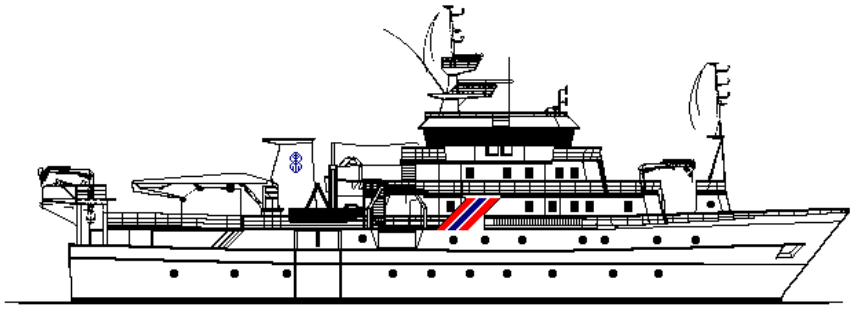

MARINE ENVIRONMENTAL SURVEY OF BOTTOM SEDIMENTS IN ANGOLA NORTH

Survey of the bottom fauna and selected physical and chemical compounds

13 april - 18 April 2006

Preliminary report

Institute of Marine Research (IMR)
Norway

Ministry of Livestock, Fisheries and Animal industry
Cameroon

Direction Générale de la Pêche et de l'Aquaculture
Gabon

IRAD - Fisheries and Oceanography Research
Cameroon

Direction Générale de la Pêche et de l'Aquaculture,
Congo

Instituto Investigação Marinha
Angola

Pêcheries Industrielles du Congo
Democratic Republic of Congo

Marine Fisheries Research Division
Ghana

The DR FRIDTJOF NANSEN RESEARCH PROGRAMME is sponsored by the Norwegian Agency for Development Cooperation (NORAD). The Food and Agriculture Organization of the United Nations (FAO) provide support to the Programme through Project GCP/INT/730/NOR: International Cooperation with the Nansen Programme: Fisheries Management and Marine Environment. This project is the follow-up to the Project NORAD/FAO/UNDP GLO/92/013. The Institute of Marine Research (IMR), Bergen, Norway is responsible for the implementation of the Programme in cooperation with FAO Fisheries Department and the local fisheries administrations. The aim of the Nansen Programme is to assist developing countries in fisheries research, management and institutional strengthening.

The programme has previously focused on the western Gulf of Guinea, but from 2004 two surveys have covered the area, Part I from Côte d'Ivoire to Benin, and Part II from Nigeria to Gabon. The following surveys has been conducted in the Gulf of Guinea:

Area	**Period**
Cape Verga (Rep. of Guinea) to Cape St. Paul (Ghana)	02 - 25 June 1981
Togo to Cameroon	07 - 20 August 1981
Côte d'Ivoire and Ghana	12 - 20 October 1989
Benin, Togo, Ghana and Côte d'Ivoire	19 April - 06 May 1999
Benin, Togo, Ghana and Côte d'Ivoire	29 August - 17 September 2000
Benin, Togo, Ghana and Côte d'Ivoire	6 July - 09 August 2002
Benin, Togo, Ghana and Côte d'Ivoire (Gulf of Guinea Part I)	14 May - 08 June 2004
Nigeria, Cameroon, São Tomé and Principe (Gulf of Guinea Part II)	11 June – 13 July 2004
Benin, Togo, Ghana and Côte d'Ivoire (Gulf of Guinea Part I)	03 May - 29 May 2005

CRUISE REPORTS "DR. FRIDTJOF NANSEN"

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Survey of the bottom fauna and selected physical and chemical compounds

13 april - 18 April 2006

by

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CHAPTER 1 INTRODUCTION

The survey of the eastern part of Gulf of Guinea was a follow up from the successful survey conducted by Institute of Marine Research (IMR) and Food and Agriculture Organisation of the United Nations (FAO) in the region last year. This years survey with Dr. Fridtjof Nansen was initiated by the GCLME (Guinea Current Large Marine Ecosystem) and forms part of the cooperation between GCLME, FAO and IMR. The survey will cover Nigeria, Cameroon, São Tomé and Principe, Gabon and Congo from the 3rd of June to the 15th of July 2005. The survey ads to the surveys of the western Gulf of Guinea conducted from Côte d'Ivoire to Benin, 14 May to 08 June this year by FAO and IMR under the project GCP/INT/730/NOR. The two surveys together cover the whole GCLME region.

The survey was organised by GCLME in cooperation with IMR and FAO under the FAO project GCP/INT/730/NOR: International cooperation with the Nansen Programme: Fisheries Management and Marine Environment, and the agreement between GCLME and IMR. This project is the continuation of a series of projects and agreements between NORAD, IMR and FAO involving surveys with the research vessel "Dr. Fridtjof Nansen". The objectives of the survey was discussed and agreed upon during a pre-survey meeting held in Tema, Ghana, prior to the survey on 3 June 2005 where representatives from GCLME and all countries surveyed were present together with representatives from FAO and IMR.

1.1 Objectives

The main objectives of the survey were:

- to collect bottom sediment samples to map benthic fauna
- to collect bottom sediment for background environmental descriptors (heavy metals, hydrocarbon, grain size etc.)
- to map the general hydrographic regime by using a CTD to monitor the temperature, salinity and oxygen
- on-the-job training on the main survey routines

1.2 Participation

Participants for the survey arrived in Luanda 1th April and 3th April. Departure of the survey was Luanda 18th April.

From Instituto Nacional de Investigação Pesqueira (**INIP**) (Angola)
- Zabaka R. Joao
- Silvana Manuell Faria
- Enoque Canganjo Vasco
- Isabel E. F. B. Cativa
- Ines Valente Vicente Quitumba
- Tito Milagre Ndumbo
- Manuell Paz Luis Pinto

From Agostinho Neto Univerity (students) (Angola)
- Paulo Andre De. S C
- Wsaso M. D. Andre

From Institute of Marine Research, Norway:
- Magne Olsen
- Tor Egil Johansson
- Terje Hovland

From UNIFOB AS, Section of Applied Environmental Research, Norway
- Gisle Vassenden

1.3 Narrative

The participants from Norway arrived Luanda airport on 1st April. Some scientific equipments were carried as luggage, and unfortunately, the custom confiscated the luggage at the airport. We did not see the equipment again before 18th April. A list of the confiscated equipments are showed in Table 1.1. This missing equipment had some consequences of the execution of the cruise. The first 10 days the vessel also waiting for delivery of fuel and lubricating oil.

The vessel left Luanda (Angola) at 19:50 on the 13th April. The vessel sailed northward during the night and the first sampling started at 08:35 on the 14th April at the inner shelf, Angola north. The stations were taken irregularly but with the aim of covering representative areas of the shelf between 20 m and 30 m depth. Due to solid bottom at some stations, and problem to

get samples, the sampling was continued at 30-50 m depth in the northern part of the investigating area. The next morning at 07:00 (15th April) sampling close to Essungo oilfield was undertaken. The platform was located in a position of 6°14,24 S and 12°09,98 E. Later this day Bagre oilfield (6°25,66 S and 12°18,48 E) was investigated. Both platforms were in Block 2 near Soyo. In the night sediment from the 80-90 m depth were sampled. In the morning at 07:00 (16th April) sampling at Lombre East (6°51,66 S / 12°23,38 E) were undertaken, and at 13:00 the Palanca Terminal (6°58,47 S / 12°22,43 E). These platforms are situated in Block 3. In the night stations south-west of Palanca were taken (80-100 m), and during the next day (17th April) some stations at 20-30 m depth were investigated when returning to Luanda. The cruise was finished 18:00. We arrived Luanda in the morning on 18th April. Information of the sampling stations is listed in Table 1.2.

Table 1.1. Missing equipment and the consequences.

Missing equipment	Alternative equipment	Consequences
Sieve 1 mm round holes	Sieve made by 1 mm square hole plankton net	Sampling not according to ISO 16665 and ISO 5667-19. Sampled fewer samples than originally planned.
Sieve 5 mm round holes	Sieve made of 3 mm round holes perforated plate	No consequences
Munsell colour chart	No	Roughly registration only
Corer	No	Sectioned samples missing
Containers	Containers from the vessel	Sampled fewer samples than originally planned.
Special plastic bags not contaminating the samples	Aluminium foil	No scientific consequences

1.4 Survey effort

Figure 1. shows the different CTD- and sediment stations. The four investigated oilfield are marked. Error: Reference source not found summarises the sampling journal and give some information of the stations.

