 0.3 m) and layers below the seabed (penetration capacity > 150 m). It has a primary and secondary operating frequencies of 15kHz and 0.5-5kHz, respectively. The primary beamwidth is 3.5 degrees, and its operational depth range is 30-10 000 m. The sub-bottom profiler was used at reef # 6 in the Træna Deep study area.

SURVEY MAPS

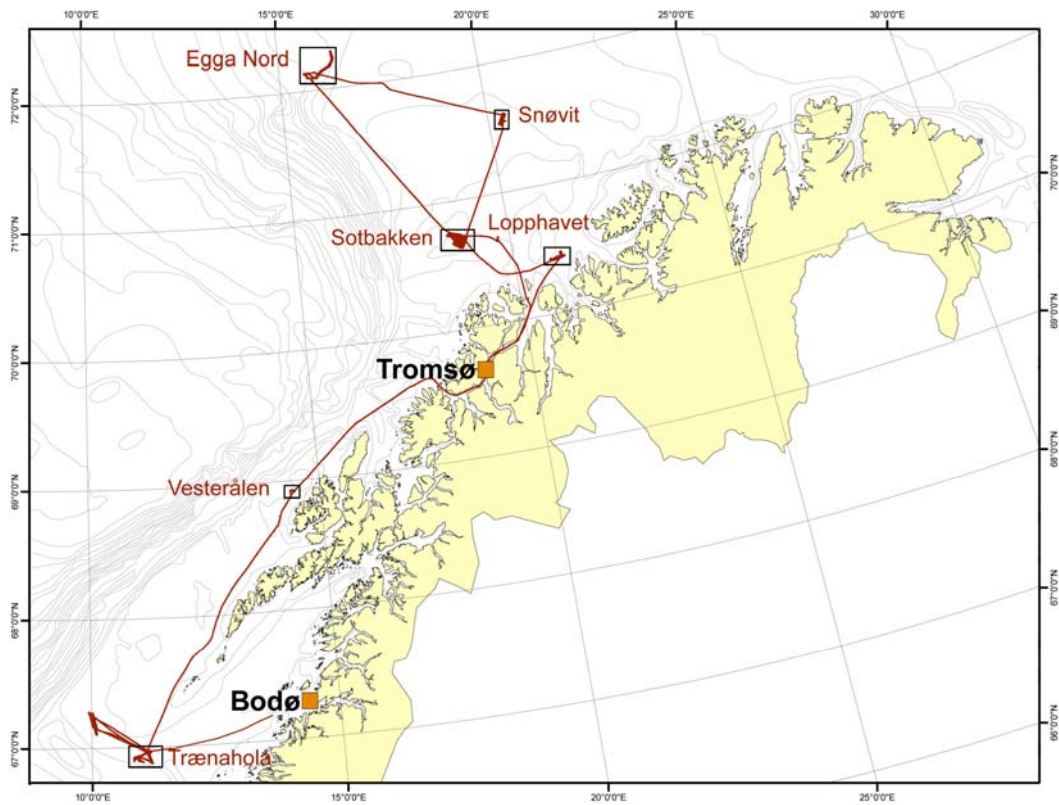


Fig. 3. Map of northern Norway showing the survey line and the study areas.

