

report

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Sediment sampling at Sleipner Vest Alfa Nord
(SVAN)

Cruise report



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Sediment sampling at Sleipner Vest Alfa Nord (SVAN) Cruise report

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Sammendrag / Summary

This cruise report presents a description of the field work that was carried out by Akvaplan-niva at Sleipner Vest Alfa Nord, 2004. The field work took place from 19th to 21th April 2004, according to the SFT guidelines. In total 96 0.1 m² van Veen grab samples were collected from 12 stations. The biological samples were sieved on board in a 1 mm round mesh sieve and preserved with formaldehyde. Samples for analyses of grain size, total organic matter (TOM), hydrocarbons and metals were taken from undisturbed samples through the inspection flaps of the grab. At each station redox measurements were carried out on three replicates at the sediment surface and at 5 cm depth.

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1 Summary

This cruise report describes of the field work carried out by Akvaplan-niva at Sleipner Vest Alfa Nord, 2004. The field work took place from 19th to 21th April 2004.

In total 96 0.1 m² van Veen grab samples were collected from 12 stations. Only one sample was rejected due to disturbance of the sediment. The biological samples were sieved on board in a 1 mm round mesh sieve and preserved in 4% formaldehyde.

Samples for analyses of grain size, total organic matter (TOM), hydrocarbons and metals were taken from undisturbed samples through the inspection flaps of the grab.

On board each sample was described with respect to sediment type, smell, colour, larger living animals and other prominent features (i.e. traces of oil, cuttings etc.). In one sample per station, the colour profile of the sediment was determined using a Munsell Soil Colour Chart. On three replicates at each station the E_h and amount of sulphide were measured at the sediment surface and at 5 cm depth.

2 Introduction

A field trial has been carried out as a part of the Environment Risk and Management System (ERMS) project. The purpose of the ERMS project is to develop tools for evaluating impacts from discharges of drill cuttings and mud. It will be achieved through a process including review of literature, establishing criteria for impacts (PNEC's), and to develop modules for simulating processes in the sediment deposited (and below). An important part of the project is to use field measurements to validate/calibrate the models, where the described field trial represents one of the most important studies.

This report contains the log from Akvaplan-niva's field survey at SVAN in 2004. The final deliverable from this activity will be a report containing a detailed overview of all analyses and respective methods, statistical analyses of the data and reporting of the results.

3 Objectives of field activities

The main objective of this activity is to sample benthic stations after the discharge of drill cuttings/mud at Sleipner Vest Alfa Nord. The discharge took place from September 2003 to April 2004. The samples will be analysed chemically and biologically, and the results will be compared with the results from the sampling carried out in September 2003 (Akvaplan-niva) and the spring 2002 (Rogalandsforskning).

All procedures were carried out according to Activity Regulation Appendix 1: Krav til miljøovervåking av petroleumsvirksomheten på norsk kontinentalsokkel and Akvaplan-niva's internal procedures, with some additions for the purpose of this particular study. In using these standardised guidelines the results can be compared with the results from other environmental surveys in the Norwegian sector.

4 Sampling sediment

Sampling was carried out with a 0.1 m² lead weighted van Veen grab. The grab has hinged and lockable inspection flaps constructed of 0.5 mm mesh, each covered by an additional rubber flap. This construction allows water to pass freely through the grab during lowering,

but prevents disturbance of the sediment surface by water currents during hauling. Two van Veen grabs were mobilised, of which one was used during the sampling.

The grab was lowered at a velocity less than 1.5 m/s. At 5-10 m above the sediment surface, the speed was reduced to less than 0.2 m/s.

5 Sampling procedures

Five biological samples and three chemical grab samples were collected at each station. At the reference station additionally 5 biological and 2 chemical samples were collected. Each grab sample was visually inspected to ensure there was no sediment disturbance. Disturbed samples were rejected.

Samples for analyses of grain size, total organic matter (TOM) hydrocarbons and metals were taken from the same grab sample. The hydrocarbon and metal samples were taken with suitable equipment from the upper sediment layer (0 - 1 cm), while sediment for grain size analysis was taken from the upper 5 cm layer with a PVC core. All samples were labelled and immediately frozen at -20°C.