Table 1.2. **Information of the sampling stations.**

Station nr. Sediment	Station nr. CTD	Date	Depth (m)	Position	Position	Oilfield	Sediment description	Samples B = biology, C = hydrocarbon, metal, grain size and total organic matter and volume (Litre)
AN 1	HD449	14.04.2006	22,5	6°54'444 S	12°32'844 E		Solid, coarse sediment	No samples
AN 2	HD450	14.04.2006	21	6°48' 732 S	12°27' 856 E		Sand	B=3L, C1=3L, C2=15L, C3=13L
AN 3	HD451	14.04.2006	27	6°37'243 S	12°19'600 E		coral	B=0.5L
AN 4	HD452	14.04.2006	38	6°35'348 S	12°16'741 E		Shell sand, mineral sand	B=21L, C1=10L, C2=9L, C=16L
AN 5	HD453	14.04.2006	45	6°27'517 S	12°09'183 E		Sand	B=9L, C1=8L, C2=8L, C3=8L
AN 6	HD454	14.04.2006	45	6°21'328 S	12°07'128 E		Sand and shell sand	B=-, C1=6L, C2=8L, C3=6L
AN 7	HD455	15.04.2006	26.5	6°12'448 S	12°09'972 E	Essungo	mud	B=9L, C1=9L, C2=10L, C3=9L
AN 8	HD456	15.04.2006	27	6°13'962 S	12°09'494 E	Essungo	mud	B=13L, C1=11L, C2=21L, C3=21L
AN 9	HD457	15.04.2006	26	6°14'104 S	12°09'693 E	Essungo	mud	B=12L, C1=8L, C2=12L, C3=9L
AN 10	HD458	15.04.2006	23,5	6°14'654 S	12°10'288 E	Essungo	mud	B=8L, C1=11L, C2=12L, C3=13L
AN 11	HD459	15.04.2006	23	6°14' 660 S	12°10' 542 E	Essungo	mud	B=11L, C1=9L, C2=10L, C3=12L
AN 12	HD460	15.04.2006	24	6°25' 655 S	12°18' 121 E	Bagre	mud	B=16L, C1=15L, C2=15L, C3=13L
AN 13	HD461	15.04.2006	24	6°25' 659S	12°17' 876 E	Bagre	Sand and mud	B=1L, C1=11L, C2=13L, C3=11L
AN 14	HD462	15.04.2006	25	6°25' 681 S	12°17' 317 E	Bagre	Fine sand, mud	B=10L, C1=12L, C2=12L, C3=13L
AN 15	HD463	15.04.2006	80	6°29' 980 S	12°03' 575 E		mud	B=21L, C1=21L, C2=21L, C3=21L
AN 16	HD464	16.04.2006	80	6°42' 444 S	12°04' 727 E		mud	B=11L, C1=7L, C2=12L, C3=11L
AN 17	HD465	16.04.2006	84	6°52' 471 S	12°04' 192 E		mud	B=11L, C1=12L, C2=15L, C3=11L

Table 1.2 continue**. Information of the sampling stations.**

Station Sediment	Station CTD	Date	Depth (m)	Position	Position		Sediment description	Samples B = biology, C = hydrocarbon, metal, grain size and total organic matter and volume (Litre)
AN 18	HD466	16.04.2006	36	6º51' 299 S	12º23' 042 E	Lombre	Sand	B=11L, C1=7L, C2=6L, C3=6L
AN 19	HD467	16.04.2006	35	6º51' 422 S	12º23' 195 E	Lombre	sand	B=3L, C1=6L, C2=5L, C3=8L
AN 20	HD468	16.04.2006	34.5	6º50' 806 S	12º22' 688 E	Lombre	sand	B=11L, C1=2L, C2=1,5L, C3=10L
AN 21	HD469	16.04.2006	46	6º50' 806 S	12º22' 688 E	Palanca	-	No samples
AN 22	HD470	16.04.2006	53	6º58' 297 S	12º21' 886 E	Palanca	Shell sand	B=3L, C1=8L, C2=2L, C3=5L
AN 23	HD471	16.04.2006	51	6º58' 429 S	12º22' 453 E	Palanca	Sand and broken shells	B=13L, C1=10L, C2=13L, C3=8L
AN 24	HD472	16.04.2006	50	6º58' 782 S	12º22' 704 E	Palanca	Sand and stones	C1=3L, C2=10L
AN 25	HD473	16.04.2006	49	6º59' 005 S	12º22' 921 E	Palanca	sand	B=5L, C1=12L, C2=13L, C3=12L
AN 26	HD474	16.04.2006	81	7º02' 670 S	12º18' 863 E		Fine sand and mud	B=15L, C1=17L, C2=21L, C3=9L
AN 27	HD475	16.04.2006	110	7º09' 196 S	12º18' 177 E		mud	B=21L, C1=21L, C2=21L, C3=21L
AN 28	HD476	17.04.2006	110	7º16' 470 S	12º24' 248 E		mud	B=18L, C1=21L, C2=21L, C3=17L
AN 29	HD477	17.04.2006	26	7º11' 478 S	12º43' 650 E		sand	B=12L, C1=11L, C2=15L, C3=11L
AN 30	HD478	17.04.2006	28	7º23' 922 S	14º50' 074 E		-	No samples
AN 31	HD479	17.04.2006	27	7º26' 466 S	12º52' 083 E		sand	B=9L, C1=12L, C2=3L, C3=13L
AN 32	HD480	17.04.2006	26	7º49' 450 S	13º02' 578 E		mud	B=21L, C1=13L, C2=15L, C3=11L
AN 33	HD481	17.04.2006	28	8º18' 516 S	13º17' 355 E		mud	B=21L, C1=21L, C2=21L, C3=21L

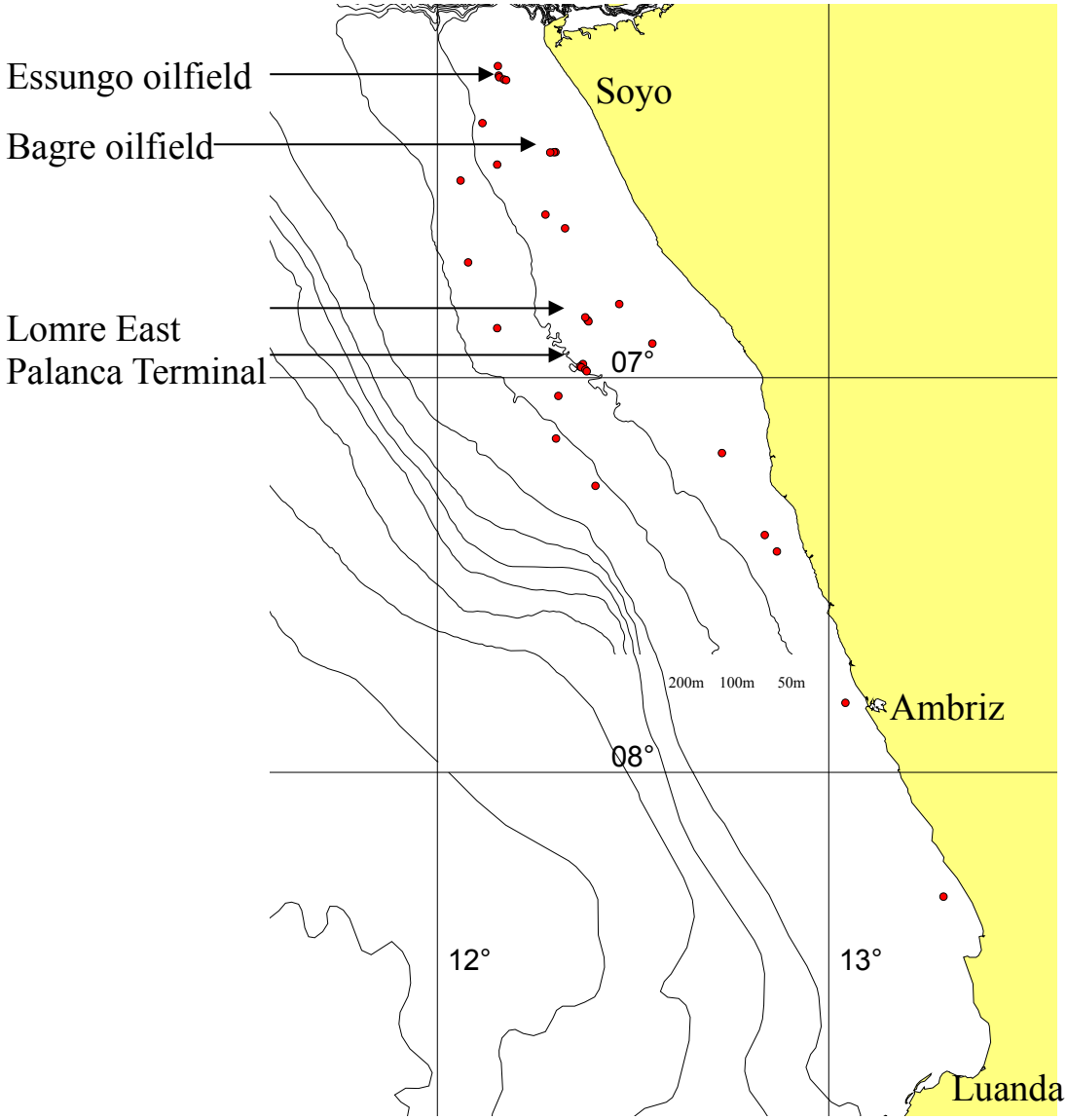

Figure 1.1 Map showing the sampling stations (red circles) and the four oilfields investigated. Depth contours are indicated (50 m, 100 m, 200 m)

~~CHAPTER 2~~

CHAPTER 3 METHODS

3.1 Meteorological and hydrographical sampling

Temperature, salinity and oxygen

CTD stations were taken in connection with bottom sediment stations. A Seabird 911 CTD plus was used to obtain vertical profiles of temperature, salinity and oxygen. Real time plotting and logging was done using the Seabird Seasave software installed on a PC. The profiles were taken down to a few metres above the bottom. The new oxygen sensor has shown to be very stable, and no calibration was conducted during the survey. The calibration constant calculated during the survey off the western Gulf of Guinea was applied for the whole survey.