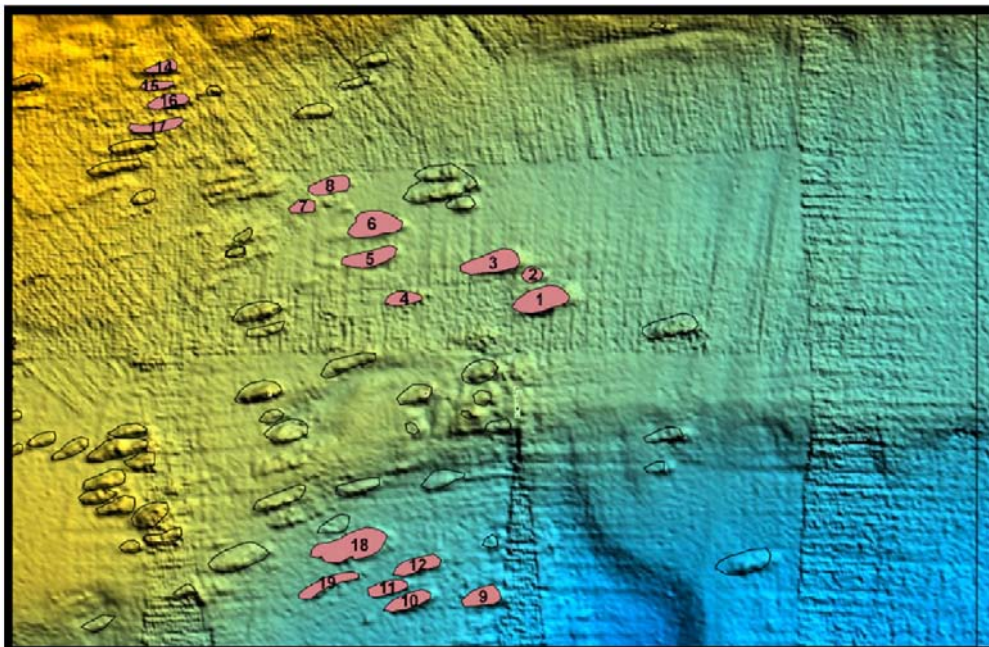


Fig. 4. Location of reef clusters in the Træna Deep study area with reefs selected for focused studies of reef morphology, the physical reef environment and biodiversity. Studied reefs are indicated with a pink colour and separate numbers.

NARRATIVE

Monday, 09.06.

17:00 Left Tromsø harbour, heading for the Sotbakken study area.

Thursday, 10.06.

0:42 Start survey in the Sotbakken area with a CTD for calibration of the multibeam. Continued with multibeam mapping until breakfast.

11:02 Deployment of drift camera over *Lophelia* reef at 270 m depth.

11:56 CTD

19:26 Deployment of drift camera on soft bottom at 259 m depth.

20:55 Deployment of drift camera on soft bottom at 259 m depth.

Friday, 11.06.

4:02 Start survey in potential sponge habitats in the Snøvit area. CTD.

7:03 ROV deployment on soft bottom at 273 m depth.

10:21 One haul with small beam trawl.

13:16 One haul with small beam trawl.

16:50 ROV deployment on gravelly soft bottom at 280 m depth.

18:41 ROV deployment on soft bottom at 290 m depth.

Saturday 12.06.

6:15 Start survey in the Egga Nord area. CTD.

8:25 ROV deployment on gravelly soft bottom at 723 m depth.

17:19 ROV deployment on gravelly soft bottom at 586 m depth.

22:14 One haul with small beam trawl.

Sunday 13.06.

8:37 Continued survey in the Sotbakken area outside reef area. CTD

17:01 One haul with small beam trawl.

18:05 One haul with small beam trawl.

18:53 One haul with small beam trawl.

19:19 CTD for calibration of multibeam.

19:40 Multibeam mapping all night

Monday 14.06.

7:31 Start survey in the LoppHAVET area. CTD

11:54 Deployment of drift camera on gravelly sand at 80 m depth.

13:00 Deployment of drift camera over *Lophelia* reef at 230 m depth.

15:11 Deployment of drift camera over *Lophelia* reef at 200 m depth.

16:59 ROV deployment on *Lophelia* reef at 200 m depth.

23:08 Deployment of drift camera on gravelly sand at 240 m depth.

Tuesday 15.06.

0:35 Deployment of drift camera on *Lophelia* rubble at 300 m depth.

1:56 Deployment of drift camera on *Lophelia* reef at 215 m depth.

3:00 Deployment of drift camera on *Lophelia* reef at 165 m depth.

4:42 Deployment of drift camera on *Lophelia* reef at 180 m depth.

5:43 Deployment of drift camera on *Lophelia* rubble at 120 m depth.

6:48 ROV deployment on *Lophelia* reef at 170 m depth.

9:10 ROV deployment on *Lophelia* reef at 160 m depth.

11:27 Five shots with video grab at depths around 215 m.

20:26 Arrived in Tromsø for change of ship crew

Wednesday 16.06.

17:00 Left Tromsø harbour, heading for the Vesterålen study area.

Thursday 17.06.

- 1:54 Deployment of drift camera on *Lophelia* reef at 230 m depth.
- 3:19 Deployment of drift camera on *Lophelia* rubble at 250 m depth.
- 5:13 Deployment of drift camera on *Lophelia* reef at 230 m depth.
- 6:42 Deployment of drift camera on *Lophelia* reef at 250 m depth.
- 8:05 Deployment of drift camera on *Lophelia* reef at 250 m depth.
- 13:52 CTD
- 14:01 Steaming for the Træna Deep study area

Friday 18.06.