Biological samples were taken from separate grab samples. After the sample volume was recorded, the sediment was gently sieved through a 1 mm round mesh sieve immersed in seawater. The fauna retained on the sieve, was preserved in a 4 formaldehyde solution, neutralised with borax.

On deck, each sample was described with respect to sediment type, smell, colour, larger living animals and other prominent features (i.e. traces of oil, cuttings etc.). In one sample per station, the colour profile of the sediment was determined using a Munsell Soil Colour Chart.

At each station measurements of E_h and sulphide were carried out on three replicates at the surface and 5 cm sediment depth according to NS 9410 (Environmental monitoring of marine fish farms).

6 Selection of stations

The position and naming of the stations were based on the baseline survey carried out in 2002 (Rogalandsforskning, 2003). In that survey the stations were named ALF-1 to ALF-14 (ref.), and the new stations were therefore named ALF-15 to ALF-24.

The original plan was to sample 1000, 500, 350, 250, 175, and 125 m in the main current direction and at 125 and 175 m in the other three directions. However, after a discussion with Henrik Rye at SINTEF, who is responsible for the *ParTrack* modelling, it was agreed to eventually sample at closer distances based on the spreading of the discharge. At the same time, the sampled stations were not supposed to exceed 12 due to the costs associated with the sampling.

The sampling started in the main current direction (10°), at 1000 m distance from the well. From the 500 m station we went directly to the 250 m station, where we observed some drill cuttings particles but an otherwise apparently undisturbed sediment. We then sampled the 175 and 125 m stations, where more signs of the discharge were observed. However, to ensure that an eventual gradient in the fauna could be detected, we decided to sample at the 75 m station instead of the 350 m station in this direction. In the other directions we started the sampling at the 125 m stations. Here there were less signs of disturbance compared to the 125 m station in the main current direction. Based on this, we decided to sample the 75 m station instead of the 175 m stations in these directions. The fact that most signs of disturbance were

observed in the 10° direction also strengthens the conclusion that this is the main current direction, which was not quite clear prior to the field work.

7 Positioning

The positioning was conducted by the captain and mates on "Siggbas". The table below shows the positions on the stations with regards to degrees and distance from the center and geographical coordinates (ED50 and WGS84 (EUREF89)).

The positions were localized with a GPS (Global Positioning System), and the vessel was held in position by the crew on the bridge. The deviations from the positions on the sea surface are within ± 20 m.

St. no.	Degrees	Distance	ED 50		wgs-84	
			Latitude	Longitude	Latitude	Longitude
Center			58° 29,821'N	1° 43,363'E	58° 29,784'N	1° 43,268'E
ALF-1	10	250	58° 29,954'N	1° 43,408'E	58° 29,917'N	1° 43,313'E
ALF-2	10	500	58° 30,087'N	1° 43,453'E	58° 30,050'N	1° 43,358'E
ALF-3	10	1000	58° 30,353'N	1° 43,543'E	58° 30,316'N	1° 43,448'E
ALF-15	10	75	58° 29,861'N	1° 43,377'E	58° 29,824'N	1° 43,282'E
ALF-16	10	125	58° 29,887'N	1° 43,386'E	58° 29,850'N	1° 43,291'E
ALF-17	10	175	58° 29,914'N	1° 43,395'E	58° 29,877'N	1° 43,300'E
ALF-19	100	75	58° 29,814'N	1° 43,440'E	58° 29,777'N	1° 43,345'E
ALF-20	100	125	58° 29,809'N	1° 43,490'E	58° 29,772'N	1° 43,395'E
ALF-21	190	75	58° 29,781'N	1° 43,350'E	58° 29,744'N	1° 43,255'E
ALF-22	190	125	58° 29,755'N	1° 43,341'E	58° 29,718'N	1° 43,246'E
ALF-23	280	75	58° 29,828'N	1° 43,287'E	58° 29,791'N	1° 43,192'E
ALF-24	280	125	58° 29,833'N	1° 43,236'E	58° 29,796'N	1° 43,141'E

8 Station log

An overview of the characteristics of the stations observed in the field is presented in the table below. The seabed was flat, and all stations had a water depth of 108 m.