Meteorological observations

Wind direction and speed, air temperature, global radiation and sea surface temperature (5 m depth) were logged automatically every nautical mile on an Aanderaa meteorological station.

3.2 Sediment sampling and sample handling

All the sampling was done by the crew from Instituto Nacional de Investigação Pesqueira_ (INIP) and Agostinho_Neto Univerity under supervision by Gisle Vassenden (UNIFOB AS/SAM-Marin). SAM-Marin is accredited for sampling, sorting and taxonomic identification under accreditation number Test 057.

The sampling programme consisted of one sample for biological analyses and 3 grab samples for chemical (hydrocarbon and metal) and grain size analyses. The sampling was carried out using a 0.1 m^2 van Veen grab with adjustable weights. The grab was deployed from an operated winch onto the seafloor. The samples were inspected for approval via the top opening of the grab. The volume of each sample was measured with an inch rule. Full grab contains 21 litres of sediment. Every sample was checked for sediment type, colour, odour and traces of pollution.

Sediment samples for oil hydrocarbon analyses were taken form the upper 0-1 cm layer of the sediment in 3 grab samples. There were taken duplicated samples, one for analyses in Angola and one for analyses in Norway. From the same 3 grab samples additional sediment was taken from the upper 0-1 cm. This sediment was mixed and will be used for heavy metal analyses (one sample for analyses in Angola and one for analyses in Norway). Mixed sediment from the upper 0-5 cm was also taken from the same 3 grabs for grain size and total organic carbon analysis (analyses in Norway). To avoid contamination an ordinary table spoon was used when taking the sediment for hydrocarbon and grain size analyses, but a plastic spoon was used when taken the sediment for metal analyses. The spoons were washed with seawater between each sample. After packaging in aluminium-foil (hydrocarbon) and labelled plastic bags all these samples were immediately frozen to prevent evaporation of labile compounds. At the end of the survey the samples for analyses in Angola were transported to a freezer at INIP. The samples for analyses in Norway were carried as luggage in cooling bags on 26th April.

The soft-bottom benthic macrofauna sampling was carried out using the 0.1 m^2 van Veen grab (Figure 2). Due to lack of suitable sieves (was at the Luanda airport) and containers, only one sample for biological analysis was taken at each station. The samples were carefully washed through a sieve with 3 mm circular holes and a sieve made of 1 mm plankton net with square holes. As a test to see how many animals going through the 1 mm sieve, a 0.5 mm sieve was used at some stations in addition to the 1 mm sieve. The fauna retained on the sieves were conservated in 20 % formaldehyde:water solution, neutralised with borax, labelled and stored in baskets on deck.

A sampling journal was written during the cruise (Appendix Table 1)

Deviations

All sampling should be undertaken in accordance with the ”Aktivitetsforskriften” and international standards (ISO 5667-19 and ISO 16665). Due to the problem with the equipment at the airport 1st April, some deviations from these guidelines and the originally sampling programme were unavoidable.

1. The sediment was visually described, but a Munsell soil colour chart should be used for detection of the sediment colour.
2. Only one mixed sample was taken for metal analyses, but it is recommended to take 3 parallels at each station.
3. Sectioned sediment samples for chemical analyses should be taken at designated sites. These samples should be taken by a corer from the top opening of the grab. It was proposed to take 3 sectioned sub samples respectively from the 0-1, 1-3 and 3-6 cm layers.
4. It is acceptable to use aluminium-foil for packaging sediment for hydrocarbon analyses to avoid contaminations of the sediment. But it was proposed to use specially designed plastic bags.
5. According to the sampling programme three replicate samples for biological analyses were proposed to be taken to obtain representative samples at each station, and to assess the patchiness in the distribution of the organisms. But the lack of suitable sieves and enough plastic containers, only one sample was taken for biological analyses. In the Norwegian guidelines (Aktivitetsforskriften) it is recommended to take 5 samples for biological analyses.
6. The sieves should be made of 1 mm circular holes. Instead a 1 mm plankton net with squared holes was used.
7. Normally we take the samples 250 m, 500 m, 1000 m, 2000 m etc. from the platform in four directions (dowenstream and upstream the predominant current direction, and perpendicular to this axis). Without permition to go inside the security zone the samples were taken mainly 500 and 1000 m from the platforms in one or two directions.

CHAPTER 4 OCEANOGRAPHIC CONDITIONS

4.1 Surface distribution

The surface layer temperature (5 m depth) was continuously recorded during the cruise. Figure 3.1 a, b and c shows the horizontal distribution of sea surface temperature (SST) for Nigeria, Cameroon, Sao Tõmè and Principe, Gabon and Congo respectively.

Nigeria and Cameroon

The sea surface temperature in Nigeria was similar to last year's survey, with the highest temperature, 28.8 °C, recorded close to the coast east of Lagos. This area was dominated of water masses with temperature >28°C. Further gradually cooler water masses was found, but the surface temperature generally never dropped below 27°C.

In Cameroon temperature extremes where found in the shallow strait between Cameroon and Equatorial Guinea, with temperatures fluctuating between 27.6°C at the Wouri River entrance to 26.8°C in outside Limbe and to 27.6°C at the southern part of the entrance to Douala. The warmer water masses generally correspond with low salinity water and commes from areas with river discharge. Cooler watermasses were also experienced further south towards Campo and offshore.

a) Nigeria - Cameroon

Figure 3.1 Horizontal distribution of surface temperature (5 m depth) at a) Nigeria - Cameroon b) Cameroon – Port Gentil, Gabon and c) São Tomé and Principe.

The surface salinity (Figure 3.2 a and b) was recorded from the Thermosalinograph at 5 m depth. The salinity varied dramatically in the survey area due to fresh water influx from the numerous rivers discharging in the region (Especially the Niger delta and Congo River systems), and effects from oceanic surface water masses (São Tomé and Principe) and local upwelling and surface currents (Gabon and Congo).

Nigeria and Cameroon

Generally the salinity was more stable in Nigeria, ranging between 32‰ and 34‰, in all but the southeastern end. The picture became more complex in this end of Nigeria and the northern part of Cameroon. The surface salinity decreased drastically towards Cameroon and the Bioco island of Equatorial Guinea with a pocket of salinity around 19‰ outside Malabo on Bioco island and as low as 17‰ close to the coast of Cameroon. The origin of this less saline water body was probably discharged from the Wouri River delta. An area with more saline waters >27‰ was found outside Limbe, This pocket corresponds with recordings of

cooler water temperatures probably indicating upwelling. Another pocket of similar saline water can be seen slightly further south. A less saline water body originating from the Douala entrance divided these two pockets. The sea surface salinity increased further south to 34 ‰ in the southern Cameroon around Campo

a) Nigeria - Cameroon

Figure 3.2 Horizontal distribution of surface salinity (5 m depth) at a) Nigeria - Cameroon b) Cameroon – Port Gentil, Gabon and c) São Tomé and Principe.

4.2 Vertical sections

Figures 2.3a-e shows the vertical distribution of temperature, salinity and dissolved oxygen as recorded on the hydrographic transects worked during the survey. There were only small differences between the profiles at different sections and no signs of upwelling in Nigeria. The most prominent feature during the survey was a pronounced thermocline and salinocline around 25 m depth in both in Nigeria and Cameroon. The water was well oxygenated throughout the survey area.

Nigeria and Cameroon
Surface temperature varied from 28°C in the south-western part of Nigeria to 27°C in the southeastern part with slightly warmer waters inshore. The temperature was approximately 20 °C below the thermocline, and decreased to 8°C in bottom layers at 500 m depth. The profiles showed very similar trends in Cameroon, but with a lifting of slightly cooler water masses on the shelf especially outside Campo. The surface salinity was around 33 - 34‰ in the south-western part of Nigeria while more variable (28 –32‰) in the south-eastern part due to the large water discharge from the many rivers in the Niger delta and from Wouri river estuary. The salinity maximum between 35.8‰ and 36.0‰ was typically around 50 m depth with a strong salinocline above this. Bottom salinity was typically 34.8‰ at 500 m. The sections in Cameroon showed a salinocline close to the surface at less than 25 m, with a less steep salinocline at the Campo section than outside Kribi. The salinity maximum (35.5‰) was below this. Bottom salinity was typically 34.8‰ at 500 m. Dissolved oxygen values decreased gradually from more than 4 ml/l at the surface to less than 2 ml/l below 200 m depth both in Nigeria and Cameroon.