- 2:14 Start deployment of three current meters at different locations in the Træna Deep study area.
- 5:54 Two ROV dives on different *Lophelia* reefs around 310 m depth.
- 10:49 Deployment of multicorer for drilling impact study
- 12:12 Deployment of multicorer for drilling impact study
- 14:19 Two shots with video grab on *Lophelia* reef at 304 m depth.
- 17:18 Deployment of multicorer for drilling impact study
- 17:51 Deployment of multicorer for drilling impact study
- 18:19 ROV deployment on *Lophelia* reef at 310 m depth.
- 21:58 Two shots with video grab on *Lophelia* reef at around 300 m depth.

Saturday 19.06.

- 0:42 Five shots with video grab on a *Lophelia* reef at around 300 m depth.
- 6:38 Two ROV dives at reefs between 300 and 310 m depth. Corals sampled.
- 9:41 Six deployments with multicorer for drilling impact study
- 15:16 Deployment of video grab. Aborted.
- 17:29 Three ROV dives at reefs between 300 and 320 m depth. Corals sampled.
- 22:58 Video-grabbing on *Lophelia* reef at 320 m depth.

Sunday 20.06.

- 0:59 Three shots with video grab on a *Lophelia* reef at around 320 m depth.
- 6:11 Eight deployments with multicorer of sediments for drilling impact study.
- 14:06 CTD. Moved to reef clusters selected for selected for environmental and faunistic studies.
- 16:33 ROV inspection of reefs (# 1-8).
- 22:44 Video-grabbing of *Lophelia* rubble at 320 m depth on reef #6.

Monday 21.06.

- 0:31 Three shots with video grab on reef # 6 at around 315 m depth.
- 5:03 ROV inspection of several reefs (# 9-12 and 18-19) within reef clusters selected for environmental and faunistic studies.
- 19:56 Five shots with video grab on reef # 6 at around 315 m depth.

Tuesday 22.06.

- 0:45 Seven shots with video grab on reef # 6 at around 315 m depth, before the ship had to leave the area due to military exercise in the area.
- 17:39 ROV inspection and sampling of corals on a *Lophelia* reef (315 m depth) within reef clusters selected for environmental and faunistic studies.
- 19:40 ROV inspection of several reefs (# 14-17) within reef clusters selected for environmental and faunistic studies.
- 22:44 Video-grabbing of *Lophelia* rubble at 315 m depth, reef # 6.

Wednesday 23.06.

- 0:28 Three shots with the video grab on *Lophelia* rubble on reef # 6 at around 315 m depth.

- 5:01 ROV inspection of seven *Lophelia* reefs (305-310 m depth) within reef cluster selected for environmental and faunistic studies.
- 10:05 Recovery of current meters.
- 14:30 Survey reef # 6 with sub-bottom profiler (TOPAS).
- 21:54 Two deployments with the drift camera to inspect reef # 6, which was earlier inspected with ROV.

Thursday 24.06.

- 1:57 Inspection with the drift camera of the same *Lophelia* reef (#14) as earlier inspected with ROV.
- 4:19 CTD
- 6:33 Five Grab samples were taken outside reef cluster earlier inspected and sampled.
- 7:57 Steaming for Bodø. End of cruise.

Onboard lectures

Aivo Lepland (NGU): "The snowball earth"

Aivo Lepland (NGU): "The origin of life - Interpretations from geological traces"

Daniel Cejka (IMR): "PCBs in the Norwegian Sea and the Barents Sea"

Pål B. Mortensen (IMR): "Deep-water corals here and there in the North Atlantic"

Pål B. Mortensen (IMR): "Ecological consequences of oil drilling on coral reefs in the Træna Deep"

Ole Christensen (NGU/NTNU): "Backscatter analysis of Multi-beam data"

Appendix

Table 1. List of sampled and video recorded locations. Geographic positions are given as decimal degrees.