St. no.	Degrees	Distance	Sample characteristics
ALF-1	10	250	Grey silt/clay. Some black particles (drill cuttings), some oil/fat. Large polychaete.
ALF-2	10	500	Grey silt/clay. <i>Myxine</i> , cnidaria.
ALF-3	10	1000	Grey silt/clay. Small sieve residue. Munsell 2,5Y 4/2. <i>Cerianthus</i> , Pennatulacea (sea pens), hermit crab, <i>Myxine glutinosa</i> (slime eel).
ALF-15	10	75	1 rejected sample (large <i>Myxine</i> in the grab, large amounts of mucus). Approximately 1 cm surface layer with light grey clay with drill cuttings (Munsell 5Y 4/2), below "normal" sediment (Munsell 5Y 4/2). Empty <i>Mytilus</i> -shells.
ALF-16	10	125	Large amount of drill cuttings, large sieve residue. Approximately 1 cm surface layer with sediment containing drill cuttings, signs of black spots, below "normal" sediment. Munsell 5Y 4/2. Polychaeta, Pennatulacea.

ALF-17	10	175	Grey silt/clay. Drill cuttings, more sieve residue. Munsell 5Y 3/2. Polychaeta, Pennatulacea.
ALF-19	100	75	Grey silt/clay. Some drill cuttings, small sieve residue. Munsell 5Y 4/2. Polychaeta, sjøfjær, sjøstjerne. Empty <i>Mytilus</i> -shells.
ALF-20	100	125	Grey silt/clay. Some drill cuttings, small sieve residue. Munsell 5Y 4/2. Small <i>Myxine</i> .
ALF-21	190	75	Stratification; light grey/light brown surface layer with drill cuttings of approximately 1 - 2 cm, "normal" sediment below (Munsell 5Y 3/2). Large polychaete.
ALF-22	190	125	Grey silt/clay, some drill cuttings. Munsell 2,5 Y 4/2. Many organisms, including large polychaetes, pennatulacea, amphipod. In one of the samples quite large sieve residue with large, grey, partly connected particles.
ALF-23	280	75	Stratification in some samples; light grey/light brown surface layer with drill cuttings of approximately 1 cm, "normal" sediment below (Munsell 5Y 4/2). Considerable sieve residue. Many organisms, including large polychaete and <i>Myxine</i> .
ALF-24	280	125	Grey silt/clay. No stratification, only a small amount of drill cuttings and a small sieve residue. Munsell 5Y 4/2. Polychaete, platyhelminthes.

9 Personell and schedule

The following personnel carried out the sampling, in addition to the crew on board on "Siggbas":

Rune Palerud, Akvaplan-niva (cruise leader)

Hilde Cecilie, Trannum Akvaplan-niva

May Helene Nystad, Unilab Analyse

The table below shows the time schedule for the field work.

Date	Time	Comments
19.04	08:45 – 11:45	Arrival vessel at Ågotnes. Mobilisation and installing of equipment.
19.04	11:50	Departure from Ågotnes.
20.04	05:15	Arrival at station ALF3. Installation of equipment.
"	05:45 – 08:35	ALF3
"	08:42 – 09:35	ALF2
"	09:40 – 10:35	ALF1
"	10:55 – 12:45	ALF17
"	12:50 – 13:58	ALF16
"	14:00 – 15:15	ALF15
"	15:45 – 16:45	ALF22
"	16:50 – 18:30	ALF21
"	18:38 – 19:35	ALF24
"	19:40 – 20:40	ALF23
"	21:00 – 21:55	ALF20
"	22:00 – 23:30	ALF19
"	23:30 – 23:45	Samples and equipment secured, departure to Ågotnes.
21.04	15:15	Arrival Ågotnes. Siggbas unloaded, material was delivered to Nor Cargo
21.04	15:30	The cruise participants left the ship.

10References

Rogalandsforskning 2003. Grunnlagsundersøkelse av miljøforholdene ved Alfa Nord 2002. RF rapport-2003/085. 39 pp.+ appendices. *In Norwegian.*