NIGERIA

c) Escravos River 10/6-05

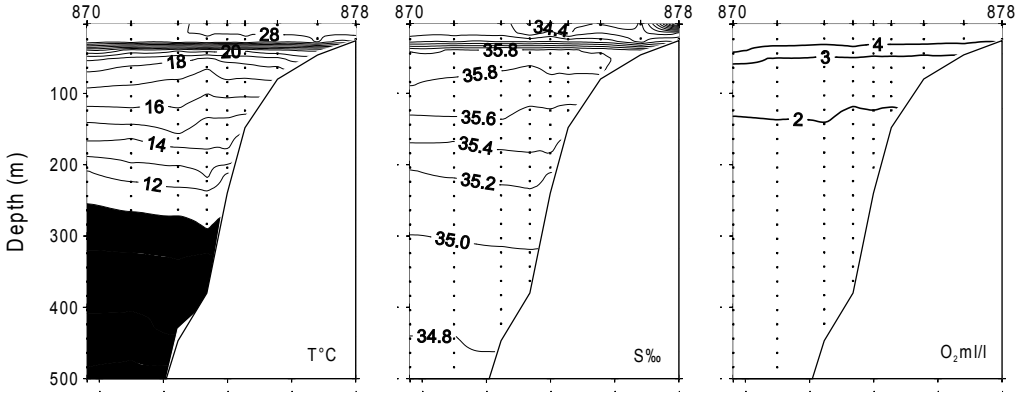

Figure3.3 Vertical sections of temperature, salinity and oxygen in **Nigeria**, at a) Lagos, b) Lekki, c) Escravos River, d) Middleton River, e) Brass River, f) Bonny River and g) Calabar River, **Cameroon** at, h) kribi and i) Campo River, **São Tomé and Principe** at j) Principe North, k) Principe South, l) São Tomé North, m) São Tomé West, n) São Tomé South, o) São Tomé East, .**Gabon** at p) Corisco, q) Equator, r), Cape Lopez, s) Iguèla, t) Sette Cama, u) Pte. Panga, v) Madingo, w) Pointe Noire.

~~CHAPTER 5~~

APPENDIX

Appendix Table 1. Sample journal. Start at the next page and contains 33 sheets.

SAMPLING JOURNAL **Page nr: 1 of 33**

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
14/04/06	HD449	AN 1	6º54'444 S	12º32'844 E	22,5

Weather: Sunny	Wind: Calm	Wave hight (m): 0,5
Time Start: 07:35 a.m	Time Finish: 08:50 a.m	Duration: 01: 15 min
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab		

Type of bottom sediment: Hard, coarse sediment	
Color: Yellow brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: 2	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1						No samples
	2						Impossible to get samples
	3						
	4						

SAMPLING JOURNAL **Page nr: 2 of 33**

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
14/04/06	HD450	AN 2	6º48' 732 S	12º27' 856 E	21

Weather: Sunny	Wind: calm	Wave hight (m): 0,5 m
Time Start: 09:50	Time Finish: 10: 47	Duration: 57 min
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab		

Type of bottom sediment: Sand	
Color: Brown-yellow	Odor: -
Observation of oil, waste etc: -	
Observation of animals: Polychaeta	
Number of rejected samples: 1	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	- / 3 L	2				
	2	- / 3 L		2	1	1	
	3	16 cm/ 15 L		2			
	4	14,5 cm/13 L		2			Gastropoda and Ophechthidae (Apterichtys klazingai) in the last sample

SAMPLING JOURNAL **Page nr: 3 of 33**

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
14/04/06	HD451	AN 3	6º37'243 S	12º19'600 E	27

Weather: Sunny	Wind: calm	Wave hight (m): 0,5 m
Time Start: 13:30	Time Finish: 13:50	Duration: 0:20
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab		

Type of bottom sediment: coral	
Color: violet	Odor: -
Observation of oil, waste etc: -	
Observation of animals: coral	
Number of rejected samples: 1	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	0,5 l	1				
	2						Impossible to get samples for
	3						chemical analyses
	4						

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
14/04/06	HD452	AN 4	6º35'348 S	12º16'741 E	38

Weather: Sunny	Wind: Calm	Wave hight (m): 0,5
Time Start: 14: 45	Time Finish: 16: 50	Duration: 2 hours
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: Shells sand, mineral sand	
Color: brown	Odor:
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: III	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	12cm/ 10L		2	1	1	A lot of animals
	2	11cm/9L		2			A lot of animals
	3	17cm/16L		2			Fine sand and gray color
	4	21cm/21L	1				

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
14/04/06	HD453	AN5	6º27'517 S	12º09'183 E	45

Weather: sunset	Wind: calm	Wave hight (m): 0,5
Time Start: 17: 54	Time Finish: 18: 50	Duration: 56 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand	
Color: olive gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	10cm/ 8 L		2	2	1	
	2	10cm/ 8 L		2			
	3	10,5cm/8L		2			
	4	11cm/9L	1				A lot of animals

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
14/04/06	HD454	AN 6	6º21'328 S	12º07'128 E	45

Weather: clean sky	Wind: calm	Wave hight (m): 0,5
Time Start: 20: 01	Time Finish: 21: 30	Duration: 29 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: Sand and shell sand	
Color: brown whiten	Odor:
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: 1	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	8cm/ 6L		2	2	1	
	2	10cm/8L		2			
	3	8cm/ 6L		2			
	4	-	1				

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD455	AN7	6º12'448 S	12º09'972 E	26,5

Weather: cloudy	Wind: a little strong	Wave hight (m): 0,5
Time Start: 6: 47	Time Finish: 7: 50	Duration:01: 03 min
Sample equipment used (name, bite area, weight):): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: green dark	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	11cm/9L		2	2	1	A lot of animals
	2	12cm/10L		2			
	3	11cm/9L		2			
	4	11cm/9L	1				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD456	AN8	6º13'962 S	12º09'494 E	27

Weather: rainy	Wind: more or less strong	Wave hight (m): 0,5
Time Start: 8: 32	Time Finish: 9: 40	Duration: 01: 28 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: dark gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: annelida , equinoderms, natantia	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	13cm/ 11L		2	2	1	
	2	21 cm/ 21L		2			
	3	21 cm/ 21L		2			
	4	15 cm/13L	1				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD457	AN 9	6º14'104 S	12º09'693 E	23,5

Weather: rainy	Wind: strong	Wave hight (m): 1
Time Start: 9: 56	Time Finish: 10: 45	Duration: 49 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: dark gray and brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: ophiuroidea, polychaeta, mollusca	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	10 cm/ 8L		2	2	1	
	2	14 cm/ 12L		2			
	3	11 cm/ 9L		2			A lot of animals
	4	14 cm/ 12 L	1(1mm) 1(0.5mm)				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD458	AN10	6°14'654 S	12°10'288 E	26

Weather: cloudy	Wind: a little bit strong	Wave hight (m): 0,5
Time Start: 11:23	Time Finish: 12: 10	Duration: 47 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: dark gray brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: equinoderms, polychaeta, natantia	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	13cm/11L		2	2	1	
	2	13,5cm/12L		2			
	3	15cm/13L		2			A lot of animals
	4	10cm/8L	1(1mm) 1(0.5mm				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD459	AN11	6º14' 660 S	12º10' 542 E	23

Weather: Cloudy	Wind: calm	Wave hight (m): 0,5
Time Start: 12: 48	Time Finish: 14:50	Duration: 52 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: Mud	
Color: green-gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: some polychaeta	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment Granulometry	Remarks:
	1	11cm/9L		2			
	2	12cm/10L		2			
	3	14cm/12L		2	2	2	
	4	13cm/11L	1				

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD460	AN12	6º25' 655 S	12º18' 121 E	24

Weather: cloudy	Wind: calm	Wave hight (m): 0,5
Time Start: 15:49	Time Finish: 17:20	Duration: 02:31 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: gray- dark	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: 1	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1						Rejected /dead shells in the grab
	2	16cm/15L		2	2	1	
	3	16cm/15L		2			
	4	15cm/13L		2			
	5	17cm/16L	2				

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD461	AN13	6º25' 659S	12º17' 876 E	24

Weather: -	Wind: -	Wave hight (m): -
Time Start: 18: 01	Time Finish: 18: 43	Duration: 42 min
Sample equipment used (name, bite area, weight):): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand, mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: polychaeta, crustacea, annelida	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	13cm/11L		2	2	1	
	2	15cm/13L		2			
	3	13cm/11L		2			
	4	2cm/1L	1 (1 mm) 1 (0.5 mm)				

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD462	AN14	6º25' 681 S	12º17' 317 E	25

Weather:	Wind: calm	Wave hight (m):
Time Start: 18: 58	Time Finish: 20: 38	Duration: 02:40 min
Sample equipment used (name, bite area, weight):): 0,1 m^2 Van Veen grab		

Type of bottom sediment: fine sand, mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: Polychaeta, sea urchin, annelidea	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	12cm/10L	2 (1 mm) 3 (0.5 mm)				
	2	14cm/12L		2	2	1	
	3	14cm/12L		2			
	4	15cm/13L		2			

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
15/04/06	HD463	AN15	6º29' 980 S	12º03' 575 E	80

Weather:	Wind: calm	Wave hight (m):
Time Start: 22:20	Time Finish: 23:05	Duration: 45 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	21cm/21L		2	2	1	
	2	21cm/21L		2			
	3	21cm/21L		2			
	4	21cm/21L	1 (1mm) 2 (0,5mm)				

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD464	AN16	6º42' 444 S	12º04' 727 E	80

Weather: partial cloudy	Wind: calm	Wave hight (m): 0,5
Time Start: 12: 45	Time Finish: 14: 10	Duration: 01:25 min
Sample equipment used (name, bite area, weight):): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: fish, polychaeta	
Number of rejected samples: 1 (open grab)	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	9cm/ 7L		2	2	1	
	2	14cm/12L		2			
	3	13cm/11L		2			
	4	13cm/11L	1				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD465	AN17	6º52' 471 S	12º04' 192 E	84