Date	Gear	Duration (hh:mm:ss)	St No.	Lat	Lon	Depth
Sotbakken						
10-jun-05	CTD		0-328	70,6545	19,6988	213
10-jun-05	Drift camera	0:40:23	1-6	70,7572	18,6725	270
10-jun-05	CTD		1-329	70,7560	18,6605	265
10-jun-05	Drift camera	1:12:58	1-7	70,6337	18,8710	263
10-jun-05	Drift camera	0:59:58	1-8	70,6337	18,8783	264
Snøvit						
11-jun-05	CTD		1-330	71,5510	20,3717	275
11-jun-05	ROV	2:04:20	2-24	71,5510	20,3701	277
11-jun-05	Beam trawl		2-1	71,5550	20,3348	274
11-jun-05	Beam trawl		2-2	71,5560	20,3329	267
11-jun-05	ROV	1:23:54	2-25	71,5805	20,3697	284
11-jun-05	ROV	2:10:46	2-26	71,5910	20,3948	291
Egga Nord						
12-jun-05	CTD		2-331	72,1353	15,6215	778
12-jun-05	ROV	2:53:12	2-27	72,1023	15,7457	720
12-jun-05	ROV	3:17:04	3-28	72,0992	15,8307	585
12-jun-05	Beam trawl		3-3	72,0993	15,8244	559
Sotbakken						
13-jun-05	CTD		4-332	70,7422	18,8628	321
13-jun-05	Beam trawl		4-5	70,6920	18,9501	258
13-jun-05	Beam trawl		4-6	70,7082	18,8103	341
13-jun-05	Beam trawl		4-7	70,7075	18,7847	341
13-jun-05	CTD		4-333	70,7182	18,7767	349
Lophavet						
14-jun-05	CTD		5-334	70,4258	20,8365	207
14-jun-05	Drift camera	0:34:02	5-9	70,4173	20,9102	78
14-jun-05	Drift camera	0:55:22	5-10	70,4212	21,0377	230
14-jun-05	Drift camera	0:20:56	5-11	70,4272	21,0778	215
14-jun-05	ROV	4:18:39	5-29	70,4211	21,0291	198
14-jun-05	Drift camera	0:23:14	5-12	70,4202	21,0717	248
15-jun-05	Drift camera	0:34:02	5-13	70,4587	21,0959	289
15-jun-05	Drift camera	0:15:48	5-14	70,4400	21,0517	216
15-jun-05	Drift camera	0:34:54	5-15	70,4367	20,9775	165
15-jun-05	Drift camera	0:23:06	5-16	70,4280	20,9652	180
15-jun-05	Drift camera	0:34:29	5-17	70,4287	20,9467	119
15-jun-05	ROV	1:51:32	5-30	70,4275	20,9653	179
15-jun-05	ROV	1:28:30	5-31	70,4363	20,9777	161
15-jun-05	Grab		5-306	70,4203	21,0300	204
15-jun-05	Grab		5-307	70,4198	21,0300	213
15-jun-05	Grab		5-308	70,4198	21,0300	213
15-jun-05	Grab		5-309	70,4198	21,0297	214
15-jun-05	Grab		5-309	70,4195	21,0297	221
Vesterålen						

Date	Gear	Duration (hh:mm:ss)	St No.	Lat	Lon	Depth
17-jun-05	Drift camera	0:24:10	6-18	68,8957	14,3773	229
17-jun-05	Drift camera	0:16:56	6-19	68,9291	14,4085	252
17-jun-05	Drift camera	0:49:34	6-20	68,9282	14,4030	254
17-jun-05	Drift camera	0:58:16	6-21	68,9237	14,3988	252
17-jun-05	Drift camera	0:54:16	6-22	68,9118	14,4340	251
17-jun-05	CTD		6-335	68,7318	14,0928	194
Træna Deep (western part)						
18-jun-05	Current meter		8-21	66,9635	11,0862	301
18-jun-05	Current meter		8-23	66,8833	11,1688	302
18-jun-05	Current meter		8-24	66,9295	10,9395	311
18-jun-05	ROV	1:08:14	8-4	66,9217	10,9085	308
18-jun-05	ROV	0:33:54	8-5	66,9230	10,9030	306
18-jun-05	Multicorer		8-7	66,9227	10,9050	308
18-jun-05	Multicorer		8-9	66,9253	10,9038	310
18-jun-05	Video grab		8-23	66,9240	10,8947	304
18-jun-05	Video grab		8-24	66,9235	10,8980	301
18-jun-05	Multicorer		8-10	66,9218	10,8990	305
18-jun-05	Multicorer		8-12	66,9227	10,8995	308
18-jun-05	ROV	1:39:07	8-6	66,9226	10,8978	307
18-jun-05	Video grab		8-25	66,9238	10,8885	302
18-jun-05	Video grab		8-310	66,9232	10,8898	305
19-jun-05	Video grab		8-311	66,9238	10,8968	305
19-jun-05	Video grab		8-312	66,9227	10,9007	307
19-jun-05	Video grab		8-313	66,9218	10,9052	307
19-jun-05	Video grab		8-26	66,9240	10,8893	300
19-jun-05	Video grab		8-27	66,9235	10,8895	298
19-jun-05	ROV	0:52:18	8-7	66,9228	10,8932	305
19-jun-05	ROV	1:05:32	8-8	66,9228	10,8932	305
19-jun-05	Multicorer		8-13	66,9223	10,8762	318
19-jun-05	Multicorer		8-14	66,9215	10,8492	320
19-jun-05	Multicorer		8-15	66,9216	10,8567	322
19-jun-05	Multicorer		8-16	66,9115	10,8505	332
19-jun-05	Multicorer		8-17	66,9247	10,8282	329
19-jun-05	Multicorer		8-18	66,9245	10,8293	329
19-jun-05	Video grab		8-28	66,9233	10,8933	297
19-jun-05	ROV	0:43:54	8-9	66,9228	10,8898	303
19-jun-05	ROV	1:26:40	8-10	66,9197	10,9898	314
19-jun-05	ROV	0:50:52	8-11	66,9207	10,9918	310
19-jun-05	Video grab		8-29	66,9077	10,8313	326
20-jun-05	Video grab		8-30	66,9078	10,8322	328
20-jun-05	Video grab		8-31	66,9077	10,8317	323
20-jun-05	Video grab		8-32	66,9078	10,8327	325
20-jun-05	Multicorer		8-19	66,8960	10,8332	339
20-jun-05	Multicorer		8-21	66,9312	10,8802	307
20-jun-05	Multicorer		8-22	66,9360	10,9267	313
20-jun-05	Multicorer		8-23	66,9253	10,9315	314
20-jun-05	Multicorer		8-25	66,9253	10,9723	323
20-jun-05	Multicorer		8-26	66,8972	10,9162	343
20-jun-05	Multicorer		8-29	66,8862	11,0190	364