Weather: clear sky	Wind: calm	Wave hight (m): 0,5
Time Start: 03:25	Time Finish: 04: 30	Duration: 01:05 min
Sample equipment used (name, bite area, weight):): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: sea stars, gastropoda	
Number of rejected samples: 1 (open grab)	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	14cm/12L		2	2	1	
	2	16cm/15L		2			
	3	15cm/13L		2			
	4	13cm/11L	4 (0,5 mm) 1 (0,1 mm)				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD466	AN18	6º51' 299 S	12º23' 042 E	36

Weather:	Wind:	Wave hight (m):
Time Start: 07:15	Time Finish: 08:46	Duration: 01:31 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand	
Color: brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: annelidea	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	13cm/11L	10				
	2	9cm/7L		2	2	1	
	3	8cm/6L		2			
	4	8cm/6L		2			

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD467	AN19	6º51' 422 S	12º23' 195 E	35

Weather: sunny	Wind:	Wave hight (m):
Time Start: 09:15	Time Finish: 10:30	Duration: 01:25 min
Sample equipment used (name, bite area, weight):): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand	
Color: brown-gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: crustacea, bivalvia, ophiuoridea	
Number of rejected samples: 2	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	8cm/6L		2	2*	1*	* Mixed sample from sample nr. 1, 2 and 4.
	2	7cm/5L		2			
	3	5cm/3L	4				
	4	10cm/8L		2			

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD468	AN20	6º50' 806 S	12º22' 688 E	34,5

Weather: sunny	Wind:	Wave hight (m):
Time Start: 10: 50	Time Finish: 11:45	Duration: 55 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sandy	
Color: brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: annelidea	
Number of rejected samples: l	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	4cm/2L		2	2	1	
	2	3,5cm/1,5L		2			
	3	12cm/10L		2			
	4	13cm/11L	14				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD469	AN21	6º50' 806 S	12º22' 688 E	46

Weather:	Wind:	Wave hight (m):
Time Start: 13:53	Time Finish: 14: 35	Duration: 42 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment:	
Color:	Odor:
Observation of oil, waste etc:	
Observation of animals:	
Number of rejected samples: 4 (station cancelled because of hard bottom and little sediment in the grab)	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1						
	2						
	3						
	4						

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
	HD470	AN22	6º58' 297 S	12º21' 886 E	53

Weather: sunny	Wind: calm	Wave hight (m): 0,5
Time Start: 14:49	Time Finish: 16:10	Duration: 01:21 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: shell sand	
Color: brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: polychaeta, crustacean	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	5,5cm/3L	8				
	2	10cm/8L		2	2	1	
	3	4 cm/ 2L		2			
	4	7 cm/ 5L		2			

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD471	AN23	6º58' 429 S	12º22' 453 E	51

Weather: sunny	Wind: calm	Wave hight (m): 0,5
Time Start: 15: 11	Time Finish: 17: 02	Duration: 01: 51
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand and broken shells	
Color: brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	12cm/ 10L		2	2	' 1	
	2	15,5cm/13L		2			
	3	10cm/8L		2			
	4	15cm/13L	19				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD472	AN24	6º58' 782 S	12º22' 704 E	50

Weather: sunny	Wind: calm	Wave hight (m): 0,5
Time Start: 17:45	Time Finish: 18:42	Duration: 57 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand and stones	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: 5 , to many rejected samples, station finishid with only 2 samples	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	5cm/3L	-	2	2	1	
	2	12cm/10L	-	2			
	3	-					
	4	-					

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD473	AN25	6º59' 005 S	12º22' 921 E	49

Weather: clear sky	Wind: more or less strong	Wave hight (m):
Time Start: 19:03	Time Finish: 20:01	Duration: 58 min
Sample equipment used (name, bite area, weight):): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand	
Color: brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: annelidea, bivalva	
Number of rejected samples: l	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	14cm/12L		2	2	1	
	2	15cm/13L		2			
	3	14cm/12L		2			
	4	7cm/ 5 L	2				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16/04/06	HD474	AN26	7º02' 670 S	12º18' 863 E	81

Weather: clear sky	Wind: more or less strong	Wave hight (m):
Time Start: 21:35	Time Finish: 22:37	Duration: 01:02 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: fine sand , mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: - annelidea, ophiuroidea	
Number of rejected samples: 1	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	18cm/17L		2	2	1	
	2	21cm/21L		2			
	3	11cm/9L		2			
	4	16cm/15L	4				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
16-17/04/06	HD475	AN27	7º09' 196 S	12º18' 177 E	110

Weather: clear sky	Wind: +/- strong	Wave hight (m): 0,5
Time Start: 21: 35	Time Finish: 22:37	Duration: 01:02 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	21cm/21L		2	2	1	
	2	21cm/21L		2			
	3	21cm/21L		2			
	4	21cm/21L	5(1mm) 1 (0,5mm)				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
17/04/06	HD476	AN28	7º16' 470 S	12º24' 248 E	110

Weather: cloudy	Wind: calm	Wave hight (m): 0,5
Time Start: 02:25 AM	Time Finish: 03:10 AM	Duration: 0:45
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: green	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	21cm/21L		2	2	1	
	2	21cm/21L		2			
	3	18cm/17L		2			
	4	19cm/18L	9(1mm) 1 (0,5mm)				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
17/04/06	HD477	AN29	7º11' 478 S	12º43' 650 E	26

Weather: totally cloudy	Wind: calm	Wave hight (m): 0,5
Time Start: 5: 45	Time Finish: 6: 25	Duration: 40 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand	
Color: brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers Bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	13cm/11L		2	2	1	
	2	16cm/15L		2			
	3	13cm/11L		2			
	4	14cm//12L	9				

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Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
17/04/06	HD478	AN30	7º23' 922 S	14º50' 074 E	28

Weather: sunny	Wind: calm	Wave hight (m):
Time Start: 8:33	Time Finish: 09:00	Duration: 27 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment:	
Color:	Odor:
Observation of oil, waste etc:	
Observation of animals:	
Number of rejected samples: 5 (all samples rejected)	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1						
	2						
	3						
	4						

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
17/04/06	HD479	AN31	7º26' 466 S	12º52' 083 E	27

Weather: sunny	Wind: calm	Wave hight (m):
Time Start: 09:18	Time Finish: 09:53	Duration: 35 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: sand	
Color: brown	Odor: -
Observation of oil, waste etc: -	
Observation of animals: amphipoda, annelidea, bivalvia	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	14 cm/12L		2	2	1	
	2	5cm/3L		2			
	3	15cm/13L		2			
	4	11cm/9L	17				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
17/04/06	HD480	AN32	7º49' 450 S	13º02' 578 E	26

Weather: cloudly partial	Wind: calm	Wave hight (m): 0,5
Time Start: 13:00	Time Finish: 13:40	Duration: 40 min
Sample equipment used (name, bite area, weight):): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	15cm/13L		2	2	1	
	2	16cm/15L		2			
	3	13cm/11L		2			
	4	21cm/21L	1				

Vessel:	Area:	Project code:	Servey nr:
R/V Dr. Fridtjof Nansen	Angola North	A4	62

Date	CTD station nr.	Grab station nr.	Position		Depth (m)
			Latatitude	Longitude	
17/04/06	HD481	AN33	8º18' 516 S	13º17' 355 E	28

Weather: sunny	Wind: calm	Wave hight (m): 0,5
Time Start: 17:15	Time Finish: 17:50	Duration: 35 min
Sample equipment used (name, bite area, weight): 0,1 m^2 Van Veen grab		

Type of bottom sediment: mud	
Color: gray	Odor: -
Observation of oil, waste etc: -	
Observation of animals: -	
Number of rejected samples: -	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks:
	1	21cm/21L		2	2	1	
	2	21cm/21L		2			
	3	21cm/21L		2			
	4	21cm/21L	1				

MARINE ENVIRONMENTAL SURVEY OF BOTTOM SEDIMENTS IN ANGOLA NORTH

Training cruise and laboratory work 13.-26. April 2006

By

Gisle Vassenden

UNIFOB AS
SAM-Marin

Introduction

This report is a summary of the benthos cruise to Angola north in the period 13th – 18th April 2006 and of my stay at INIP in the period 19th - 26th April 2006. The duration of the cruise was planned to be more than two weeks, but due to problems with delivery of fuel and lubricating oil, and problems to get the equipment through the custom at the airport, the duration of the cruise was reduced to only 4 days. Anyway, the cruise gave a lot of experience to the participants of the cruise.

Participations at the cruise

From Instituto Nacional de Investigação Pesqueira (**INIP**) (Angola)
Manuell Paz Luis Pinto
Zabaka R. Joao
Silvana Manuell Faria
Enoque Canganjo Vasco
Isabel E. F. B. Cativa
Ines Valente Vicente Quitumba
Tito Milagre Ndumbo

From Agostinho Neto Univerity (students) (Angola)
Paulo Andre De. S C
Wsaso M. D. Andre

From Institute of Marine Research, Norway:
Magne Olsen
Tor Egil Johansson
Terje Hovland

From UNIFOB AS, Section of Applied Environmental Research, Norway
Gisle Vassenden

Objectives

- to collect bottom sediment samples to map benthic fauna
- to collect bottom sediment for background environmental descriptors (heavy metals, hydrocarbon, grain size etc.)
- to map the general hydrographic regime by using a CTD to monitor the temperature, salinity and oxygen
- on-the-job training on the main survey routines

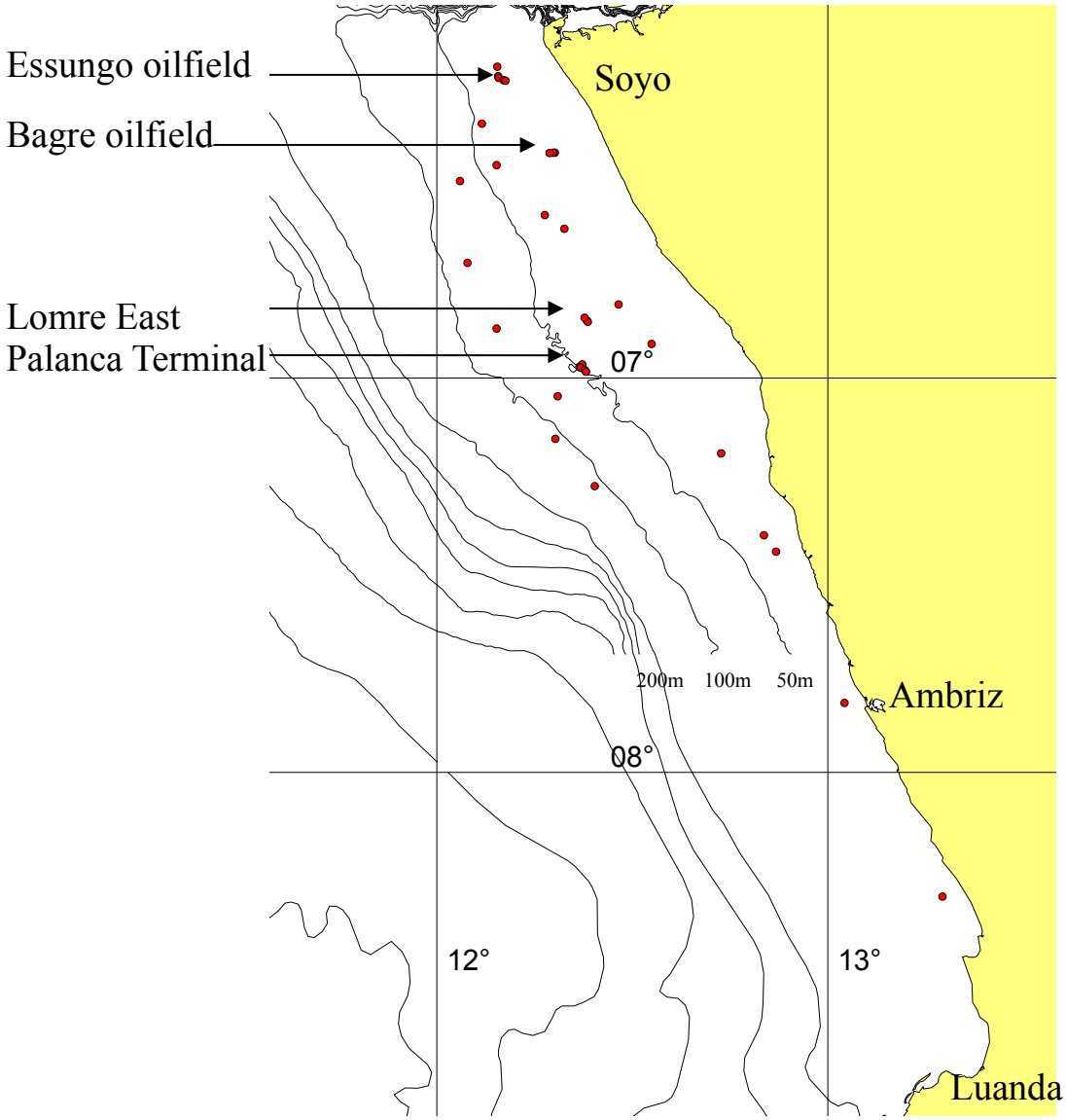

Figure 1. Map showing the sampling stations (red circles) and the four oilfields investigated.

Diary

We arrived Luanda airport on 1st April. We had some scientific equipment as luggage, and unfortunately, the custom confiscated the luggage at the airport. We did not see the equipment again before 18th April. A list of the confiscated equipments are showed in Table 1. This missing equipment had some consequences of the execution of the cruise. The first 10 days the vessel also waiting for delivery of fuel and lubricating oil.

The vessel left Luanda (Angola) at 19:50 on the 13th April. The vessel sailed northward during the night and the first sampling started at 08:35 on the 14th April at the inner shelf, Angola

north. The stations were taken irregularly but with the aim of covering representative areas of the shelf between 20 m and 30 m depth. Due to solid bottom at some stations, and problem to get samples, the sampling was continued at 30-50 m depth in the northern part of the investigating area. The next morning at 07:00 (15th April) sampling close to Essungo oilfield was undertaken. The platform was located in a position of 6º14,24 S and 12º09,98 E. Later this day Bagre oilfield (6º25,66 S and 12º18,48 E) was investigated. Both platforms were in Block 2 near Soyo. In the night sediment from the 80-90 m depth were sampled. In the morning at 07:00 (16th April) sampling at Lombre East (6º51,66 S / 12º23,38 E) were undertaken, and at 13:00 the Palanca Terminal (6º58,47 S / 12º22,43 E). These platforms are situated in Block 3. In the night stations south-west of Palanca were taken (80-100 m), and during the next day (17th April) some stations at 20-30 m depth were investigated when returning to Luanda. The cruise was finished 18:00. We arrived Luanda in the morning on 18th April. Information of the sampling stations is listed in Table 2.

Table 1. Missing equipment and the consequences.

Missing equipment	Alternative equipment	Consequences
Sieve 1 mm round holes	Sieve made by 1 mm square hole plankton net	Sampling not according to ISO 16665 and ISO 5667-19. Sampled fewer samples than originally planned.
Sieve 5 mm round holes	Sieve made of 3 mm round holes perforated plate	No consequences
Munsell colour chart	No	Roughly registration only
Corer	No	Sectioned samples missing
Containers	Containers from the vessel	Sampled fewer samples than originally planned.
Special plastic bags not contaminating the samples	Aluminium foil	No scientific consequences

Table 2. Information of the sampling stations.

Station nr. Sediment	Station nr. CTD	Date	Depth (m)	Position	Position	Oilfield	Sediment description	Samples B = biology, C = hydrocarbon, metal, grain size and total organic matter and volume (Litre)
AN 1	HD449	14.04.2006	22,5	**6º54'444 S**	**12º32'844 E**		Solid, coarse sediment	No samples
AN 2	HD450	14.04.2006	21	**6º48' 732 S**	**12º27' 856 E**		Sand	B=3L, C1=3L, C2=15L, C3=13L
AN 3	HD451	14.04.2006	27	**6º37'243 S**	**12º19'600 E**		coral	B=0.5L
AN 4	HD452	14.04.2006	38	**6º35'348 S**	**12º16'741 E**		Shell sand, mineral sand	B=21L, C1=10L, C2=9L, C=16L
AN 5	HD453	14.04.2006	45	**6º27'517 S**	**12º09'183 E**		Sand	B=9L, C1=8L, C2=8L, C3=8L
AN 6	HD454	14.04.2006	45	**6º21'328 S**	**12º07'128 E**		Sand and shell sand	B=-, C1=6L, C2=8L, C3=6L
AN 7	HD455	15.04.2006	26.5	**6º12'448 S**	**12º09'972 E**	Essungo	mud	B=9L, C1=9L, C2=10L, C3=9L
AN 8	HD456	15.04.2006	27	**6º13'962 S**	**12º09'494 E**	Essungo	mud	B=13L, C1=11L, C2=21L, C3=21L
AN 9	HD457	15.04.2006	26	**6º14'104 S**	**12º09'693 E**	Essungo	mud	B=12L, C1=8L, C2=12L, C3=9L
AN 10	HD458	15.04.2006	23,5	**6º14'654 S**	**12º10'288 E**	Essungo	mud	B=8L, C1=11L, C2=12L, C3=13L
AN 11	HD459	15.04.2006	23	**6º14' 660 S**	**12º10' 542 E**	Essungo	mud	B=11L, C1=9L, C2=10L, C3=12L
AN 12	HD460	15.04.2006	24	**6º25' 655 S**	**12º18' 121 E**	Bagre	mud	B=16L, C1=15L, C2=15L, C3=13L
AN 13	HD461	15.04.2006	24	**6º25' 659S**	**12º17' 876 E**	Bagre	Sand and mud	B=1L, C1=11L, C2=13L, C3=11L
AN 14	HD462	15.04.2006	25	**6º25' 681 S**	**12º17' 317 E**	Bagre	Fine sand, mud	B=10L, C1=12L, C2=12L, C3=13L
AN 15	HD463	15.04.2006	80	**6º29' 980 S**	**12º03' 575 E**		mud	B=21L, C1=21L, C2=21L, C3=21L
AN 16	HD464	16.04.2006	80	**6º42' 444 S**	**12º04' 727 E**		mud	B=11L, C1=7L, C2=12L, C3=11L
AN 17	HD465	16.04.2006	84	**6º52' 471 S**	**12º04' 192 E**		mud	B=11L, C1=12L, C2=15L, C3=11L

Table 2 continue. Information of the sampling stations.