Date	Gear	Duration (hh:mm:ss)	St No.	Lat	Lon	Depth
20-jun-05	Multicorer		8-30	66,9180	10,9057	311
20-jun-05	CTD		8-336	66,9181	10,9057	311
Træna Deep (eastern part)						
20-jun-05	ROV	4:59:50	9-12	66,9680	11,1380	327
20-jun-05	Video grab		9-33	66,9702	11,1265	320
21-jun-05	Video grab		9-34	66,9703	11,1230	315
21-jun-05	Video grab		9-35	66,9700	11,1238	312
21-jun-05	Video grab		9-36	66,9700	11,1238	318
21-jun-05	ROV	3:26:51	9-13	66,9595	11,1312	356
21-jun-05	Video grab		9-37	66,9702	11,1228	314
21-jun-05	Video grab		9-38	66,9702	11,1223	314
21-jun-05	Video grab		9-39	66,9698	11,1223	313
21-jun-05	Video grab		9-40	66,9700	11,1217	315
21-jun-05	Video grab		9-41	66,9698	11,1217	314
22-jun-05	Video grab		9-42	66,9700	11,1228	313
22-jun-05	Video grab		9-43	66,9698	11,1235	313
22-jun-05	Video grab		9-44	66,9697	11,1240	318
22-jun-05	Video grab		9-45	66,9700	11,1240	313
22-jun-05	Video grab		9-46	66,9697	11,1240	317
22-jun-05	Video grab		9-47	66,9700	11,1237	313
22-jun-05	Video grab		9-48	66,9700	11,1233	313
22-jun-05	ROV	1:37:40	9-14	66,9698	11,1208	313
22-jun-05	ROV	2:08:10	9-15	66,9742	11,1110	297
22-jun-05	Video grab		9-49	66,9697	11,1218	314
23-jun-05	Drift camera		9-50	66,9696	11,1221	315
23-jun-05	Drift camera		9-51	66,9697	11,1210	315
23-jun-05	Drift camera		9-52	66,9697	11,1215	313
23-jun-05	ROV	4:35:07	9-16	66,8777	11,1980	313
23-jun-05	CTD		9-337	66,9342	10,9387	315
23-jun-05	Drift camera	1:10:30	9-53	66,9697	11,1212	317
23-jun-05	Drift camera	1:08:34	9-54	66,9697	11,1212	314
24-jun-05	Drift camera	1:29:56	9-55	66,9740	11,1067	293
24-jun-05	CTD		9-338	66,9685	11,1308	322
24-jun-05	Van Veen grab		9-314	66,9708	11,1363	325
24-jun-05	Van Veen grab		9-315	66,9708	11,1367	325
24-jun-05	Van Veen grab		9-316	66,9708	11,1365	325
24-jun-05	Van Veen grab		9-317	66,9712	11,1358	324
24-jun-05	Van Veen grab		9-318	66,9712	11,1358	324
Sum	Drift camera	14:41:24				
	ROV	20:36:06				