Station Sediment	Station CTD	Date	Depth (m)	Position	Position		Sediment description	Samples B = biology, C = hydrocarbon, metal, grain size and total organic matter and volume (Litre)
AN 18	HD466	16.04.2006	36	**6º51' 299 S**	**12º23' 042 E**	Lombre	Sand	B=11L, C1=7L, C2=6L, C3=6L
AN 19	HD467	16.04.2006	35	**6º51' 422 S**	**12º23' 195 E**	Lombre	sand	B=3L, C1=6L, C2=5L, C3=8L
AN 20	HD468	16.04.2006	34.5	**6º50' 806 S**	**12º22' 688 E**	Lombre	sand	B=11L, C1=2L, C2=1,5L, C3=10L
AN 21	HD469	16.04.2006	46	**6º50' 806 S**	**12º22' 688 E**	Palanca	-	No samples
AN 22	HD470	16.04.2006	53	**6º58' 297 S**	**12º21' 886 E**	Palanca	Shell sand	B=3L, C1=8L, C2=2L, C3=5L
AN 23	HD471	16.04.2006	51	**6º58' 429 S**	**12º22' 453 E**	Palanca	Sand and broken shells	B=13L, C1=10L, C2=13L, C3=8L
AN 24	HD472	16.04.2006	50	**6º58' 782 S**	**12º22' 704 E**	Palanca	Sand and stones	C1=3L, C2=10L
AN 25	HD473	16.04.2006	49	**6º59' 005 S**	**12º22' 921 E**	Palanca	sand	B=5L, C1=12L, C2=13L, C3=12L
AN 26	HD474	16.04.2006	81	**7º02' 670 S**	**12º18' 863 E**		Fine sand and mud	B=15L, C1=17L, C2=21L, C3=9L
AN 27	HD475	16.04.2006	110	**7º09' 196 S**	**12º18' 177 E**		mud	B=21L, C1=21L, C2=21L, C3=21L
AN 28	HD476	17.04.2006	110	**7º16' 470 S**	**12º24' 248 E**		mud	B=18L, C1=21L, C2=21L, C3=17L
AN 29	HD477	17.04.2006	26	**7º11' 478 S**	**12º43' 650 E**		sand	B=12L, C1=11L, C2=15L, C3=11L
AN 30	HD478	17.04.2006	28	**7º23' 922 S**	**14º50' 074 E**		-	No samples
AN 31	HD479	17.04.2006	27	**7º26' 466 S**	**12º52' 083 E**		sand	B=9L, C1=12L, C2=3L, C3=13L
AN 32	HD480	17.04.2006	26	**7º49' 450 S**	**13º02' 578 E**		mud	B=21L, C1=13L, C2=15L, C3=11L
AN 33	HD481	17.04.2006	28	**8º18' 516 S**	**13º17' 355 E**		mud	B=21L, C1=21L, C2=21L, C3=21L

Sampling and sample handling

All the sampling was done by the crew from Instituto Nacional de Investigação Pesqueira_ (INIP) and Agostinho_Neto Univerity under supervision by Gisle Vassenden (UNIFOB AS/SAM-Marin). SAM-Marin is accredited for sampling, sorting and taxonomic identification under accreditation number Test 057.

The sampling programme consisted of one sample for biological analyses and 3 grab samples for chemical and grain size analyses. It was taken sediment-samples for hydrocarbon- and metal analyses. The sampling was carried out using a 0.1 m^2 van Veen grab with adjustable weights. The grab was deployed from an operated winch onto the seafloor. The samples were inspected for approval via the top opening of the grab. The volume of each sample was measured with an inch rule. Full grab contains 21 litres of sediment. Every sample was checked for sediment type, colour, odour and traces of pollution.

Sediment samples for oil hydrocarbon analyses were taken form the upper 0-1 cm layer of the sediment in 3 grab samples. There were taken duplicated samples, one for analyses in Angola and one for analyses in Norway. From the same 3 grab samples additional sediment was taken from the upper 0-1 cm. This sediment was mixed and will be used for heavy metal analyses (one sample for analyses in Angola and one for analyses in Norway). Mixed sediment from the upper 0-5 cm was also taken from the same 3 grabs for grain size and total organic carbon analysis (analyses in Norway). To avoid contamination an ordinary table spoon was used when taking the sediment for hydrocarbon and grain size analyses, but a plastic spoon was used when taken the sediment for metal analyses. The spoons were washed with seawater between each sample. After packaging in aluminium-foil (hydrocarbon) and labelled plastic bags all these samples were immediately frozen to prevent evaporation of labile compounds. At the end of the survey the samples for analyses in Angola were transported to a freezer at INIP. The samples for analyses in Norway were carried as luggage in cooling bags on 26th April.

The soft-bottom benthic macrofauna sampling was carried out using the 0.1 m^2 van Veen grab (Figure 2). Due to lack of suitable sieves (was at the Luanda airport) and containers, only one sample for biological analysis was taken at each station. The samples were washed through a sieve with 3 mm circular holes and a sieve made of 1 mm plankton net with square holes. As

a test to see how many animals going through the 1 mm sieve, a 0.5 mm sieve was used at some stations in addition to the 1 mm sieve. The fauna retained on the sieves were conservated in 20 % formaldehyde:water solution, neutralised with borax, labelled and stored in baskets on deck.

A sampling journal was written during the cruise (Appendix Table 1)

Figure 2. 0.1 m^2 Ven Veen grab and the arrangement of the table and sieves.

Figure 3. Conservation with borax and formalin.

Deviations

All sampling should be undertaken in accordance to guidelines for environmental monitoring of the petroleum activities on the Angolan continental shelf (a translation of the Norwegian guidelines of the petroleum activities) and international standards (ISO 5667-19 and ISO 16665). Due to the problem with the equipment at the airport 1st April, some deviations from these guidelines and the originally sampling programme were unavoidable.

1. The sediment was visually described, but a Munsell soil colour chart should be used for detection of the sediment colour.
2. Only one mixed sample was taken for metal analyses, but it is recommended to take 3 parallels at each station.
3. Sectioned sediment samples for chemical analyses should be taken at designated sites. These samples should be taken by a corer from the top opening of the grab. It was proposed to take 3 sectioned sub samples respectively from the 0-1, 1-3 and 3-6 cm layers.
4. It is acceptable to use aluminium-foil for packaging sediment for hydrocarbon analyses to avoid contaminations of the sediment. But it was proposed to use specially designed plastic bags.
5. According to the sampling programme three replicate samples for biological analyses were proposed to be taken to obtain representative samples at each station, and to assess the patchiness in the distribution of the organisms. But the lack of suitable sieves and enough plastic containers, only one sample was taken for biological analyses. In the Norwegian guidelines it is recommended to take 5 samples for biological analyses.
6. The sieves should be made of 1 mm circular holes. Instead a 1 mm plankton net with squared holes was used.
7. Normally we take the samples 250 m, 500 m, 1000 m, 2000 m etc. from the platform in four directions (dowenstream and upstream the predominant current direction, and perpendicular to this axis). Without permition to go inside the security zone the samples were taken mainly 500 and 1000 m from the platforms in one or two directions.

Health and safety

Before departure everybody was informed about the safety rules onboard. Chief Officer on Dr Fridtjof Nansen gave a guided tour on the vessel and explained the alarm signals, and showed the emergency exits and the muster sites.

When working on deck hard hats and safety boots were worn. In addition safety glasses and gloves were worn when working with formaldehyde. Rain gear was used when necessary. A

grab is heavy and information of the importance not to putting hands inside an open grab was repeated several times.

There were no accidents during the cruise. During disembarkment from the survey vessel one of the participants, Tito Milagre Ndumbo, got an allergic reaction. This was probably caused by not working with gloves when transporting the containers with formaldehyde (contact by skin) or just caused by the formaldehyde gas.

Needs for the next cruise

- Positions of platforms to be investigated
- Name of the platforms
- Radio frequense which they are listening
- Bottom maps with pipe lines, cables, subsea installations etc.
- Permition to go inside the security zone
- Information of the predominating current directions around the platforms
- Suitable equipment

LABORATORY WORK

Participations

From Instituto Nacional de Investigação Pesqueira (**INIP**) (Angola)
Lia Neto S
Manuell Paz Luis Pinto
Zabaka R. Joao
Silvana Manuell Faria
Isabel E. F. B. Cativa

From UNIFOB AS, Section of Applied Environmental Research, Norway
Gisle Vassenden

Objectives

on-the-job training on the main laboratory work like:

- Rinsing the sediment to remove the formaldehyde.
- Sorting of benthic fauna into main taxonomic groups.
- Preparation of the fauna for taxonomic identification.

Suitable equipment

Protecting gloves
Sieves and tubs
Dissecting binocular with light
Petri dish
Forceps
Tubes
Lables
Ethanol
10 % formaldehyde:water solution (Phylum Priapulida and Sipuncula)
Container with caps for the sample and the waste
Elastics

Transport and storage of samples

At the cruise, the containers with sediment samples were placed in baskets belonging to the vessel. When arriving Luanda, the samples were transferred to a temporary store at INIP. When transferring the containers to the long-time store, it was difficult and time consuming to

sort the different containers by station. In addition it was not healthy to sort the samples in the high concentration of formaldehyde gas. These situations could be avoided if the containers had be placed in suitable transport boxes labelled by the actually stations.

A gas mask should be worn when visiting the long-time store because of formaldehyde gas.

Washing procedure

The formalin solution should be rinsed from the sample in the laboratory in a ventilated sink or extractor. Lack of extractor and suitable sink, washing of the sediment was undertaken in a tub outside the building. A 1 mm sieve (or 0,5 mm sieve) was used.

Protective gloves were used when rinsing the sediment.

After rinsing the sediment, all the sediment and fauna was transferred to a container or box (Figure 2). It is suitable to use an ordinary ice-cream-box or similar to preserve the sample when sorting out the animals.

When building the ventilated sink or extractor, it is important to avoid clogging of the outlet pipe with sediment. One way of designing the sink is to prepare a bucket or similar under the sink which can collect the sediment, and can be emptying when full. A sketch of a possible design is illustrated in Figure 4.

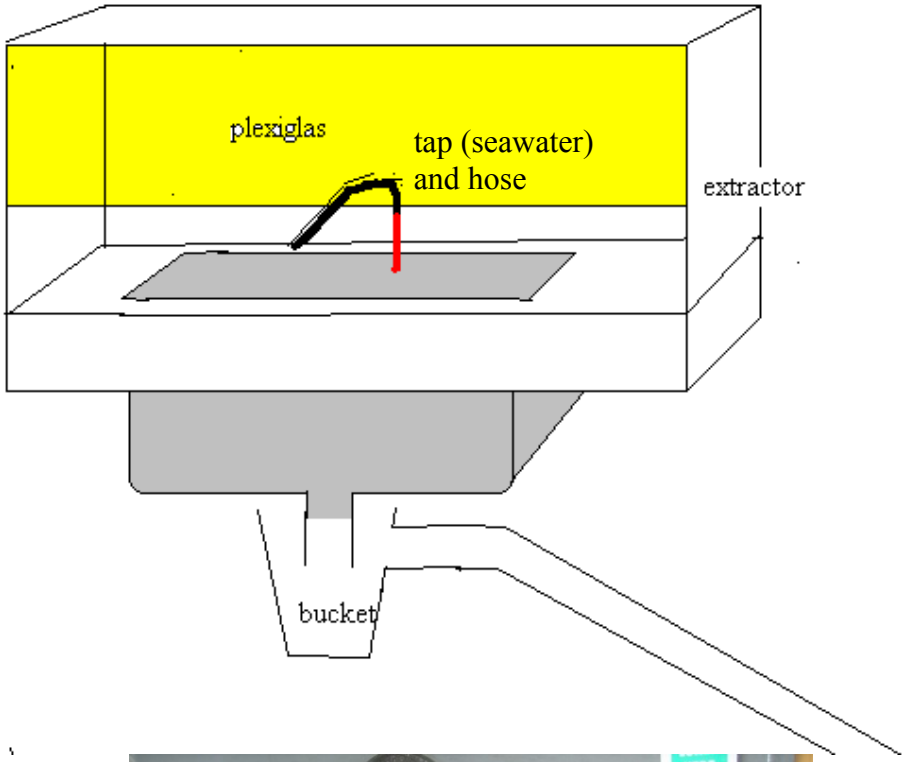

Figure 4. An extractor with sink for washing the samples.

Sorting procedure

Sorting of formaldehyde-fixated animals should be undertaken in an extractor. One way of designing an extractor is showed in Figure 5. For short period it may be suitable to use the point-ventilation outlets showed in Figure 6.

Lack of extractors, the work was undertaken without. Formaldehyde gas was registered in the laboratory, and is not recommended.

The sample should be sorted under suitable magnification. As a general rule, all fauna should be extracted from the residue, otherwise it is not a quantitative investigation. Fragments of "living" animals should also be sorted out. The fauna should be sorted into the main taxonomic groups, placed in separate sample vails with identification labels. The following information should be recorded on the labels: Sampling station number, replicate number, date of sampling, animal group and initial of the sorter.

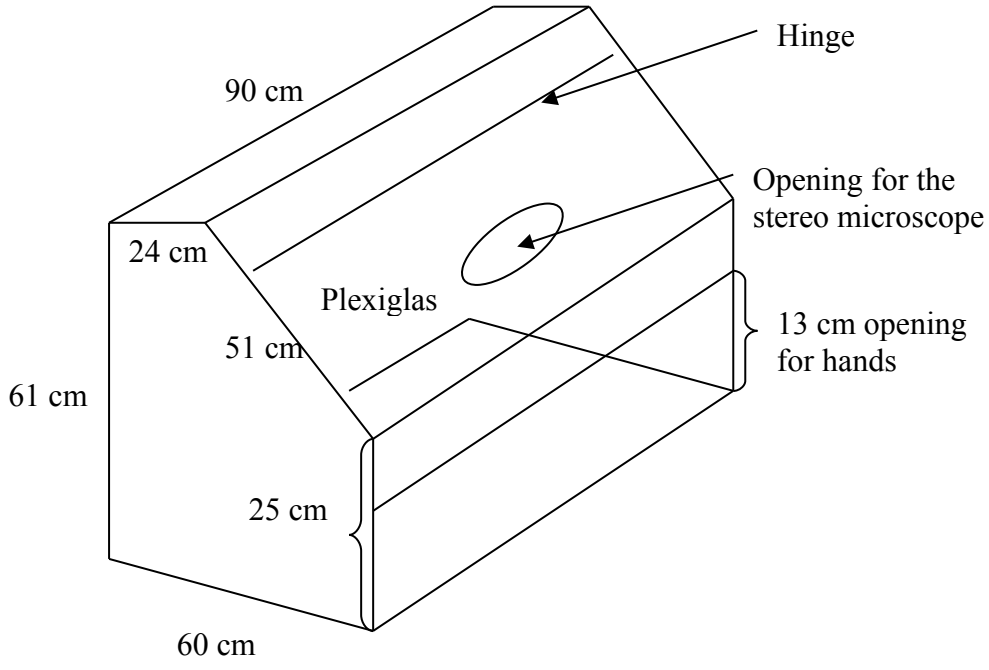

Figure 5. This extractor is custom-made and the sketch shows the size of it.

Figure 6. This point-ventilation outlets can be an alternative for short period of time. We use this for ethanol-samples. Visit the web at the following address to see some different solutions. http://www.alsident.com/

Quality control

The first 7-8 samples were controlled by Gisle Vassenden by re-sorting the sediment. In the beginning too many animals was still in the samples after the participants had tried to sort out all the animals. Sometimes more than 50 % of the animals were not observed by the sorter. During the week the participants became better and better, but still too many animals were observed in the sediment after sorting. I hope that after all the samples are sorted, the participants are able to sort within accepted criterion. As a general rule maximum 10 individuals should be found by the quality control. The sediment from the cruise is ideally to achieve the appropriate training to sorting samples. By the international standard ISO 16665 it is recommended that minimum 10 % of the processed samples, randomly selected, should be subjected to quality control.

Identification

Should be discussed later!

Health and safety

All phases of benthic sampling and sample processing should adhere strictly to national and international health and safety regulations.

A valid health and safety manual should be freely available in the institute or laboratory and the appropriate first-aid supplies and emergency facilities (such as eyewash station and shower) should be installed.

Stay in the long-time store should be avoided without a gas mask.

Rinsing the samples should be undertaken in a ventilated sink or under a an extractor. Protective gloves should be used.

Sorting should be undertaken in an extractor. A monitor for chemical levels in the air can be installed to control the level of formaldehyde gas.

Summary and conclusion; Field and laboratory work

The duration of the cruise was planned to be 2-3 weeks. Due to the problems of getting fuel, lubrication oil, and the equipment from the airport, it was decided to start the work with improvised equipment (sieves) on 13th April. Duration of the cruise was therefore reduced to only 4 days.

The equipment worked well, and the participants got valuable training in the main sampling procedure. The participants did a great job onboard. At the laboratory the participant got valuable training in the sorting procedure.

The ship had no permition to go inside the security zone around the platforms. The sampling was therefore undertaken more than 500 m distance from four different platforms. Sampling close to the platforms gave us valuable experience for future investigations.

It was taken one sample for benthic fauna, one sample for grain size and metal analyses and three replicates for analyses of hydrocarbons. During the cruise it was collected 117 containers for fauna analyses, 29 samples for grain size and metal analyses and 86 samples for hydrocarbon analyses. In a full monitoring investigation, the amount of samples will be larger. The investigation in April 2006 will hopefully give INIP the experience they need to be prepared for a full investigation. That includes the need for a suitable long-time store, the need of a room for washing, the need of extractors for sorting, and to achieve high quality in the sorting procedure.

Literature

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Appendix table 1. **SAMPLING JOURNAL** **Page nr: 1 of .....**

Vessel:	Area:	Project code:	Servey nr:

Date	Grab station nr.	Position		Depth (m)
		Latatitude	Longitude	

Weather:	Wind:	Wave hight (m):
Time Start:	Time Finish:	Duration:
Sample equipment used (name, bite area, weight):		

Type of bottom sediment:	
Color:	Odor:
Observation of oil, waste etc:	
Observation of animals:	
Number of rejected samples:	

Station nr.	Sample nr	Volume cm/liter	No containers bottom fauna	Oil hydrocarbons	Heavy metal	Sediment granulometry	Remarks: