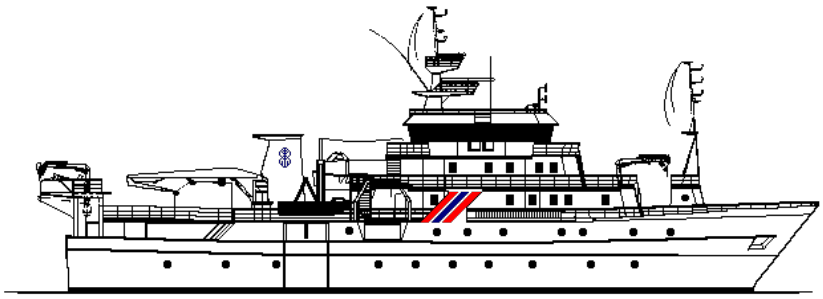

MARINE ENVIRONMENTAL SURVEY OF BOTTOM SEDIMENTS IN GHANA

Preliminary results - selected physical and chemical compounds from the Eastern Coast

May 2011

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Bergen November 2012

THE EAF-NANSEN PROJECT

FAO started the implementation of the project “Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries (EAF-Nansen GCP/INT/003/NOR)” in December 2006 with funding from the Norwegian Agency for Development Cooperation (Norad). The EAF-Nansen project is a follow-up to earlier projects/programmes in a partnership involving FAO, Norad and the Institute of Marine Research (IMR), Bergen, Norway on assessment and management of marine fishery resources in developing countries. The project works in partnership with governments and also GEF-supported Large Marine Ecosystem (LME) projects and other projects that have the potential to contribute to some components of the EAF-Nansen project.

The EAF-Nansen project offers an opportunity to coastal countries in sub-Saharan Africa, working in partnership with the project, to receive technical support from FAO for the development of national and regional frameworks for the implementation of Ecosystem Approach to Fisheries management and to acquire additional knowledge on their marine ecosystems for their use in planning and monitoring. The project contributes to building the capacity of national fisheries management administrations in ecological risk assessment methods to identify critical management issues and in the preparation, operationalization and tracking the progress of implementation of fisheries management plans consistent with the ecosystem approach to fisheries.

LE PROJET EAF-NANSEN

La FAO a initié la mise en oeuvre du projet "Renforcement de la base des connaissances pour mettre en œuvre une approche écosystémique des pêcheries marines dans les pays en développement (EAF-Nansen GCP/INT/003/NOR)" en décembre 2006. Le projet est financé par de l'Agence norvégienne de coopération pour le développement (Norad). Le projet EAF-Nansen fait suite aux précédents projets/ programmes dans le cadre du partenariat entre la FAO, Norad et l'Institut de recherche marine (IMR) de Bergen en Norvège, sur l'évaluation et l’aménagement des ressources halieutiques dans les pays en développement. Le projet est mis en oeuvre en partenariat avec les gouvernements et en collaboration avec les projets grands écosystèmes marins (GEM) soutenus par le Fonds pour l’Environnement Mondial (FEM) et d'autres projets régionaux qui ont le potentiel de contribuer à certains éléments du projet EAF-Nansen.

Le projet EAF-Nansen offre l’opportunité aux pays côtiers de l'Afrique subsaharienne partenaires de recevoir un appui technique de la FAO pour le développement de cadres nationaux et régionaux visant une approche écosystémique de l’aménagement des pêches et la possibilité d'acquérir des connaissances complémentaires sur leurs écosystèmes marins. Ces éléments seront utilisés pour la planification et le suivi des pêcheries et de leurs écosystèmes. Le projet contribue à renforcer les capacités des administrations nationales responsables de l’aménagement des pêches en introduisant des méthodes d'évaluation des risques écologiques pour identifier les questions d’aménagement d’importance majeure ainsi que la préparation, la mise en œuvre et le suivi des progrès de la mise en œuvre de plans d’aménagement des ressources marines conformes à l'approche écosystémique des pêches.

Cruise schedule

Departure :

From Tema port 19/4-11(1st period) and 6/5-11(2nd period)

Return :

to Tema 25/4-11(1st period) and 8/5-11(2nd period)

Participants on the cruise

From Ghana 1st Group:

Lloyd Cyril Allotey	(University of Ghana, Legon)
Emmanuel Appoh	(EPA Ghana)
Margaret Fafa Awushie	(University of Cape Coast)
Benjamin O. Botwe	(University of Ghana, Legon)
George Diawuo	(EPA Ghana Western region)
Ebenezer Lartey	(Survey Department)
Abdallah Ibin Siddiq	(EPA Ghana)
Maxwell Seyram Sunu	(EPA Ghana)

From Ghana 2nd Group:

Sarfo Afriyie	(EPA Ghana, Western Region)
Lilian Brew	(EPA Ghana)
Tsatsu Kwame Selorm Gbedemah	(University of Ghana, Legon)
Isaac Debrah	(EPA Ghana)
Kwame Damoah	(Marine Fisheries Research Division)
Isaac Larbie	(Survey Department)
John Kofi Nyante	(EPA Ghana)
Simon Sovoe	(EPA Ghana, Volta Region)

Shoreline :

Emmanuel Appoh	(EPA Ghana)
Peter A.	(University of Cape Coast)
Hans Omane	(EPA Ghana)
Joshua Odonkor	(EPA Ghana)
George Diawuo	(EPA Ghana Western Region
Tor Magne Ensrud	(UNI Research Norway)
Maxwell Seyram Sunu	(EPA Ghana)

From Norway:

Bjørn Serigstad (Cruise leader)	(IMR)
Magne Olsen	(IMR)
Tore Mørk	(IMR)
Ole Sverre Fossheim	(IMR)
Marek Ostrowski	(IMR)
Frøydis Lygre	(University of Bergen)
Tor Magne Ensrud	(Uni Research AS):
Fredrik Wendel	Argus
Jan Bryn	Argus

We would like to thank the officers and the crew onboard *Dr. Fridtjof Nansen*.

Analysis and reporting

Sorting of biological samples
IMR/University of Łódź (in progress)

Identification of biological samples
IMR/University of Łódź (in progress)

Organic chemical analyses
Personnel at Eurofins Environmental laboratory AS

Metal analyses
Personnel at Eurofins Environmental laboratory AS

Physical analyses
IMR/University of Gdańsk (in progress)

Computer analyses
Kristin Hatlen and Tor Magne Ensrud (Uni Research AS/IMR)

Reporting
Bjørn Serigstad (IMR), Tor Magne Ensrud (Uni Research AS/IMR), Kristin Hatlen (Uni Research AS), Marek Ostrowski, (IMR), Magne Olsen (IMR), Emmanuel Appoh (EPA Ghana)

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Title of report: **Environmental monitoring Ghana 2011. Chemical analysis.**	Date: 21/11-2012
	N.o. pages: 56
Authors: Tor Ensrud	Project leader: Bjørn Serigstad
	Survey number: 2011404

Client : **Environmental Protection Agency Ghana. (EPA Ghana)**	Accessibility: Open

Abstract: The monitoring regime for 2011 consisted of three transects in the central and western region of the Ghana coast starting from Winneba, Old Ningo and Denu going from the lower end of the beach to about 1000m water depth. The monitoring consisted of benthic soft bottom macrofauna analyses, grain size distribution of sediment and chemical analyses of hydrocarbons, heavy metals and PCB. This is a preliminary report for the chemical analysis.

The results of the metal analysis Showed values within the lower part of what is defined as good conditions with no risk of ecological effects and compared to European and Norwegian standards mostly well below what is regarded as background levels.Most parameters shows an increase with depth most likely because of the finer grain size in the sediments associated with increasing water depth and the general pattern of sedimentation.

The conditions in the investigated areas can be described as pristine and in good environmental condition based on the findings from the chemical analysis.

Keywords: Marine survey, THC, PAH, NPD, heavy metals, PCB, offshore monitoring, Background concentration.

Responsible for:	**Date:**	**Signature:**
Professional evaluations and interpretations:	21/11-2012	*Bjørn Serigstad*
Project:	2011404	*Tor M. Ensrud*

Contents

1. INTRODUCTION

The coastal zone of Ghana stretches from the borders with the Republic of Togo in the east to the Republic of Cote d'Ivoire in the West and covers a total distance of 565 km. The coastal stretch may be divided into three geomorphologic zones with various characteristics as below:

- The West Coast covers 95 km and is made up of fine sand, gentle beaches and coastal lagoons
- The Central Coast covers 321 km, and is made up of embayed coast of rocky headlands, rocky shores, littoral sand barriers and coastal lagoons
- The East Coast is 149 km long and has sandy beaches with the deltaic estuary of Volta River situated half way in between.

Ghana's coastal zones cover about 6.5 % of the country's land area, but inhabits about 25 % of the nations population. The current use of the coastal areas in Ghana are fishing; human settlements; tourism; industrial development; mining; sand winning, oil and gas exploration and exploitations. Marine fishing contributes about 4 % to the country's GDP. The living standards of people in the fishing communities in these areas are significantly lower than in the urban centres. Average welfare levels among food farmers in rural coastal areas, estimated by the Ghana Poverty Reduction Strategy, are 12 % below that of large urban centres such as Accra. Lack of healthcare, poverty and environmental degradation contribute to a vicious circle that inhibits human development in the coastal zone.

Consequently, the emerging oil industry poses a challenge to Ghana's coastal population, the majority being fishermen. The effects of the oil industry on other industrial and economical interests are also of concern to Ghana. These groups are concerned about the possible negative impacts of the petroleum activity in several areas, such as:

- Pollution from oil production and oil tankers accidents
- Discharges of untreated wastes from oil tankers and other vessels
- Loss of marine biodiversity due to drilling activity and pollution
- Reduced fish stocks
- Limited access to fishing grounds
- Limitations to settlements and recreational use of the coast line
- Fear of health problems relating to pollution
- Limitations to the emerging tourist industry

The co-existence of the fishing communities and the oil industries among others, is necessary for a sustainable utilisation of marine resources, conservation and protection of the marine environment. An effective Coastal Zone Management must therefore be based on a clear understanding of the complexities in relation to the natural resources of the coastal areas, and the coastal population that subsists on these resources.

An important factor in safeguarding and balancing the relation between different commercial users, the coastal inhabitants and the protection of the marine environment, is the development of legislations, political instruments including policies, the establishment of governmental institutions, NGOs and private institutions. These initiatives are being spearheaded by the Environment Protection Agency (EPA). Previous Ghanaian legislations that have been passed in the area of integrated coastal zone management and sustainable development includes the following:

- Beaches Obstruction Ordinance, 1897 (Cap 240)
- Rivers Ordinance, 1903 (Cap 226)
- Wild Animals Preservation Act, Act 43, 1961
- Oil in Navigable Waters Act, Act 235, 1964
- Towns Ordinance, 1892
- Volta River Development Act, 1961
- Fisheries (Amended) Regulations, 1977 and 1984
- Fisheries Law, PNDC 256, 1991
- Fisheries Act 625, 2002.

The legislation for marine environmental protection, sustainable use, and conservation of marine living resources is contained in *the Biodiversity Strategy and Action Plan* and the Coastal Wetlands Strategy of Ghana. To be prepared to handle the events of operational discharges and accidental spills of hydrocarbons, drill cuttings, drilling mud and chemicals used to control and maintain drilling operations; various legislation have been passed including the Oil Revenue Bill which have been passed by the parliament of Ghana. This will safeguard the nations including the coastal communities' interests regarding environmental issues and also ensure that safety and environmental standards are commensurable with international practices.

To empower the EPA in its mission to co-manage, protect and enhance the country's marine environment, the offshore environmental monitoring plan comprising three regional baseline surveys were conducted prior to oil and gas exploration on a large scale.

The problems with pollution and transport of pollutants are complex and transboundary. Petroleum activities are not only limited to the Ghanaian territory but also to our neighbours in the West and East including Cote d'Ivoire and Nigeria, respectively. It is therefore a shared problem between countries in the Guinea Current Large Marine Ecosystems (GCLME).

A detailed overview of the marine resources and the environmental state of the ecosystem is necessary for the management of the marine resources in a way that will benefit Ghana.

The initial surveys conducted on the Ghanaian continental shelf are aimed at providing useful data on the existing marine environment, fish stocks and the benthic fauna, which could help when designing a future monitoring program. Both field-specific monitoring and wider area monitoring has been adopted by the Environmental Protection Agency to ensure holistic environmental quality monitoring of the marine environment.Consequently, a multisectorial approach for the baseline surveys were facilitated by the Ministries of Environment Science and Technology (MEST), Ministry of Energy (Petroleum), Ministry of Fisheries and the Universities.

The survey of 2009 consisted of a station grid surrounding the Jubilee Petroleum Field and three transects; GW (close to the border to Ivory Coast, GP (along the proposed location for a pipeline from the Jubelee fielt to shore, GE begins close to the Princes Town

In 2010 three transects named Ghana central (GC) GC1, GC2 and GC3 were investigated in addition to the station grids around Mahogany oil rig (MA-Deep) and the Salt Pond oil rig (SP). The GC transects are positioned east of the previous year's Ghana east transect, with GC1 initiating at the shoreline close to Cape Coast, GC2 starting near Salt pond and GC3 stretching out from the outlet of the Volta River at Adah Foah. The Mahogany and Salt Pond oil rigs are positioned off Bonyere and Salt Pond, respectively. A shoreline survey (beach and 5 m) was also conducted including the transects from 2009.

The 2011 survey consisted of three transects called GE1,GE2 and GE3 (Ghana East). Starting from Winneba, Old Nigo and Denu, including shoreline and 5 m samples.

2. MATERIALS AND METHODS

2.1 Survey area

The dominant current flow in this area is north-west to south-east, parallel to the shelf shown in fig 2.1.

2.2 Sampling design

The goal of this survey was to complete the coverage of the Ghana coastline providing increased knowledge about the environmental status of the marine ecosystem in the Coastal Regions of Ghana. To achieve this, 24 grab sites on 3 transects and two stations grids around oil rigs were sampled in the coastal zone in the central and eastern part of Ghana. This year's sampling sites were spread out on the three transects at eight predefined depths (approximately 0m (shoreline) 5m, 25 m, 50 m, 100 m, 250 m, 500 m and 1000 m depth). The 5m depth stations were sampled with a handheld 0.025m^2 Van Veen grab from canoes/boats. Composite samples were collected at the shore (0m) within the tidal zone with the same equipment. From 25 m and deeper, a 0.5m^2 Van Veen grab was utilized. A map of the 2011 sampling stations is presented in fig 2.1 and a complete overview of the sampling sites in table 2.1 .

The sediment sampling was executed in accordance with the OSPAR guidelines for sediment monitoring in offshore oil production areas. Duplicate samples were collected for chemical analysis for the purpose of training of local personnel and comparison of analytical results.

Table 2.1. Date, position and depth of benthic sampling sites.

Transect/ area	Grab station	Date	Longitude WGS84	Lattitude WGS84	Depth
Ghana east 1	GE1/0	28.04.2011	00º34'814	05º57'888	0
GE/1	GE1/5	28.04.2011			5
Winneba	GE1/22	20.04.2011	-0,5214	5,3048	22
	GE1/53	20.04.2011	-0,4254	5,1522	53
	GE1/101	20.04.2011	-0,3589	5,0691	101
	GE1/249	2104.2011	-0,3428	5,053	249
	GE1/515	22.04.2011	-0,3397	5.0297	515
	GE1/991	22.04.2011	-0,3177	5,023	991
Ghana east 2	GE2/0	29.04.2011	00º09'948	05º44'036	0
GE/2	GE2/5	30.04.2011	*00º11'018	*05º44'402	5
Old Nigo	GE2/29	25.04.2011	0,1964	5,6607	29
	GE2/53	25.04.2011	0,217	5,6097	53
	GE2/101	25.04.2011	0,2411	5,557	101
	GE2/247	25.04.2011	0,2497	5,535	247
	GE2/503	24.04.2011	0,2583	5,5145	503
	GE2/1005	24.04.2011	0.2706	5,4868	1005
Ghana east 3	GE3/0	29.04.2011	1º09`724	6º05`729	0
GE/3	GE3/5	29.04.2011			5
Denu	GE3/26	07.05.2011	1,198	6.0220	26
	GE3/52	07.05.2011	1,2359	5,9439	52
	GE3/105	07.05.2011	1,2552	5,8974	105
	GE3/254	07.05.2011	1,2616	5,8833	254
	GE3/510	07.05.2011	1,2719	5,8608	510
	GE3/998	07.05.2011	1,2844	5,8294	998

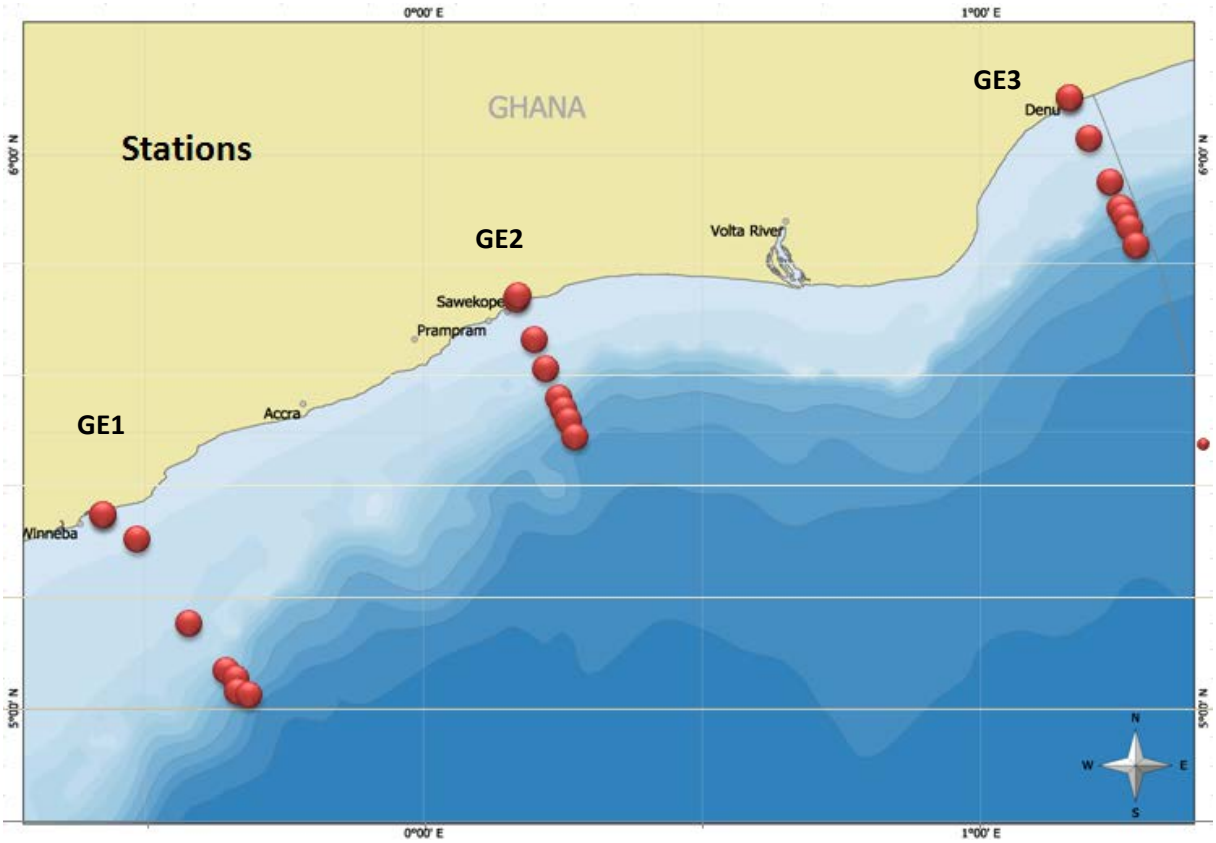

Fig. 2.1 Map of the sampled area

2.2.5 Chemical Compound Analysis

2.2.5.1 Oil Hydrocarbons Analysis

- Principle

The petroleum hydrocarbon content was determined by GC/FID analysis of the extracts obtained as outlined in Intergovernmental Oceanographic Commission, Manuals & Guides no 11, UNESCO (1982).

The petroleum hydrocarbons were isolated from the sediment sample by saponification with methanolic potassium hydroxide for two hours, followed by extraction with pentane. The pentane phase is reduced using a Rotavapor and is subsequently purified by solid phase extraction. The petroleum hydrocarbon components were eluted (extracted) from the solid phase column with pentane followed by dichloromethane. The extract was reduced using a heating jacket and analyzed using Gas Chromatography with Flame Ionisation Detection

(GC/FID). The analyses of PAHs and Decalines were performed by Gas Chromatography with Mass Selective Detection operating in the Single Ion Monitoring mode (GC/MS SIM).

- Procedure

The sediment sample was homogenized by stirring and subsequently centrifuged at 2300 rpm for 5 minutes to remove excess water. The amount of dry matter in the centrifuged sample was determined by the differencial weight of a small part (about 10 g) of the sample before and after drying at 105°C for 16 hours.

- Soxtec extraction

The saponification was carried out using a Soxtec System equipped with glass cups and cellulose thimbles at 150°C. In order to reduce the background level of hydrocarbons in the blank samples, the empty cellulose thimbles were boiled for 1 hour in methanol prior to its use.

About 20 g of the sample was placed in the cellulose thimble and boiled for 1 hour (in the “boiling position” in 50 mL of a solution of potassium hydroxide in methanol (30 g/L). Before boiling, 1.0 mL of a mixture of internal standards is added to the extraction cups. The thimble was lifted to the “rinsing position” for 1 hour while the refluxing methanol extracted hydrocarbons from the sample. For every 20 samples, reference samples of HDF 200 (base oil in drilling fluid; for THC, olefins and decalines) and HS-4B (Harbour Marine Sediment Reference Material; for PAH and NPD) are extracted, purified and analysed according to this method for monitoring the accuracy of the method.

- Pentane extraction

The methanol extract was collected in a Duran bottle. After cooling, 25 mL of pentane was added and the bottle shaken for 10 minutes. The pentane phase was separated from the methanol phase and collected in a conical flask. Another 25 mL of pentane was added to the methanol, shaken, separated and added to the first pentane phase. The pentane was reduced to 1 mL using a Rotavapor with a water bath at 30°C.

- Solid phase clean up

The final clean up was carried out using 200 mg florisil solid phase columns. The columns were conditioned prior to use. The sample was then added to the column which was eluted with 2x2 mL pentane and 2 mL dichloromethane. The elute was reduced to dryness using a heating jacket at 40°C. The residue was redissolved in 1 mL of dichloromethane and analyzed by GC/FID (THC) and GC/MS-SIM (PAH, NPD).

Quantification of components

- THC

The content of THC was quantified in the nC_{12}-nC_{35} boiling point range by using external and internal standards. The external standard was a solution of n-alkanes in dichloromethane (5 mg/L of each component; Restek # 57257). This external standard was also used to establish the retention time window. The internal standards (bromobenzene, *o*-terphenyl and squalane; all 5 mg/L) were added to the sample before boiling as well as to the external standard. The average THC value from blank samples was subtracted before the final quantification of the THC content of the sample. A chromatogram illustrate the presence of specific compounds within the samples (Figure 2.1) while the analytical conditions of the GC/FID system are presented in Table 2.3.

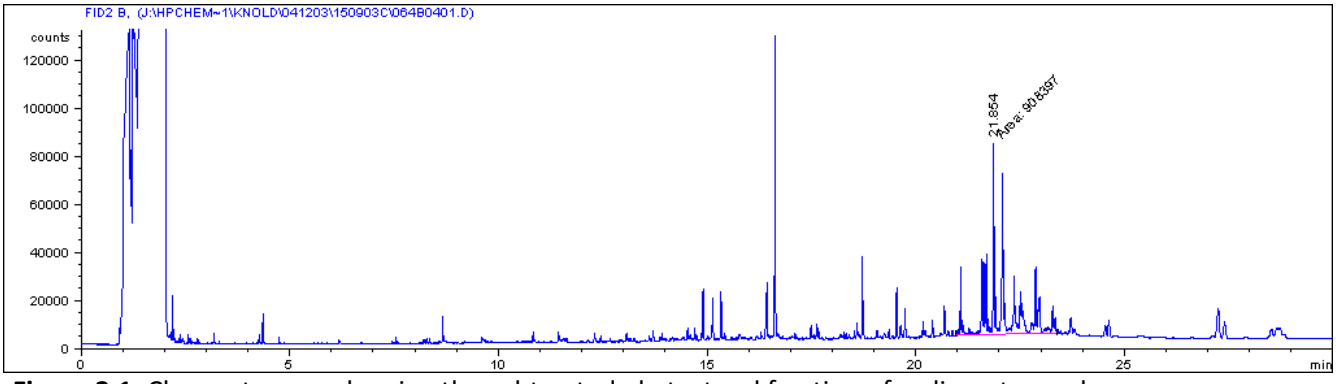

Figure 2.1. Chromatogram showing the subtracted phytosterol fraction of sediment sample.

Table 2.3. GC/FID conditions

GC system	Hewlett-Packard 5890 Series II Gas Chromatograph with split/splitless injector, Flame Ionisation Detector
Column	Agilent DB-5, length: 25 m, ID: 0,2 mm, film: 0,33 μm
Injector temperature	290°C
Detector temperature	300°C
Temperature program	35°C (3 min) - 15°C/min - 315°C (9,5 min)
Carrier gas	H_2, 1,4 mL/min
Injection	1 μL, splitless

- PAH and NPD

The PAHs/NPDs analysis was performed by GC/MS operating in the SIM (single ion monitoring) mode. The analytical conditions of the GC/MS system are shown in Table 2.4.

Table 2.4. GC/MS conditions

GC system	Agilent Technologies 6890N Network GC System
MS	Agilent 5973 Network Mass Selective Detector
Column	Agilent DB-5ms, length: 30 m, ID: 0,25 mm, film: 0,25 μm
Injector temperature	300°C
Temperature program	60°C (2 min) - 12°C/min - 300°C (8 min)
Carrier gas	He, 1,0 mL/min
Injection	1 μL, splitless, purge flow: 40 mL/min in 1 min

The amounts of PAHs and NPDs were quantified using internal deuterium marked standards and calibration curves made from 3 levels of standards containing the 16 EPA PAHs and selected NPDs (Table 2.5). The internal standards were added to the sample before boiling as well as to the external standard. The 16 standard EPA PAHs were obtained in PAH cocktail ampoules from Ehrensdorfer (20952500 PAH Mix 25) and Chemservice (PP-HC6JM). A NPD cocktail containing 1 compound representing each of the NPD clusters was obtained from Chiron (NPD Cocktail 3, S-4046). The NPD compounds in the cocktail were: Dibenzothiophene, 4-methyldibenzothiophene, 2,8-dimethyldibenzothiophene, 2,4,7-trimethyldibenzothiophene, naphthalene, 2-methylnaphthalene, 2,3-dimethylnaphthalene, 2,3,6-trimethylnaphtalene, phenanthrene, 2-methylphenanthrene, 1,6-dimethylphenanthrene and 1,2,8-trimethylphenanthrene. Table 2.3.3 shows target ion, qualifier ion, and the corresponding internal standard for each PAH compound and NPD cluster. Before the final quantification was carried out, the corresponding average concentration of blank samples was subtracted.

Table 2.5. Analyzed PAH compounds and NPD clusters

Compound / cluster	Target ion m/z	Qualifier ion m/z	Corresponding internal standard
Naphthalene	128	102	Naphthalene-d8
C1-naphthalene	142	141	Naphthalene-d8
C2-naphthalene	156	141	Acenaphthylene-d10
Acenaphthylene	152	151	Acenaphthylene-d10
Acenaphthene	153	154	Acenaphthylene-d10
C3-naphthalene	170	155	Acenaphthylene-d10
Flourene	166	165	Acenaphthylene-d10
Dibenzothiophene	139	168	Acenaphthylene-d10
Phenanthrene	178	176	Phenanthrene-d10
Anthracene	178	176	Phenanthrene-d10
C1-dibenzothiophene	198	-	Phenanthrene-d10
C1-phenanthrene	192	191	Phenanthrene-d10
C2-dibenzothiophene	212	-	Phenanthrene-d10
C2-phenanthrene	206	191	Phenanthrene-d10
Fluoranthene	202	101	Fluoranthene-d10
C3-dibenzothiophene	226	-	Fluoranthene-d10
Pyrene	202	101	Pyrene-d10
C3-phenanthrene/antracene	220	-	Pyrene-d10
Benzanthracene	228	114	Pyrene-d10

Chrysene/triphenylene	228	114	Pyrene-d10
Benz[bjk]fluoranthenes	252	250	Benz[a]pyrene-d12
Benz[a]pyrene	252	250	Benz[a]pyrene-d12
Indeno(1,2,3-cd)pyrene	276	274	Benz[a]pyrene-d12
Dibenzo[a,h]anthracene	278	-	Benz[a]pyrene-d12
Benzo(ghi)perylene	276	274	Benzo(ghi)perylene-d12
Internal standards			
Naphthalene-d8	136		
Acenaphthylene-d10	160		
Phenanthrene-d10	188		
Fluoranthene-d10	212		
Pyrene-d10	212		
Benz[a]pyrene-d12	264		
Benzo(ghi)perylene-d12	288		

2.2.5.3 Metal Analysis

Principle

The metal content is determined by Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP-AES) except mercury which was determined by Cold Vapour Atomic Emission Spectrometry (CVAAS) after drying, sieving and digestion.

Procedure

The sediment samples were dried at 105°C or 40°C for samples containing mercury. The sample was sieved through a 0.5 mm sieve and the fraction <0.5 mm was digested with nitric acid in accordance with NS4770.

Digestion by nitric acid

Digestion was performed in an autoclave. About 1g of sample was weighed into a sterile PP test tube with 4 mL of nitric acid. The samples were then autoclaved at 120°C for 30 min. After digestion, the samples were filtered and diluted to 50 mL.

Metal analysis by ICP-AES

The metals, except mercury, were analysed by a Varian Vista-PRO ICP-AES method. The analytical conditions are found in Table 2.6.

Table 2.6 ICP-AES analytical conditions

Element	Wavelength	Power (kW)	Background correction
Ba	233.527	1.35	Fitted
Cd	228.802	1.35	One point, left
Cr	267.716	1.35	Fitted
Cu	324.754	1.35	Fitted
Pb	220.353	1.35	Fitted
Zn	213.857	1.35	Fitted

Mercury Analysis by CVAAS

Mercury was analyzed using the mercury analyser instrument, Cetac M6000-A. The mercury in the solution was reduced by $SnCl_2$ to its elementary form Hg^0. Elementary mercury is volatile and was separated from the solution in a gas liquid separator by an argon carrier gas. The absorption at 254 nm was measured to determine the concentration of mercury.

Reference materials

CRM015-050 metals on sediment and CRM031-040 metals on soil (Resource Technology Corporation) was use as a reference.

3. Chemical samples Ghana 2011

The sampling for chemical analysis was conducted according to the OSPAR guidelines for monitoring of offshore oil activities. The results of the analysis were then compared to the Background concentrations found in the OSPAR guidelines and KLIF's (The Directorate of climate and pollution, Norway) TA 2229-2007, Classification of metals and organic poisons in water and sediments. These two standards are developed for use in the North West Atlantic region based on measurements mainly from upon the shelf. The measurements are taken in what is regarded as prestine areas, and from sedment layers thought to be formed prior to industrialisation. Because of the depth gradient with gradually finer sediments, and from that higher affinity to chemical compounds and metals, espesically the metals are expected to show higher levels in deeper waters than upon the shelf (NGU Rapport 2011.035 TA-2683/2011). The general pattern of sedimentation also contrbutes to this.

The KLIF classification system is based on risk assesment regarding ecological effects. None of the measurements in the 2011 survey showed concentrations above the lower part of class II, defined as Good conditions, with no risk of ecological effects when compared to this standard.

3.1 Pecticides

In 2010 the following pesticides were analysed: Aldrin; alpha-endosulfane; alpha-HCH; beta-HCH; Dieldrin; gamma-HCH; Hexachlorobenzene; Hexachlorobutadien; Heptachlor; o,p-DDD; o,p-DDE; o,p-DDT; p,p-DDT; p,p-DDD; p,p-DDE and Pentachlorobenzene. Due to a high detection limit of 0.01 mg/kg, most results were below detection limit.

The relatively high detection limits on these analysis and advice from our chemical consultant suggested against these analysis in the 2011 budget.

3.2 Metals

Table 3.2.1 and 3.2.2 summarises the results of metal analysis. The complete data set including replicates is given in the Appendix table. The sediment samples were analysed for the following heavy metals: arsene (As), cadmium (Cd), copper (Cu), barium (Ba), mercury (Hg), chromium (Cr), lead (Pb), nickel (Ni) and zink (Zn) (figure. 3.2.1-3.2.18).

Table 3.2.1 Overview over results of the metal analysis compared to background concentrations (Bc).

Parameter	Arsen (As)		Barium (Ba)		Lead (Pb)		Copper (Cu)		Chromium (Cr)		Mercury (Hg)		Nickel (Ni)		Zink (Zn)		Cadmium (Cd)	
	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac
KLIF	<20				<30		<35		<70				<30		<150		<0,25	
OSPAR	<15	<25			<25	<38	<20	<27	<60	<81	<0,05	<0,07	<30	<36	<90	<122	<0,2	<0,31
Highest measurement	**38**		**100**		**12**		**14**		**72**		**0,037**		**26**		**65**		**0,27**	
Singles over Bc Klif/ospar	**8/14**				**0/0**		**0/0**		**1/2**		**0/0**		**0/0**		**0/0**		**1/3**	

All samples show low values of the measured heavy metals including Arsene. The measured values were **well below** levels that are assumed to represents a risk of ecological effects.

A quick search in the Ghana Standards Authority did not give any results for metals in marine sediments. Because of this the values were compared to OSPAR and Klif (Norwegian Pollution Authority) standards for coastal waters. The background levels for these natural occurring substances however might differ considerably from one area to another depending on geological conditions, and should as such be regarded as guidance levels rather than strict limits (NGU Rapport 2011.035 TA-2683/2011 p: 6). Arsene is often associated with sulphites and Arsene and Cadmium are associated with the type of rock called shale in Europe, an estimate of background levels for these parameters is therefore dependent on knowledge of geological conditions in this specific geological area including runoffs and possible anthropogenic sources.

The comparison to these standards might therefore not be relevant, nevertheless: With the exception of Arsene on four sampling sites, Chromium on one station and Cadmium on one station the concentrations of heavy metals were below what is regarded as background concentrations according to OSPAR and Klif standards

Barium, Mercury, Copper, Nickel, Zink and to some extent Chromium and cadmium showed a trend of increasing concentration with depth.

The gradually finer grain size which is more common in the deep water areas is an important parameter to explain this. The literature states that finer sediments contain higher concentrations of metals and other pollutants than coarser sediments from the same sample. (NGU Rapport 2011.035 TA-2683/2011 p: 24). The most likely explanation for this is that the reduced particle size gives a higher surface ratio and therefore higher affinity to these metals as well as other chemical compounds. The grain size analysis is yet to be finished and the results will be included in the final report.

Until local background levels are established or brought to our attention Klifs approach to look for ecological effects of the substances in question might a be more relevant approach and should apply regardless of local conditions.

Mercury: All stations shows average values below the upper limit for background levels, and no single measurements were higher than what is regarded as background levels (OSPAR 2005-06, North Atlantic).

None of the samples were collected close to any city centre, known sources of sour or runoffs from densely populated areas, fillings, mining areas or any other sources of pollution brought to our attention. It is therefore recommended to do analysis of bioaccumulation in stationary demersal fish and shellfish in selected areas with dense population and industrial activities for assessment of environmental poisons and food safety.

Table 3.2.2 Average concentrations and standard deviations from three parallel samples (mg/kg dry weight) of metal at eight depths of transects GE1, GE2 and GE3. Samples were collected in April and May 2011. The highest mean value for each parameter is highlighted and values above background concentrations (Bc) are marked red.

		Arsene (As)		Barium (Ba)		Lead (Pb)		Copper (Cu)		Cromium (Cr)	
Transect	**Depth**	**Av**	**Std**	**Av**	**Std**	**Av**	**Std**	**Av**	**Std**	**Av**	**Std**
GE1	0	9,867	1,848	1,9	0,2	4,233	1,097	3,1	0,755	9,667	2,021
	6	6,467	0,321	5,233	0,611	5,167	0,252	3,6	0,265	25,333	0,577
	22	**24,667**	2,309	3,267	0,666	2,667	0,153	0,833	0,201	18	0
	53	**20,333**	3,215	11	1	4,567	0,208	2,433	0,252	30,667	2,309
	101	5,567	1,012	11,667	0,577	3,8	0,346	3,5	0,1	32,667	1,528
	249	5,2	0,3	10,4	1,039	3,5	0,4	3,033	0,289	36	2,646
	515	4,8	0,458	38	3,464	5,567	0,416	7,733	0,635	34	3,464
	991	6,9	0,265	**96,667**	5,774	7,567	0,252	8,633	0,723	40,333	2,082
GE2	0	2,033	0,252	2	0,1	1,033	0,058	0,753	0,086	2,6	0,557
	5	4,7	0,5	31,333	18,771	3,667	1,002	1,14	0,277	12,667	1,155
	29	13,1	3,439	2,9	0,608	1,8	0,4	0,577	0,368	6,733	1,85
	53	9,667	0,493	8,833	0,351	5,2	0,173	2,033	0,208	25,667	1,528
	101	**28,667**	8,083	12,333	0,577	10,067	1,701	4,233	0,351	40	3,606
	247	5,6	0,458	19,333	0,577	7,333	0,351	8,433	0,451	40	1
	503	9,533	3,87	51	5,292	8,433	0,577	11,333	0,577	47	1
	1005	5,333	0,462	94,333	4,933	8,5	1,212	**12,667**	1,528	46,667	4,509
GE3	0	1,9	0,265	0,913	0,023	0,94	0,139	1,227	0,361	8,967	0,306
	5	7,833	0,208	3,767	0,321	2,467	0,153	0,8	0,079	11	0
	26	2,817	2,302	2,32	1,958	1,183	0,9	0,875	0,743	10,433	8,79
	52	6,733	1,563	14,333	2,887	5,633	1,361	5,6	1,127	33,333	6,429
	105	10,667	2,309	14,333	2,887	6,167	0,777	4,867	1,115	28,667	6,807
	254	**18,333**	3,055	17,667	1,528	9,767	0,252	6,833	0,751	**65,667**	6,028
	510	12,733	5,605	45	4,583	10,2	0,721	11,333	0,577	45,667	0,577
	998	8,5	0,458	78,667	4,726	**10,667**	1,155	**12,667**	1,155	44,667	2,887

Table 3.2.2 continued. Average concentrations and standard deviations from three parallel samples (mg/kg dry weight) of metal at eight depths of transects GE1, GE2 and GE3. Samples were collected in April and May 2011. Values in mg/kg dry weight. The highest mean value for each parameter is highlighted and values above background concentrations (Bc)are marked red.

		Mercury (Hg)		Nickel (Ni)		Zink (Zn)		Cadmium (Cd)	
Transect	Depth	Av	Std	Av	Std	Av	Std	Av	Std
GC1	0	0,001	0	1,833	0,416	15,667	3,786	0,005	0
	6	0,003	0,001	3,733	0,153	27,333	2,309	0,013	0,001
	22	0,004	0,001	1,8	0,1	13,7	5,645	0,065	0,048
	53	0,01	0,001	7,3	0,985	24	1	0,086	0,007
	101	0,013	0	11	0	34,333	1,528	0,075	0,004
	249	0,012	0,001	9,267	0,666	39,667	3,512	0,096	0,005
	515	0,021	0,001	17	1,732	37,333	3,786	0,112	0,017
	991	0,03	0,001	18,333	1,155	45,333	2,082	0,102	0,008
GC2	0	0,002	0	0,617	0,025	3,367	0,777	0,005	0
	5	0,004	0,002	2,533	0,153	22	1	0,009	0,003
	29	0,002	0,002	0,96	0,231	4,6	1,308	0,035	0,007
	53	0,009	0,001	7,5	0,4	26,667	0,577	0,044	0,005
	101	0,017	0,001	13	1	37,333	3,215	0,059	0,001
	247	0,02	0,001	17,333	0,577	39	1	0,084	0,014
	503	0,023	0,001	23,333	0,577	46,333	1,528	0,127	0,012
	1005	0,027	0,002	**25,333**	3,055	49	5,568	0,14	0,026
GC3	0	0,001	0	1,933	0,153	4,767	0,907	0,005	0
	5	0,001	0	2,8	0,173	12	0	0,005	0
	26	0,002	0	2,3	1,908	7,4	6,235	0,06	0,001
	52	0,011	0,002	13,3	2,944	34,667	8,505	**0,227**	0,045
	105	0,017	0,009	11,367	3,001	33,333	4,041	0,153	0,029
	254	0,017	0,002	16,667	1,155	**60,667**	4,041	0,113	0,016
	510	0,032	0,005	23	0	48,667	1,155	0,2	0,03
	998	**0,033**	0,002	23,333	1,528	51	2,646	0,17	0,02

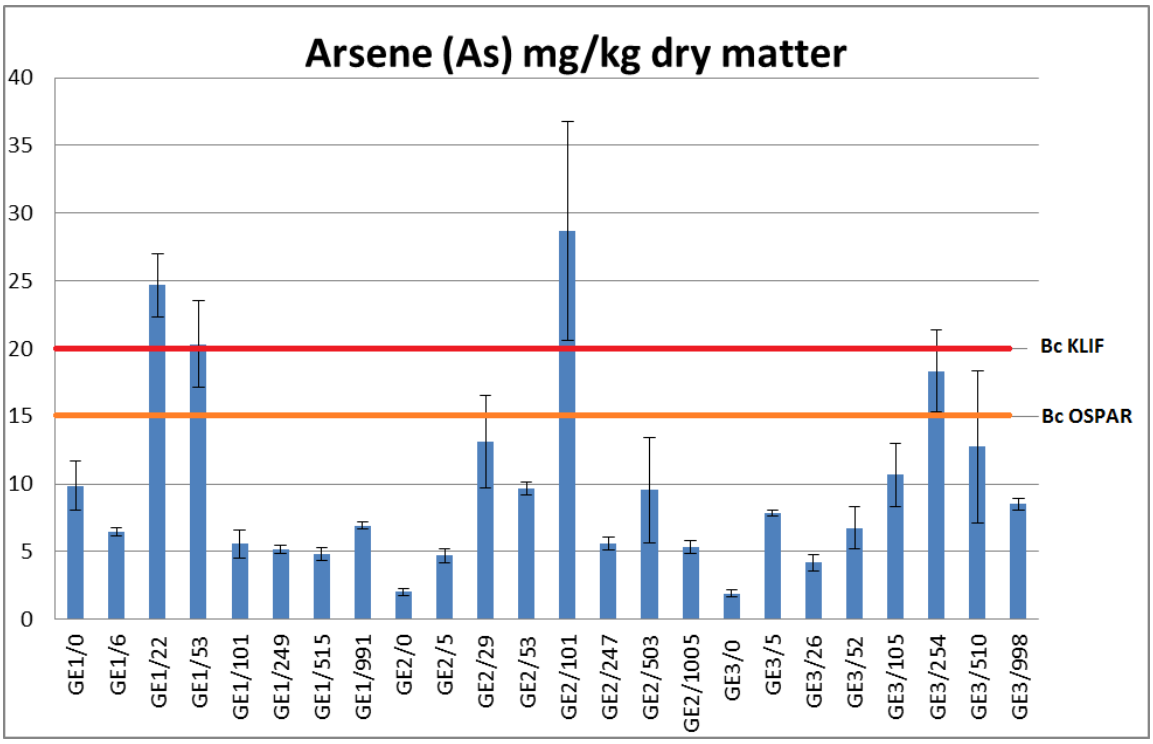

Figure 3.2.1 Distribution of Arsene (average and stdev) at different depths along the trasects GC1, GC2 and GC3.

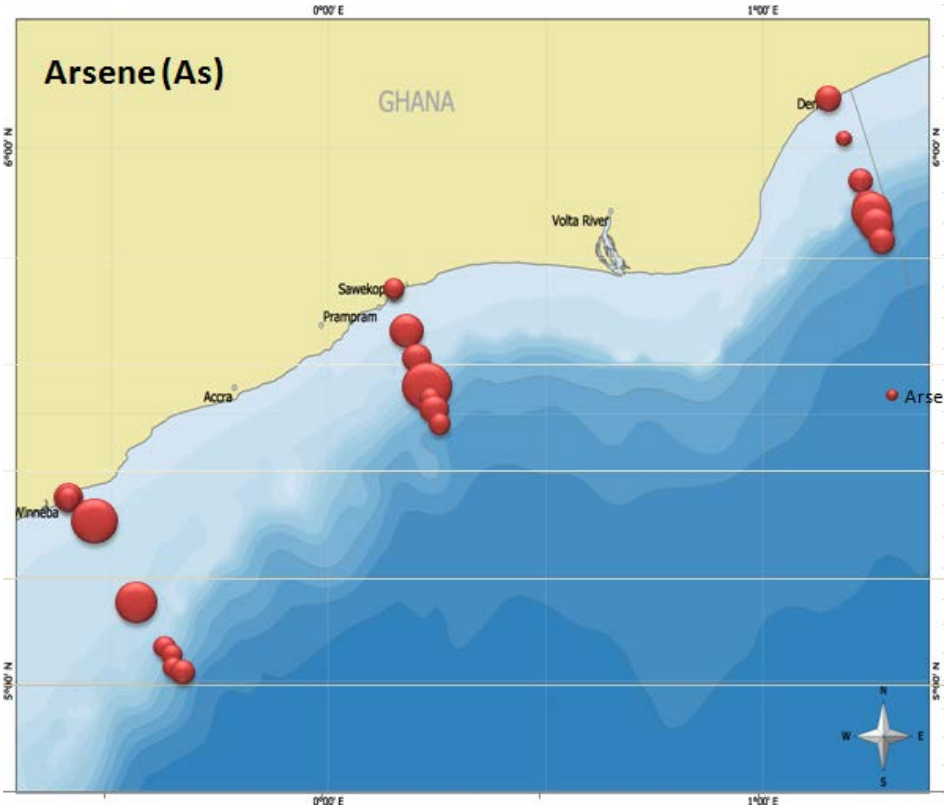

Figure 3.2.2 Distribution of Arsene. The circles shows the relative abundance.

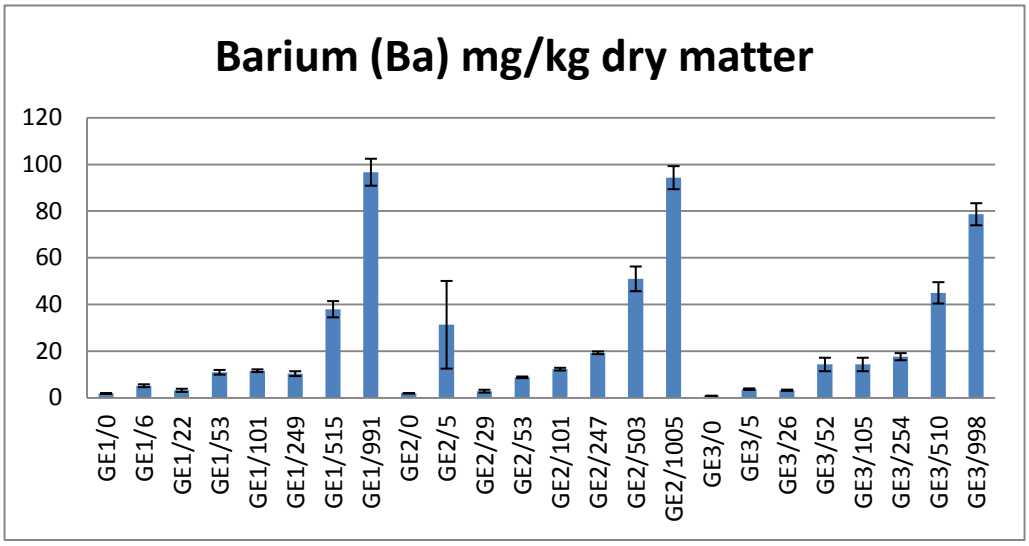

Figure 3.2.3 Distribution of Barium (average and std) at different depths along the trasects og GE1, GE2 and GE3. The sizes of the circles in the map illustrates the relative concentration of barium at each station.

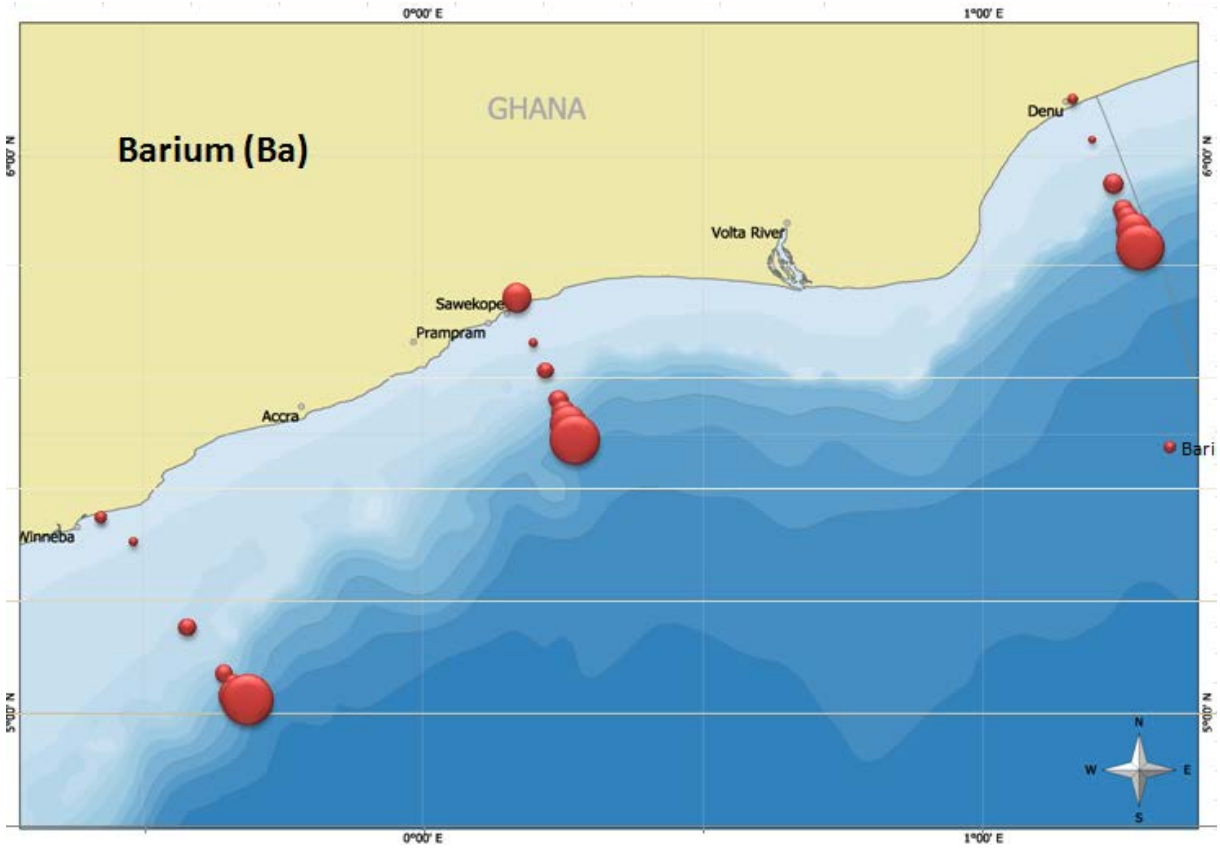

Figure 3.2.4 Distribution of Barium. The circles shows the relative abundance.

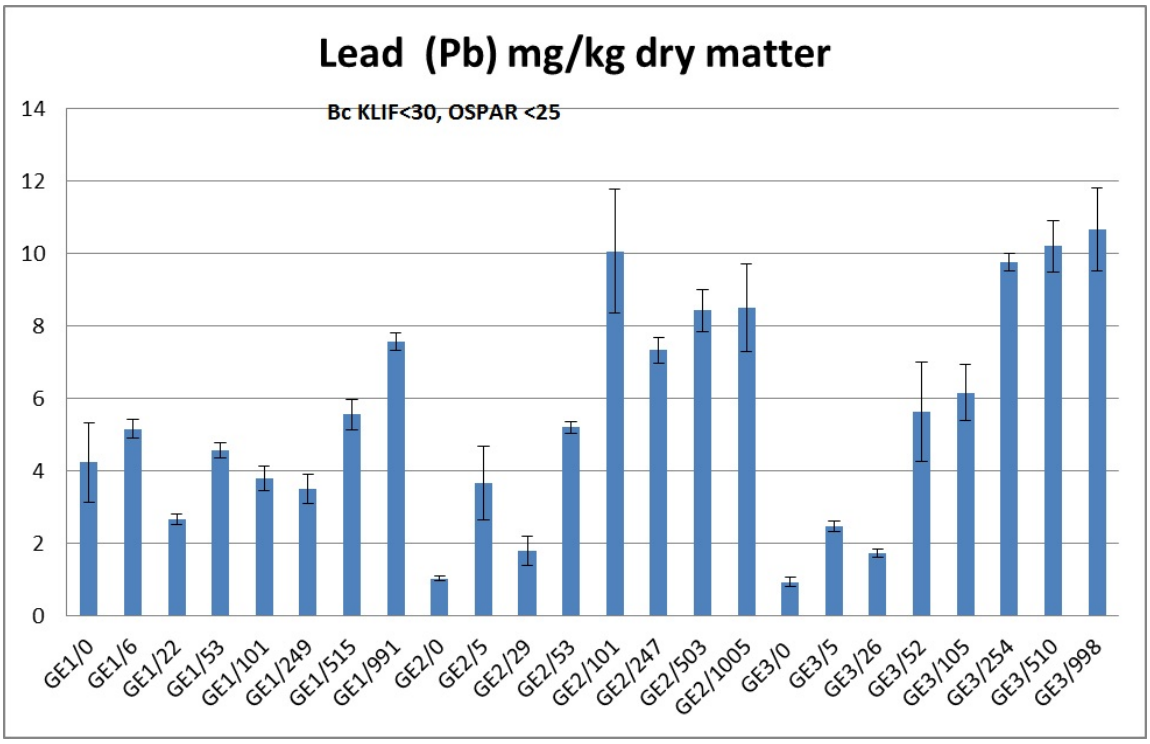

Figure 3.2.5 Distribution of lead (average and std) at different depths along the trasects GE1, GE2 and GE3. Bc KLIF <30, OSPAR <25.

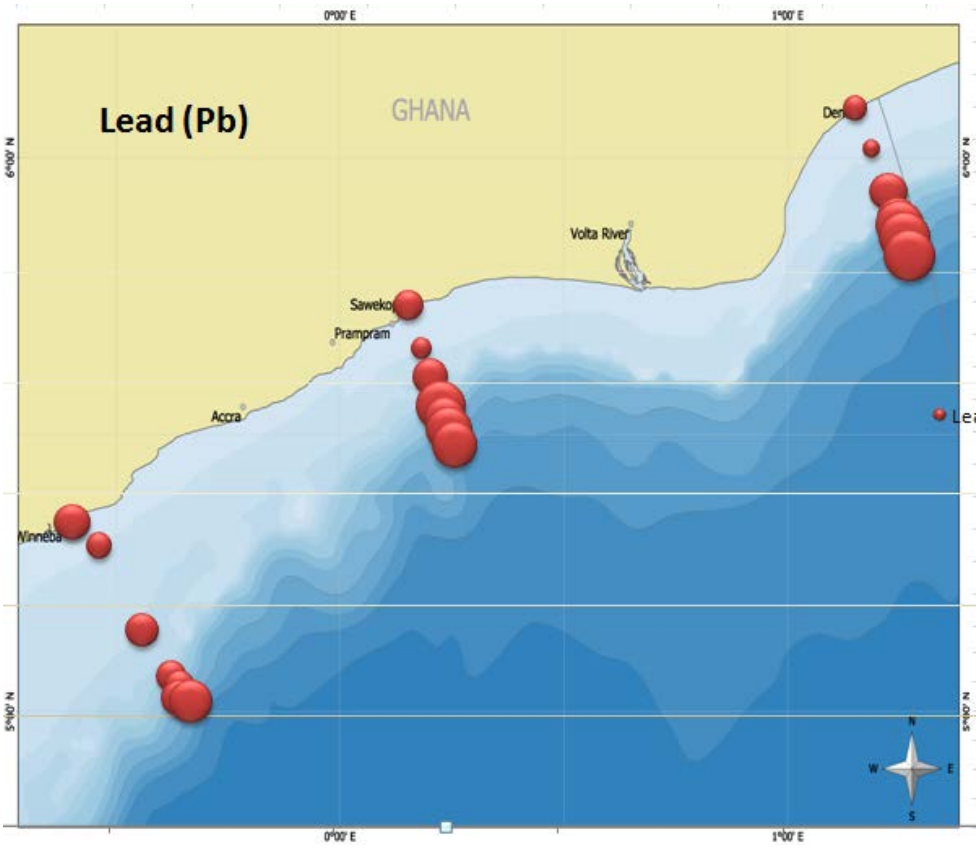

Figure 3.2.6 Distribution of Lead (Pb). The circles shows the relative abundance.

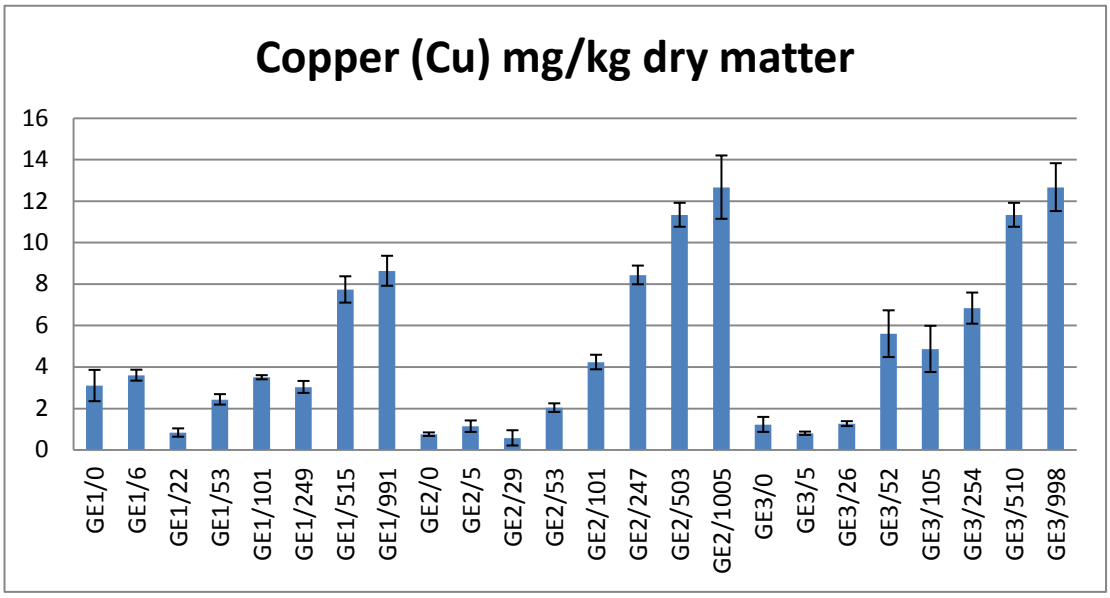

Figure 3.2.7 Distribution of copper (average and std) at different depths along the trasects GE1, GE2 and GE3. Bc KLIF : <35, OSPAR <20.

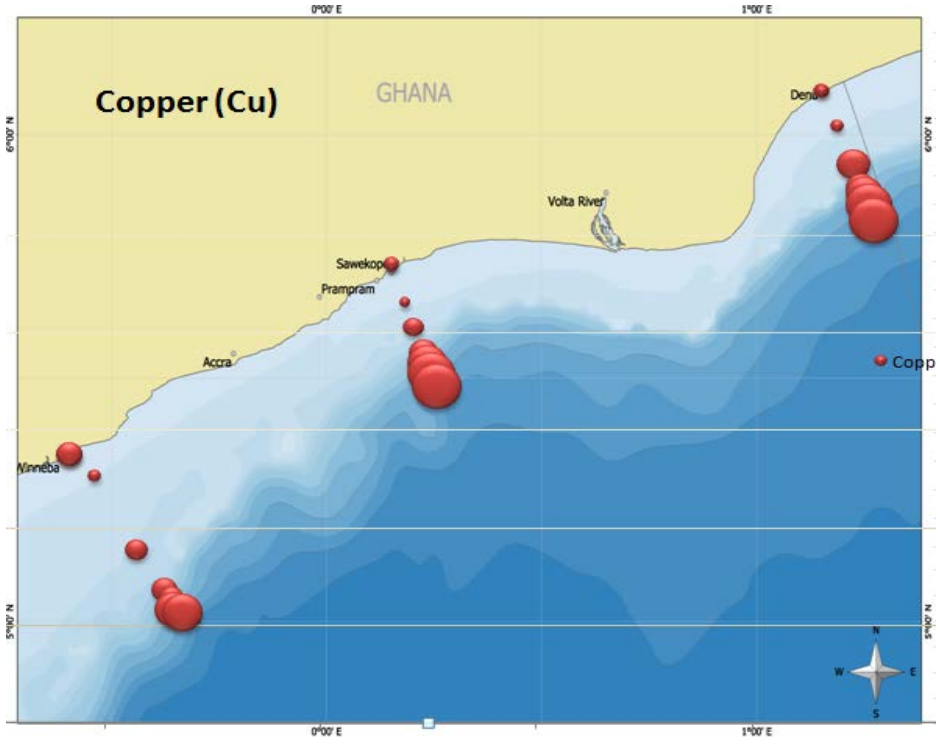

Figure 3.2.8 Distribution of Copper. The circles shows the relative abundance.

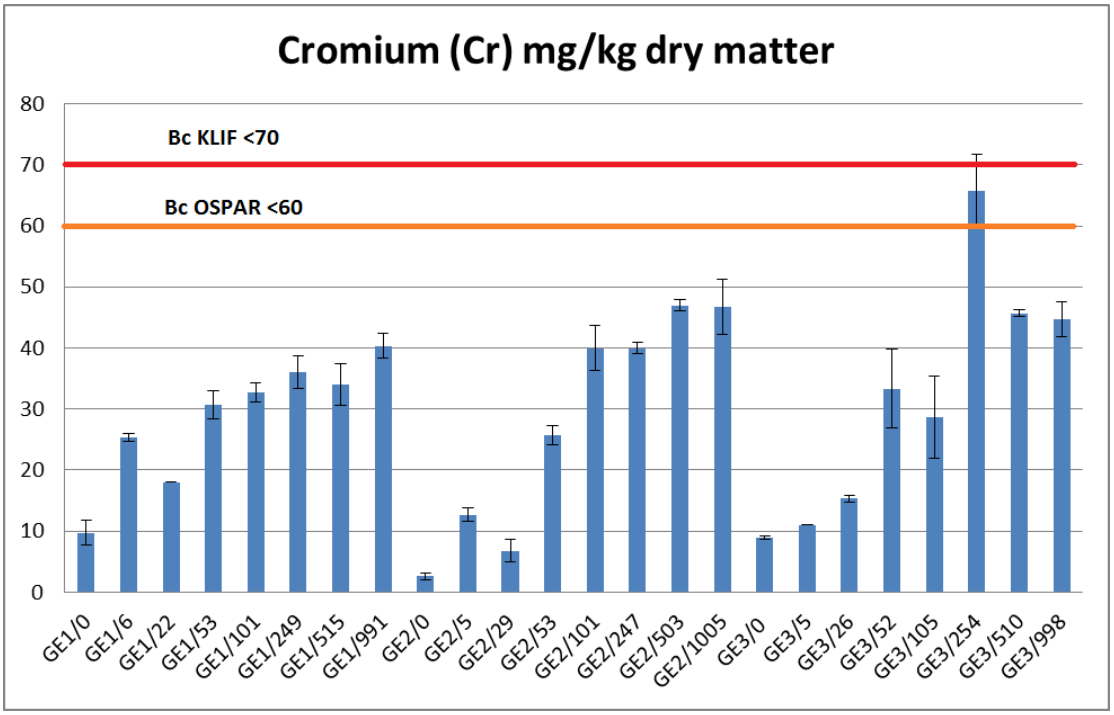

Figure 3.2.9 Distribution of Chromium (average and std) at different depths along the trasects GE1, GE2 and GE3.

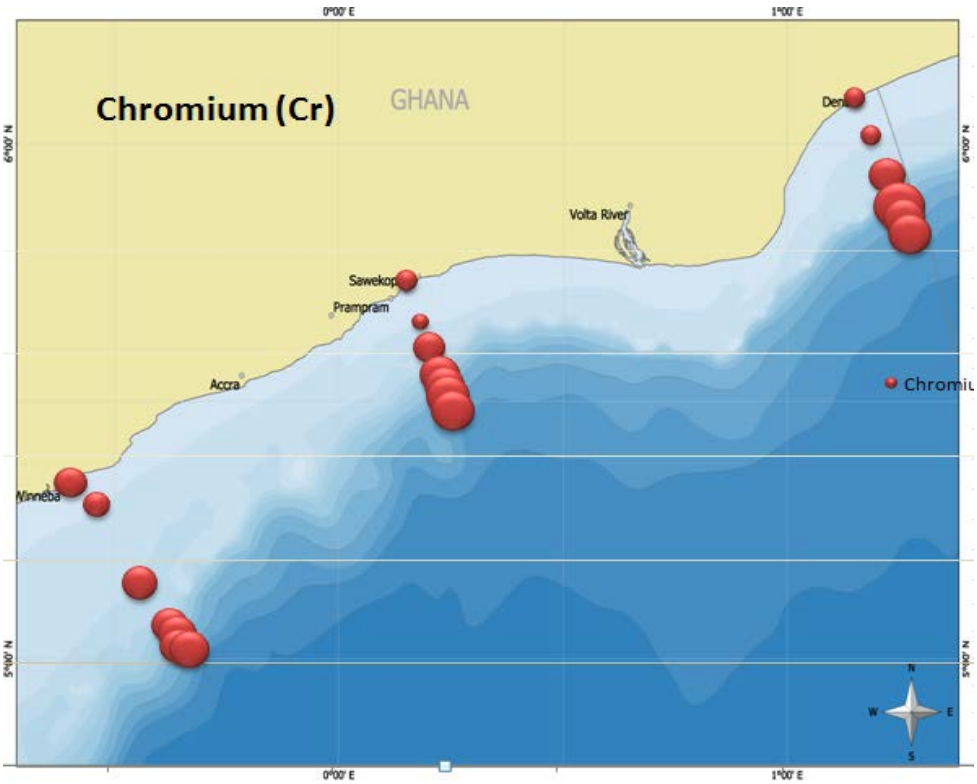

Figure 3.2.10 Distribution of Chromium. The circles shows the relative abundance.

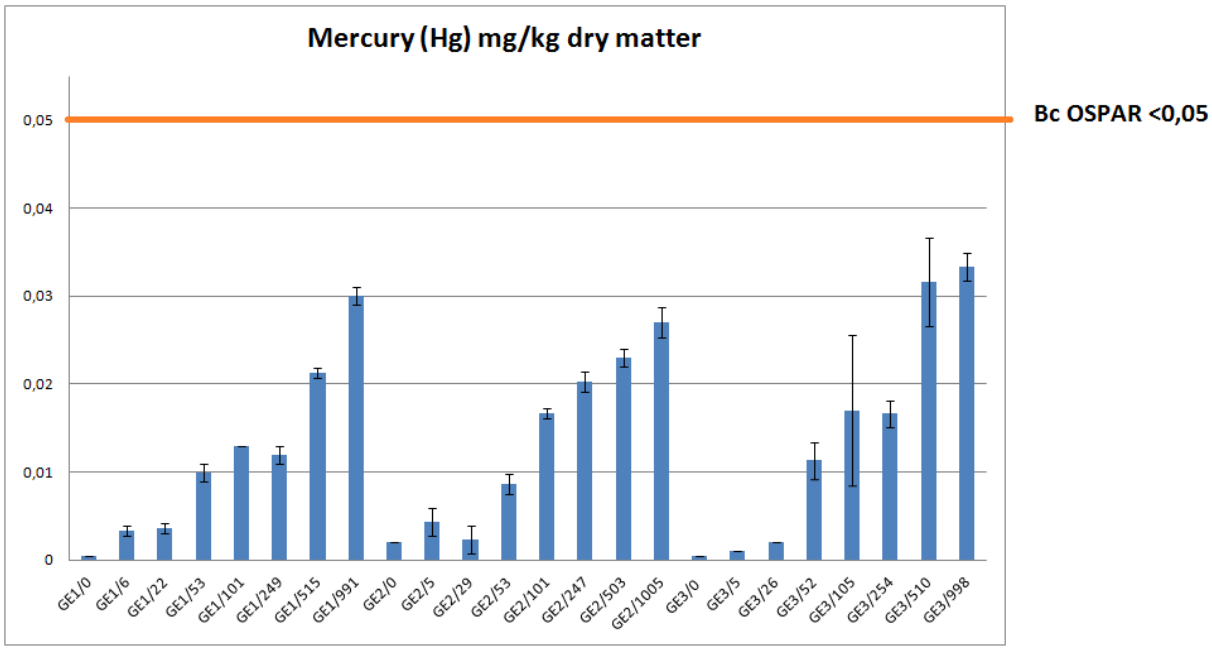

Figure 3.2.11 Distribution of mercury (average and std) at different depths along the trasects og GE1, GE2 and GE3.

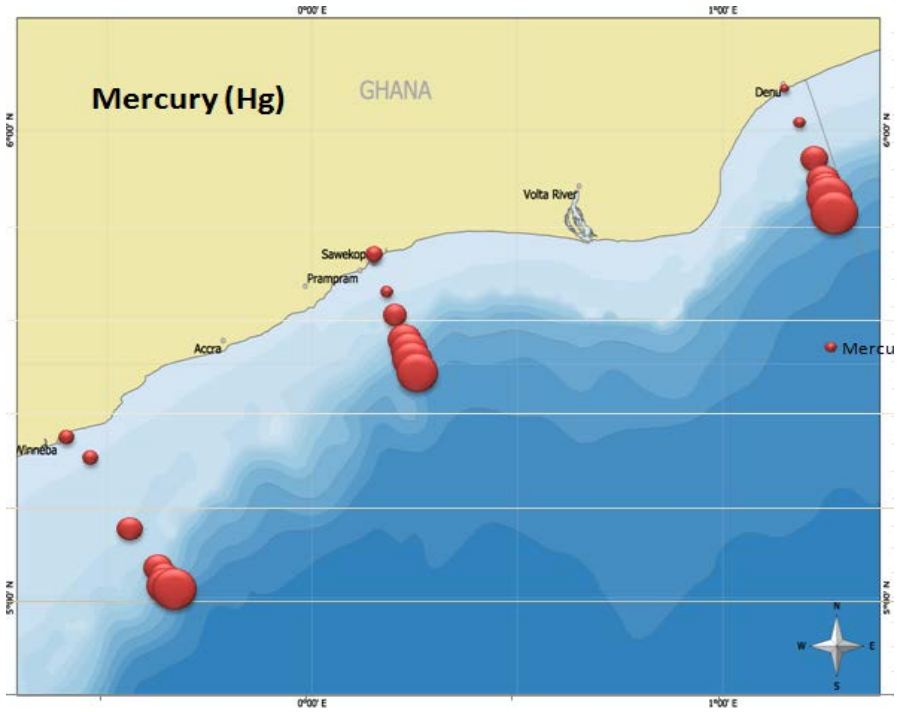

Figure 3.2.12 Distribution of Mercury. The circles shows the relative abundance.

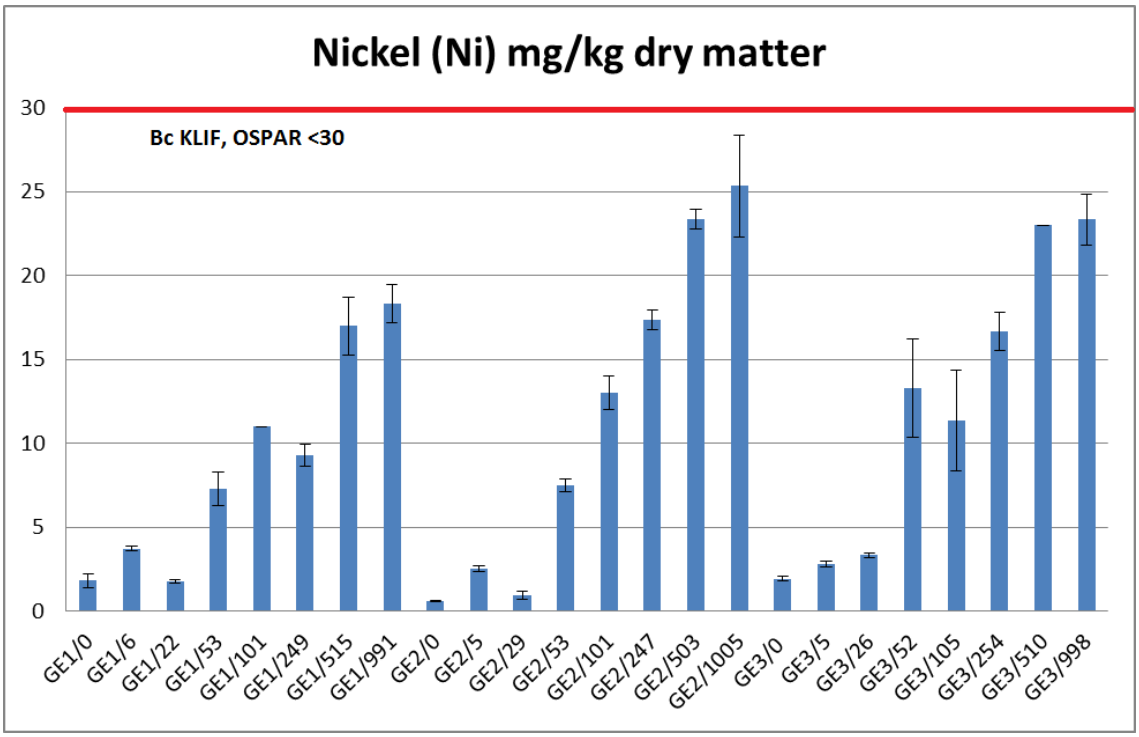

Figure 3.2.13 Distribution of Nickel (average and std) at different depths along the trasects GC1, GC2 and GC3.

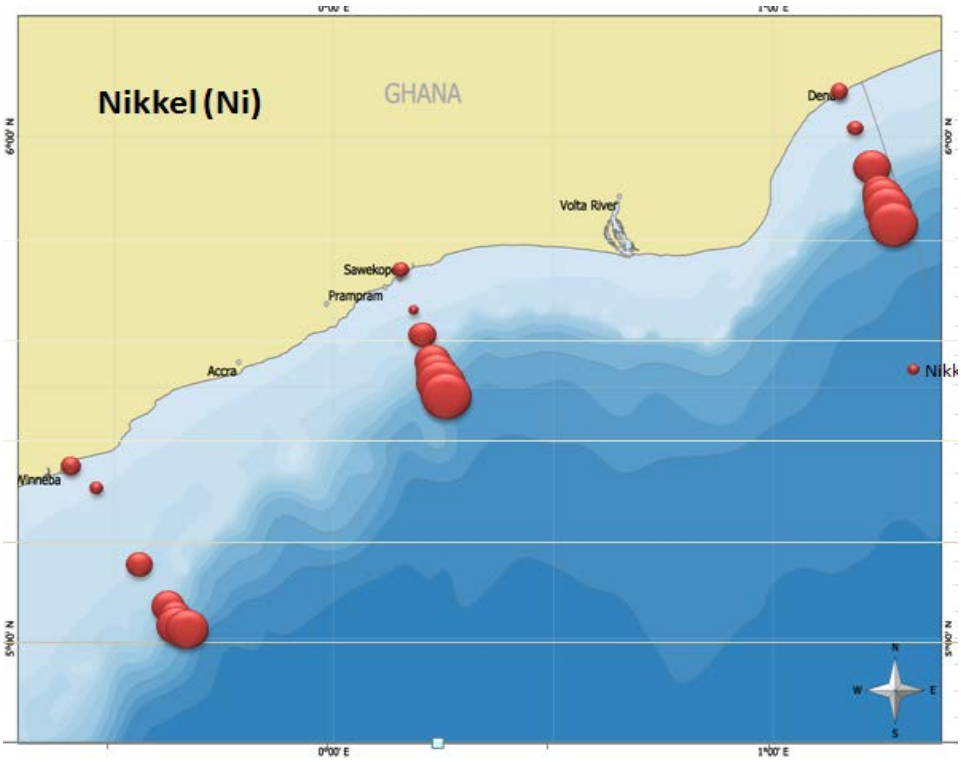

Figure 3.2.14 Distribution of Nickel. The circles shows the relative abundance

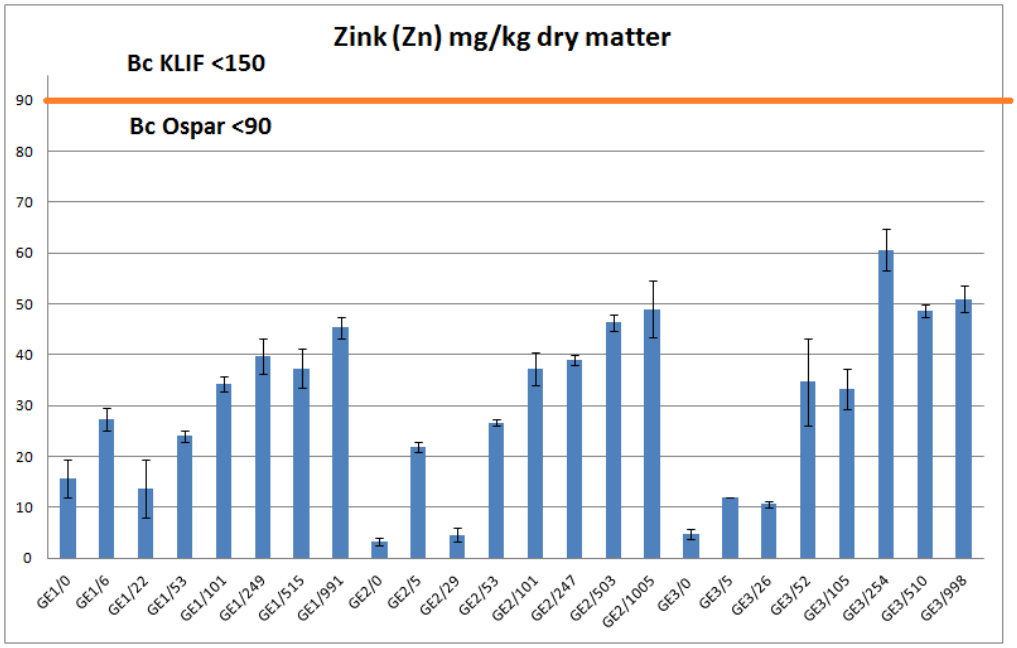

Figure 3.2.15 Distribution of zinc (average and std) at different depths along the trasects GE1, GE2 and GE3.

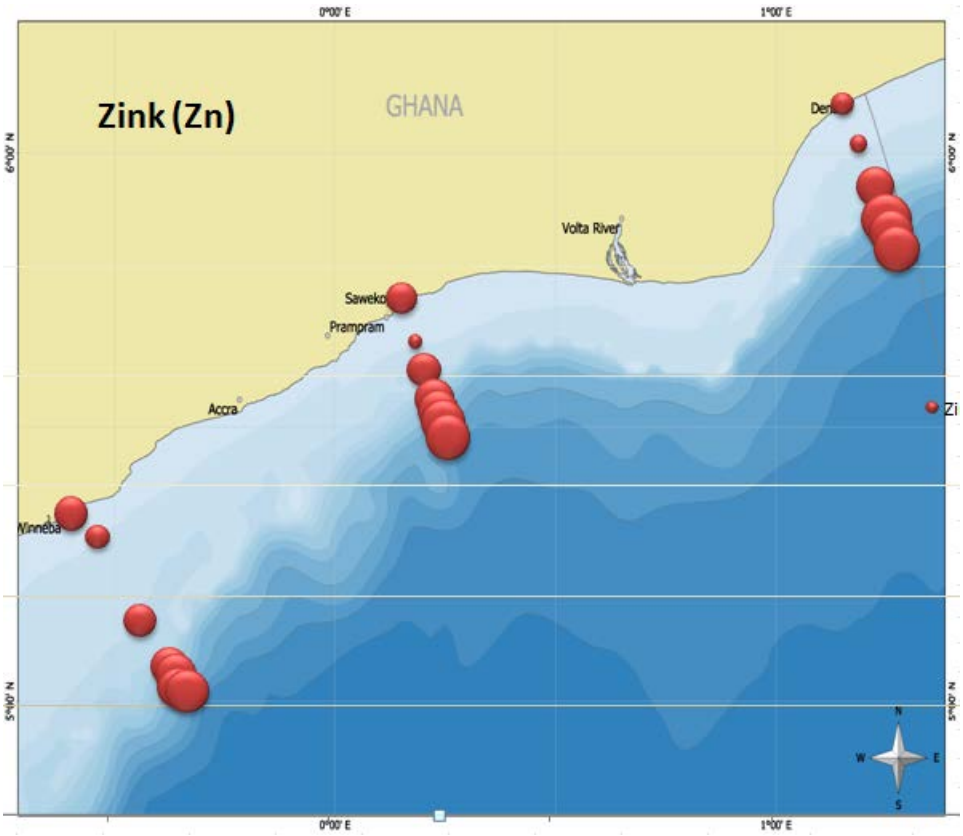

Figure 3.2.16 Distribution of Zink. The circles shows the relative abundance.

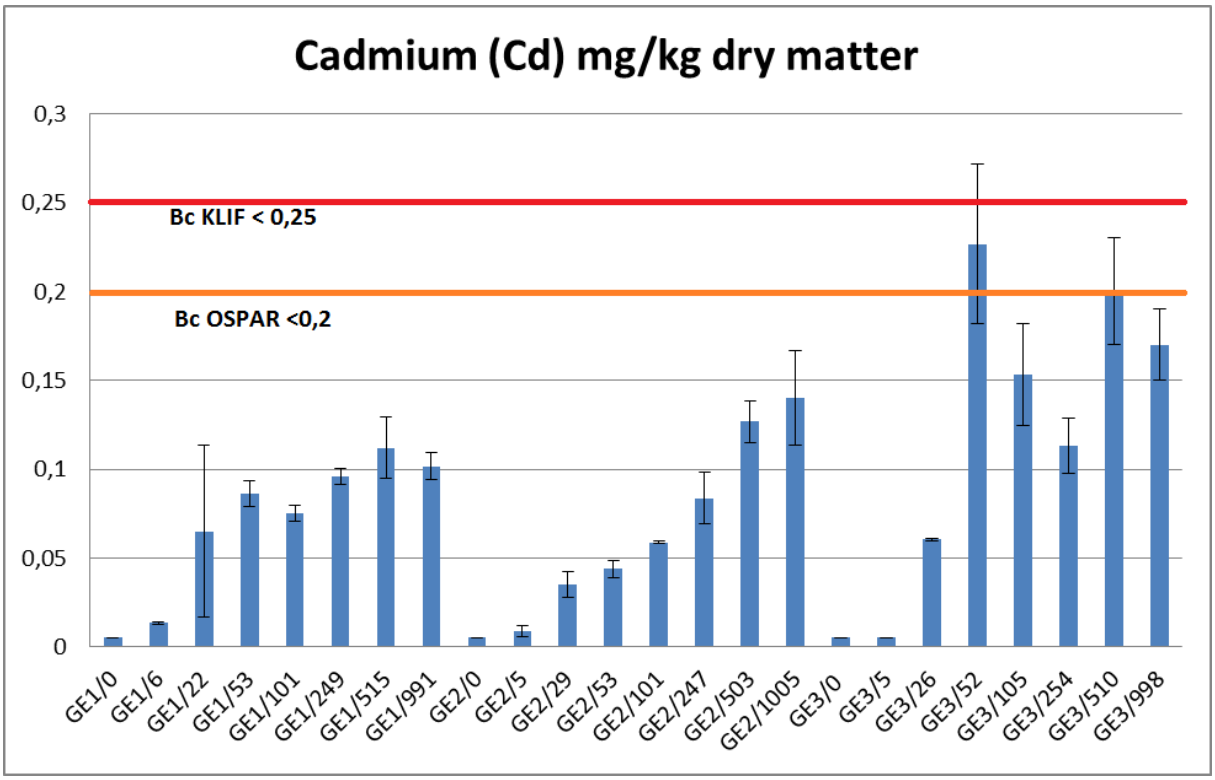

Figure 3.2.17 Distribution of cadmium (average and std) at different depths along the trasects GC1, GC2 and GC3.

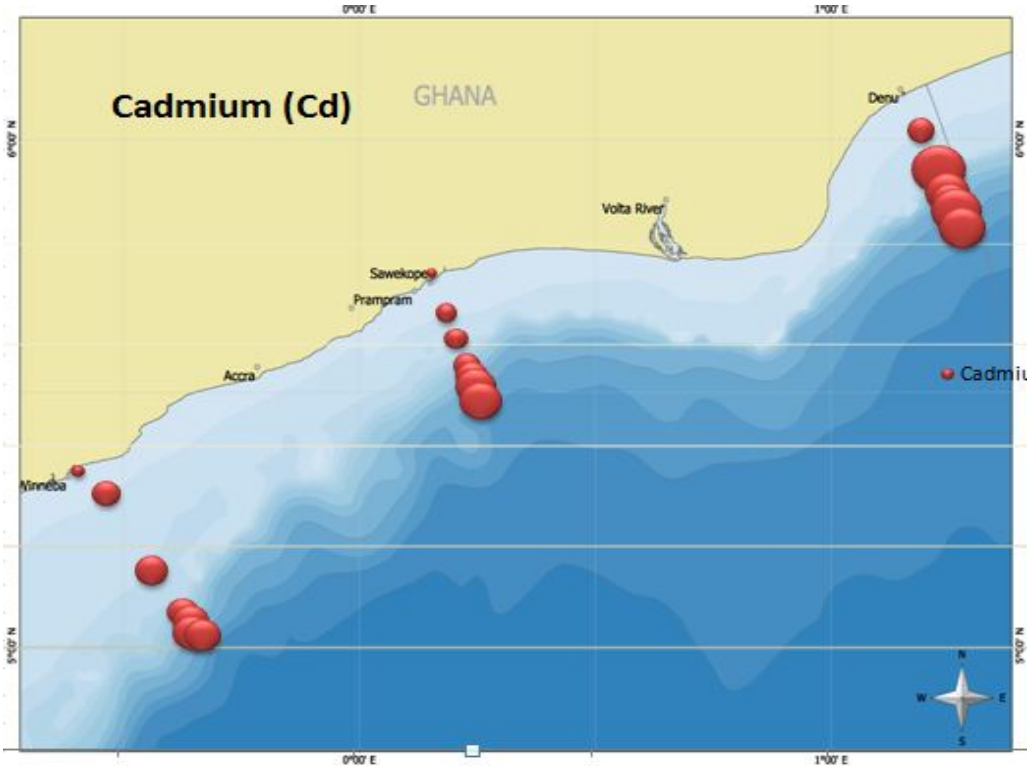

Figure 3.2.18 Distribution of Cadmium (Cd). The circles shows the relative abundance.

3.3 Hydrocarbons

Table 3.3.1 summarises the results of the hydrocarbon analysis. The complete data set including replicates is presented in Appendix.

Table 3.3.1: Average concentrations and standard deviations of THC (C12-35), PAH16, NPD's and PCB (mg/kg dw) at eight stations with different depths along the transects GE1, GE2, GE3.

	THC (TPH) C12-C35 (mg/kg dry matter)		PCB (7)(Sum) (mg/kg dry matter)		NPD's Sum (mg/kg dry matter)		PAH 16 EPA (sum)15 parametere (mg/kg dry matter)	
Station	Av	Stdev	Av	Stdev	Av	Stdev	Av	Stdev
GE1/0	<1		nd		nd		<0,01	
GE1/6	<1		nd		<0,005		0,013	0,007
GE1/22	<1		nd		nd		nd	
GE1/53	<1		nd		nd		<0,01	
GE1/101	<1		nd		nd		<0,01	
GE1/249	2,67	3,75	nd		0,01041	0,0137	<0,01	
GE1/515	1,53	1,05	nd		nd		<0,01	
GE1/991	1,93	1,10	nd		nd		<0,01	
GE2/0	<1		nd		nd		<0,01	
GE2/5	2,80	2,04	nd		<0,005		0,014	0,015
GE2/29	<1		nd		nd		nd	
GE2/53	<1		nd		nd		<0,01	
GE2/101	<1		nd		nd		<0,01	
GE2/247	<1		nd		nd		<0,01	
GE2/503	21,87	16,10	nd		0,00852	0,0048	0,025	0,007
GE2/1005	<1		nd		nd		0,012	0,003
GE3/0	<1		nd		nd		nd	
GE3/5	<1		nd		nd		<0,01	
GE3/26	<1		nd		nd		nd	
GE3/52	<1		nd		nd		nd	
GE3/105	<1		nd		0,00557	0,0053	<0,01	
GE3/254	<1		nd		<0,005		<0,01	
GE3/510	<1		nd		nd		0,010	0,004
GE3/998	<1		nd		<0,005		0,019	0,002

PCB's, PAH's and NPD's

No PCB values from the 2011 transects (GE1, GE2 and GE3) were seen above the detection limit of 0,5 µg/kg dry weight. The whole dataset is presented in the Appendix in table 1.5.1.

The concentrations of hydrocarbons were low at all sites and most compounds of PAH (polyaromatic hydrocarbons) and NPD (naphthalene, phenanthrene and dibenzothiophene) were below the detection limits. No values were found to be higher than Bc. for any of the parameters.

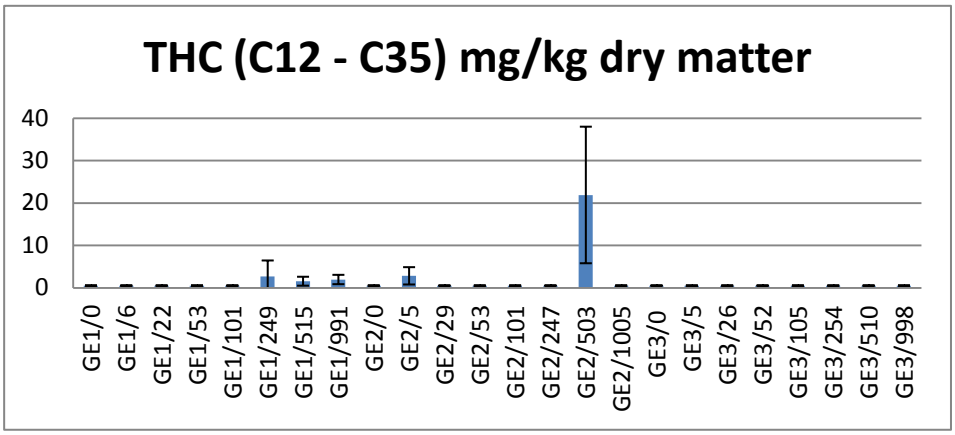

Figure 3.3.1. Distribution of THC (C12-35) (average and standard deviation) along the transects GE1, GE2 and GE3. Data lower than the detection limit are presented as half the detection limit.

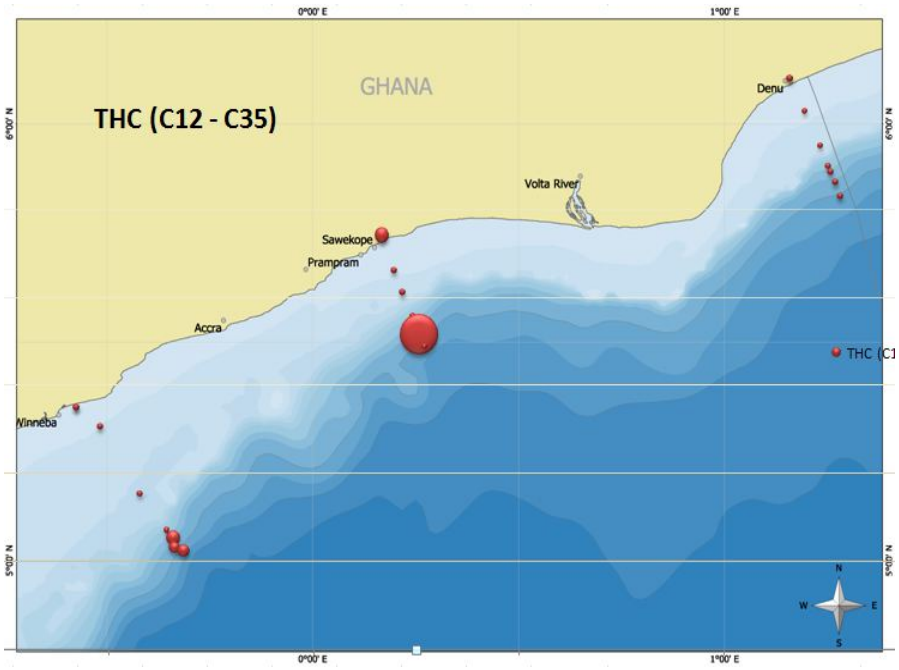

Figure 3.3.2 Distribution of THC (C12-C35). The circles shows the relative abundance.

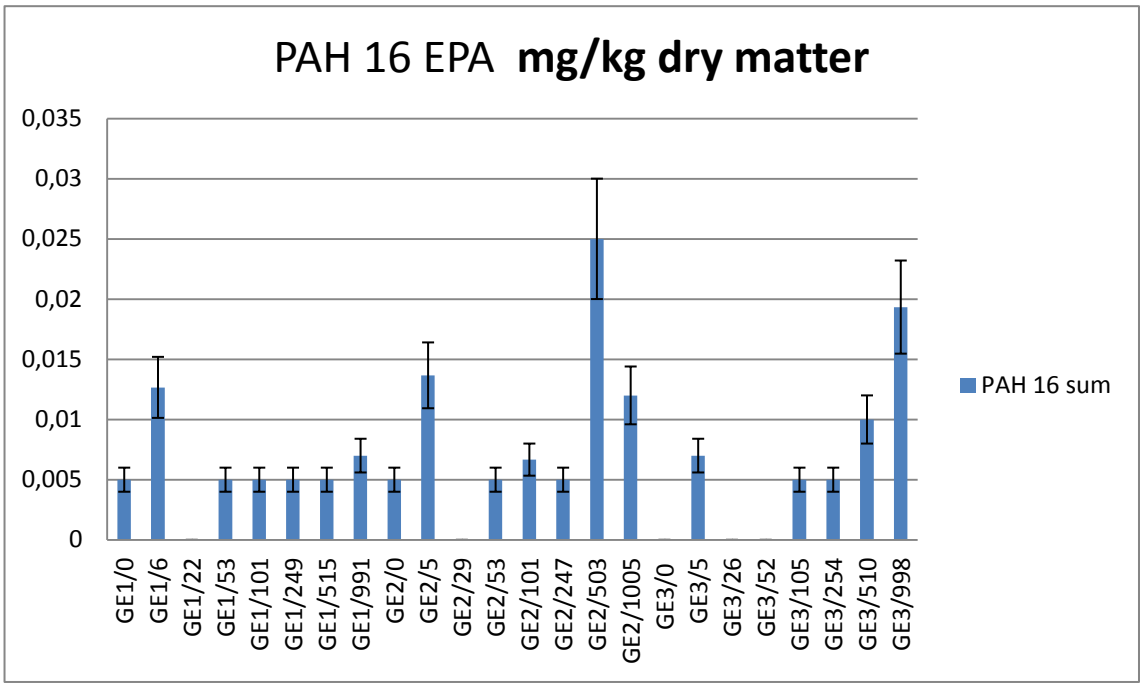

Figure 3.3.3. Distribution of the 16 EPA PAH (average and standard deviation) along the transects GE1, GE2, GE3. Data lower than the detection limit are presented as half the detection limit.

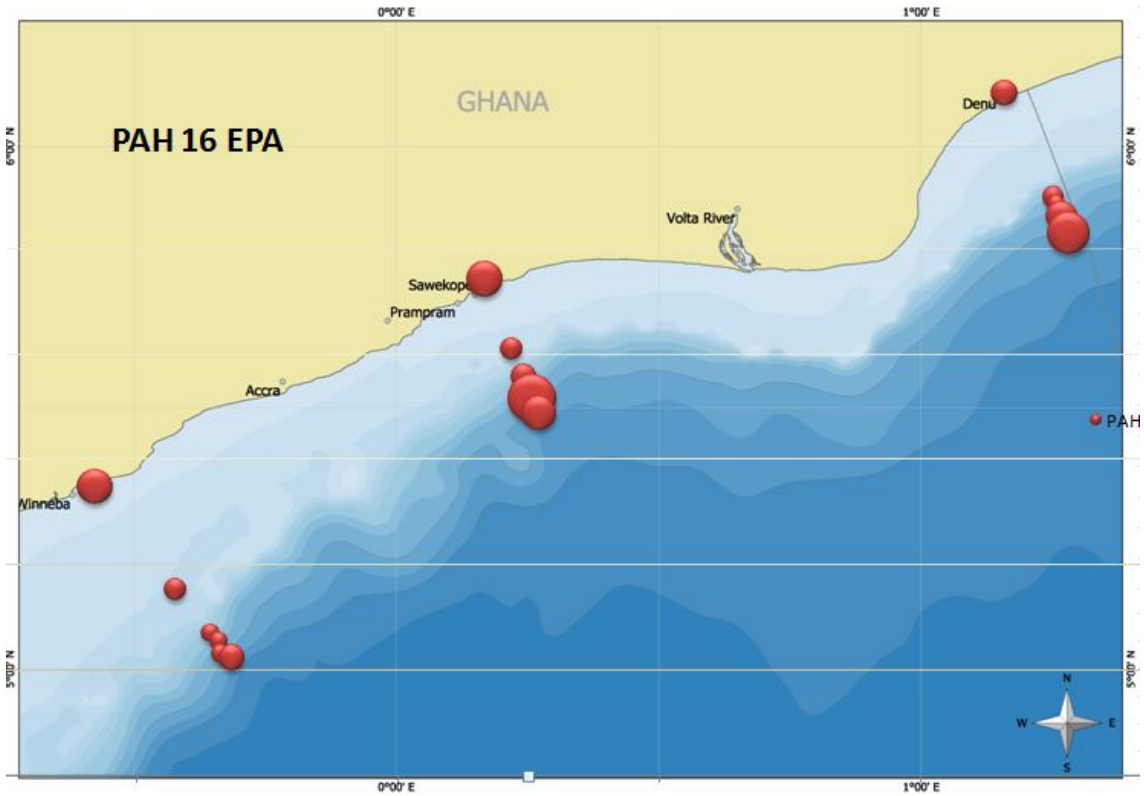

Figure 3.2.4 Distribution of PAH's. The circles shows the relative abundance.

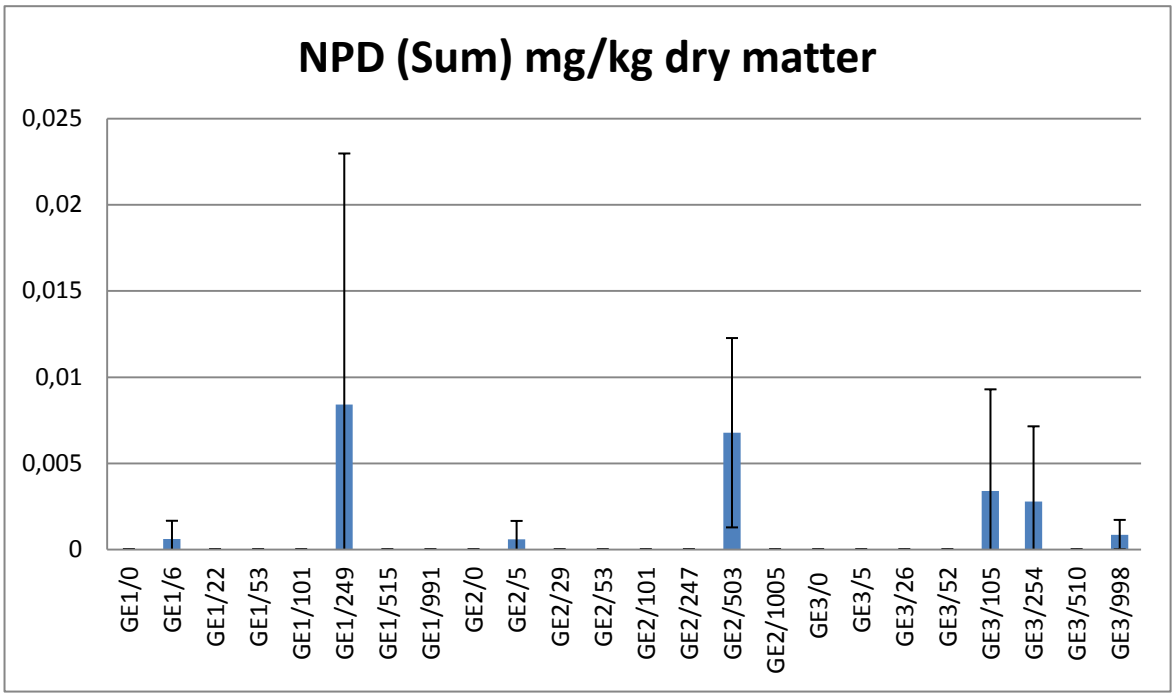

Figure 3.3.5. Distribution of NPD's (sum Naphtalene C1,C2,C3, Phenanthren C1,C2,C3 and Dibenzothiophene C1,C2,C3) (average and standard deviation) along the transects GE1, GE2, GE3. Data lower than the detection limit are presented as half the detection limit.

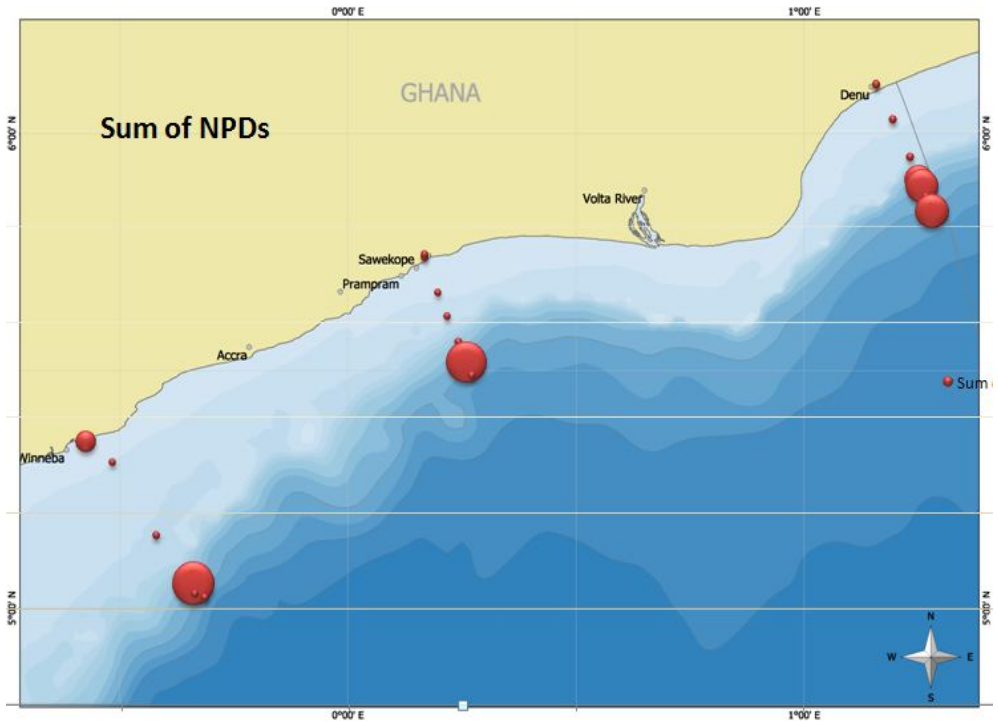

Figure 3.3.6 Distribution of NDP's. The circles shows the relative abundance.

3.4 TOM /Dry matter

Tab. 3.4.1 Dry matter and ignition loss.

	Dry matter (%)		TOM (% DM)	
Station	AV	STDV	AV	STDV
GE1/0	84,33	3,51	0,99	0,28
GE1/6	78,33	0,58	1,80	0,10
GE1/22	75,00	5,20	2,27	0,98
GE1/53	70,67	6,11	4,30	0,35
GE1/101	67,67	0,58	5,83	0,67
GE1/249	64,33	2,52	5,07	0,21
GE1/515	54,33	2,52	9,07	0,67
GE1/991	54,67	2,31	10,10	0,85
GE2/0	82,33	0,58	0,56	0,23
GE2/5	80,00	1,00	1,01	0,51
GE2/29	73,67	4,51	1,90	0,50
GE2/53	75,33	0,58	2,80	1,40
GE2/101	69,33	3,06	6,33	1,04
GE2/247	56,00	2,00	9,43	0,51
GE2/503	44,00	12,29	14,00	3,61
GE2/1005	51,00	2,65	11,87	2,80
GE3/0	96,33	1,15	0,39	0,29
GE3/5	78,33	1,15	0,91	0,72
GE3/26	82,33	0,58	1,70	0,46
GE3/52	74,33	1,53	3,33	0,38
GE3/105	67,00	4,36	6,50	1,13
GE3/254	59,00	3,61	8,60	0,60
GE3/510	50,00	2,65	17,67	6,03
GE3/998	51,33	0,58	9,13	1,33

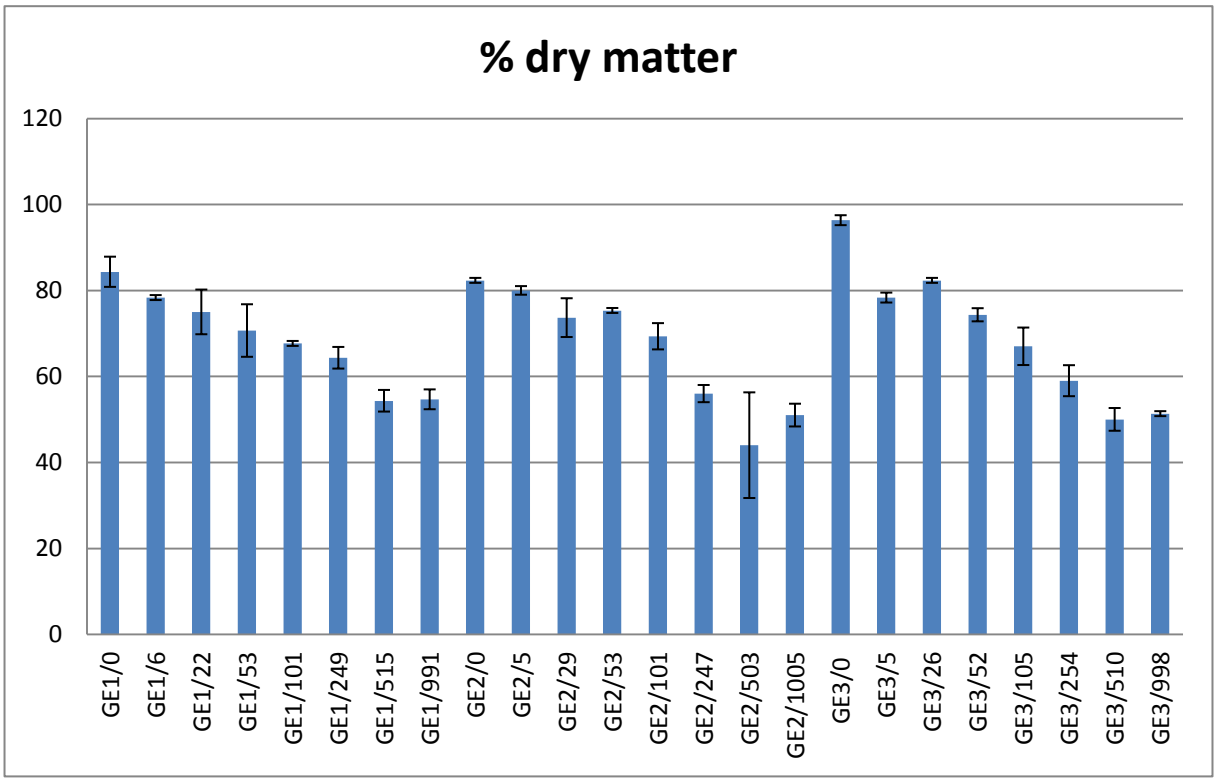

Fig. 3.4.1 Dry matter.

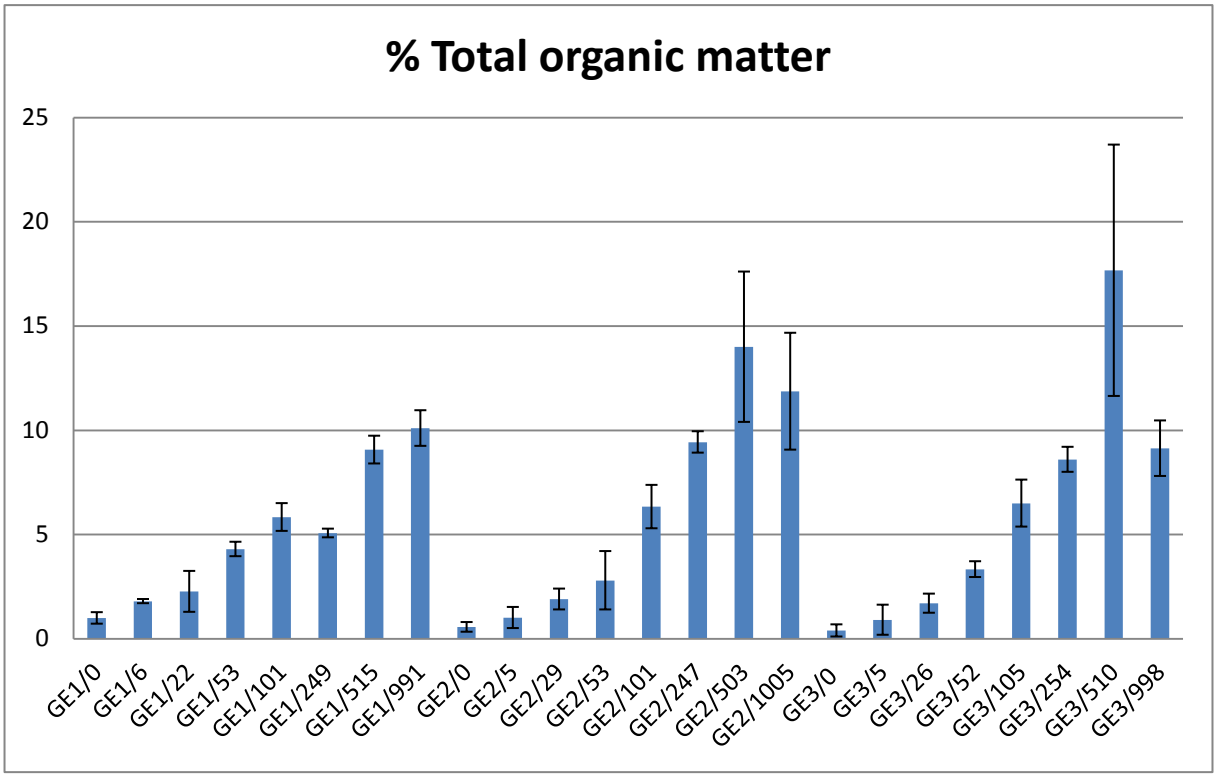

Fig. 3.4.2 ignition loss.

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5. LIST OF ABBREVIATIONS

Ba	Barium
Bc	Background concentration
Cd	Cadmium
Cu	Copper
CTD	Conductivity, Temperature and Density
DGPS	Differential Global Positioning System
Fe	Iron
GC/FID	Gas chromatography with flame ionization detector
GC/MS	Gas chromatography with mass selective detector
GPS	Global Positioning System
IMR	Institute of Marine Research
NPD	Naphthalene, Phenathrene/Anthracene, Dibenzothiophene and their C_1-C_3 homologues
NS	Norwegian Standard
PAH	Polycyclic Aromatic Hydrocarbons, including NPDs and 3-6 ring aromatics
Pb	Lead
THC	Total Hydrocarbon Content
TOM	Total Organic Material
UCC	University of Cape Coast
Zn	Zinc

6. Appendix:

Tab. 6.1. Metals. The highest measurements are highlighted values higher than OSPAR Bc. are marked yellow, values higher than KLIF Bc. are marked red.

Station	Sample	Arsen (As) (mg/kg) (dw)	Barium (Ba) (mg/kg) (dw)	Lead (Pb) (mg/kg) (dw)	Copper (Cu) (mg/kg) (dw)	Chromium (Cr) (mg/kg) (dw)	Mercury (Hg) (mg/kg) (dw)	Nickel (Ni) (mg/kg) (dw)	Zink (Zn) (mg/kg) (dw)	Cadmium (Cd) (mg/kg) (dw)
GE1/0	1	12	2,1	5,5	3	12	<0,001	2,3	20	<0,01
	2	8,8	1,9	3,6	2,4	8,5	<0,001	1,5	14	<0,01
	3	8,8	1,7	3,6	3,9	8,5	<0,001	1,7	13	<0,01
GE1/6	1	6,1	4,7	5,2	3,4	26	0,003	3,7	30	0,013
	2	6,6	5,9	5,4	3,9	25	0,004	3,9	26	0,014
	3	6,7	5,1	4,9	3,5	25	0,003	3,6	26	0,013
GE1/22	1	**26**	2,7	2,5	0,61	18	0,003	1,7	9,1	0,029
	2	**22**	4	2,8	0,89	18	0,004	1,9	12	0,12
	3	**26**	3,1	2,7	1	18	0,004	1,8	20	0,046
GE1/53	1	**24**	10	4,4	2,2	28	0,009	6,2	23	0,094
	2	**19**	11	4,8	2,4	32	0,01	7,6	24	0,085
	3	**18**	12	4,5	2,7	32	0,011	8,1	25	0,08
GE1/101	1	6,2	12	4	3,4	33	0,013	11	34	0,07
	2	6,1	12	4	3,5	34	0,013	11	36	0,077
	3	4,4	11	3,4	3,6	31	0,013	11	33	0,078
GE1/249	1	5,5	11	3,5	3,2	37	0,013	9,6	40	0,091
	2	5,2	11	3,9	3,2	38	0,012	9,7	43	0,097
	3	4,9	9,2	3,1	2,7	33	0,011	8,5	36	0,1
GE1/515	1	4,4	40	5,7	8,1	36	0,022	18	40	0,13
	2	4,7	40	5,9	8,1	36	0,021	18	39	0,11
	3	5,3	34	5,1	7	30	0,021	15	33	0,096
GE1/991	1	7,1	90	7,3	7,8	38	0,031	17	43	0,1
	2	7	**100**	7,8	9	42	0,029	19	46	0,095
	3	6,6	**100**	7,6	9,1	41	0,03	19	47	0,11
GE2/0	1	2	2,1	1,1	0,66	3,2	<0,001	0,64	3,6	<0,01
	2	1,8	1,9	1	0,77	2,1	0,002	0,62	2,5	<0,01
	3	2,3	2	1	0,83	2,5	0,002	0,59	4	<0,01
GE2/5	1	4,2	53	4,8	0,82	14	0,003	2,4	23	0,01
	2	4,7	20	3,3	1,3	12	0,004	2,5	21	<0,01
	3	5,2	21	2,9	1,3	12	0,006	2,7	22	0,011
GE2/29	1	9,3	2,2	1,4	0,33	4,9	0,001	0,74	3,7	0,03
	2	14	3,3	1,8	0,4	6,7	0,004	0,94	4	0,043
	3	**16**	3,2	2,2	1	8,6	0,002	1,2	6,1	0,032
GE2/53	1	10	8,8	5,3	1,8	26	0,008	7,5	27	0,039
	2	9,1	9,2	5,3	2,1	27	0,01	7,9	27	0,043
	3	9,9	8,5	5	2,2	24	0,008	7,1	26	0,049
GE2/101	1	**24**	12	8,8	4,2	37	0,016	12	35	0,058
	2	**24**	13	9,4	4,6	39	0,017	13	36	0,059
	3	**38**	12	12	3,9	44	0,017	14	41	0,059

Tab. 6.1. Metals continued. The highest measurements are highlighted, values higher than OSPAR Bc are marked yellow, higher than KLIF Bc are marked red.

Station	Sample	Arsen (As) (mg/kg) (dw)	Barium (Ba) (mg/kg) (dw)	Lead (Pb) (mg/kg) (dw)	Copper (Cu) (mg/kg) (dw)	Chromium (Cr) (mg/kg) (dw)	Mercury (Hg) (mg/kg) (dw)	Nickel (Ni) (mg/kg) (dw)	Zink (Zn) (mg/kg) (dw)	Cadmium (Cd) (mg/kg) (dw)
GE2/247	1	5,2	20	7,7	8,9	41	0,021	18	40	0,1
	2	5,5	19	7,3	8,4	39	0,021	17	38	0,078
	3	6,1	19	7	8	40	0,019	17	39	0,073
GE2/503	1	7,4	47	8,1	11	46	0,022	23	46	0,12
	2	7,2	49	8,1	11	47	0,023	23	45	0,12
	3	14	57	9,1	12	48	0,024	24	48	0,14
GE2/1005	1	5,6	91,0	8,3	13,0	47,0	0,0	**26,0**	50,0	0,2
	2	4,8	92	7,4	11	42	0,028	22	43	0,11
	3	5,6	**100**	9,8	**14**	51	0,028	28	54	0,16
GE3/0	1	2,1	0,94	0,87	1,6	8,7	<0,001	1,9	5,6	<0,01
	2	1,6	0,9	1,1	1,2	9,3	<0,001	2,1	4,9	<0,01
	3	2	0,9	0,85	0,88	8,9	<0,001	1,8	3,8	<0,01
GE3/5	1	7,6	3,9	2,3	0,71	11	0,001	2,7	12	<0,01
	2	8	4	2,6	0,86	11	0,001	3	12	<0,01
	3	7,9	3,4	2,5	0,83	11	0,001	2,7	12	<0,01
GE3/26	1	4,7	3,4	1,8	1,2	16	0,002	3,5	11	0,06
	2	4,3	3	1,8	1,19	15,1	0,002	3,2	9,9	0,06
	3	3,5	3,5	1,6	1,4	15	0,002	3,3	11	0,061
GE3/52	1	6,5	11	4,1	4,3	26	0,009	9,9	25	0,18
	2	8,4	16	6,7	6,2	38	0,012	15	41	**0,27**
	3	5,3	16	6,1	6,3	36	0,013	15	38	0,23
GE3/105	1	12	16	6,4	5,3	31	0,016	12	34	0,17
	2	12	16	6,8	5,7	34	0,026	14	37	0,17
	3	8	11	5,3	3,6	21	0,009	8,1	29	0,12
GE3/254	1	21	18	9,8	6,8	60	0,018	16	57	0,13
	2	19	16	10	6,1	**72**	0,017	16	**65**	0,099
	3	15	19	9,5	7,6	65	0,015	18	60	0,11
GE3/510	1	19	50	11	11	46	**0,037**	23	48	0,23
	2	11	41	9,6	12	45	0,027	23	48	0,17
	3	8,2	44	10	11	46	0,031	23	50	0,2
GE3/998	1	8,4	75	10	12	43	0,033	22	50	0,15
	2	9	84	**12**	14	48	0,035	25	54	0,19
	3	8,1	77	10	12	43	0,032	23	49	0,17

Tab 6.2.1. PAH 16.

Station	Sample	PAH 16 **Dibenzo(a,h)anthracene** (mg/kg dry matter)	PAH 16 **Fluoranthene** (mg/kg dry matter)	PAH 16 **Fluorene** (mg/kg dry matter)	PAH 16 **Indeno(1,2,3-cd)pyrene** (mg/kg dry matter)
GE1/0	1	<0,0005	0,00059	<0,0005	<0,0005
	2	<0,0005	0,00073	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/101	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	0,00075	<0,0005	<0,0005
	3	<0,0005	0,00059	<0,0005	<0,0005
GE1/22	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
1 GE1/249	1	<0,0005	0,00078	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/515	1	<0,0005	0,0011	<0,0005	<0,0005
	2	<0,0005	0,00077	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/53	1	<0,0005	0,00074	<0,0005	<0,0005
	2	<0,0005	0,00083	<0,0005	<0,0005
	3	<0,0005	0,00089	<0,0005	<0,0005
GE1/6	1	<0,0005	0,002	<0,0005	<0,0005
	2	<0,0005	0,003	<0,0005	<0,0005
	3	<0,0005	0,0043	<0,0005	0,0006
GE1/991	1	<0,0005	0,0023	<0,0005	<0,0005
	2	<0,0005	0,0018	<0,0005	<0,0005
	3	<0,0005	0,0018	<0,0005	<0,0005
GE2/0	1	<0,0005	0,0012	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/1005	1	<0,0005	0,0021	<0,0005	<0,0005
	2	<0,0005	0,0023	<0,0005	<0,0005
	3	<0,0005	0,0033	<0,0005	<0,0005
GE2/101	1	<0,0005	0,0021	<0,0005	<0,0005
	2	<0,0005	0,0017	<0,0005	0,00051
	3	<0,0005	0,00086	<0,0005	<0,0005
GE2/247	1	<0,0005	0,0012	<0,0005	<0,0005
	2	<0,0005	0,0012	<0,0005	<0,0005
	3	<0,0005	0,0013	<0,0005	<0,0005
GE2/29	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/5	1	<0,0005	0,00071	<0,0005	<0,0005
	2	<0,0005	0,0056	<0,0005	0,0019
	3	<0,0005	0,0011	<0,0005	0,00061
GE2/503	1	<0,0005	0,0045	<0,0005	0,00079
	2	<0,0005	0,0047	<0,0005	0,00052
	3	<0,0005	0,0076	<0,0005	0,00082
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	0,00056	<0,0005	<0,0005
	3	<0,0005	0,00074	<0,0005	<0,0005
GE3/0	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005

Tab 6.2.2. PAH 16.

Station	Sample	PAH 16 **Naphtalene** (mg/kg dry matter)	PAH 16 **Phenanthrene** (mg/kg dry matter)	PAH 16 **Pyrene** (mg/kg dry matter)	PAH 16 EPA (sum) (mg/kg dry matter)
GE1/0	1	<0,0005	<0,0005	0,00058	<0,01
	2	<0,0005	<0,0005	0,00063	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/101	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	0,00076	<0,01
	3	<0,0005	<0,0005	0,00063	<0,01
GE1/22	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
1 GE1/249	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,00059	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/515	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,00095	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/53	1	<0,0005	<0,0005	0,00059	<0,01
	2	<0,0005	<0,0005	0,00072	<0,01
	3	<0,0005	<0,0005	0,00071	<0,01
GE1/6	1	<0,0005	<0,0005	0,0017	<0,01
	2	<0,0005	<0,0005	0,0028	0,014
	3	<0,0005	<0,0005	0,0033	0,019
GE1/991	1	0,0018	<0,0005	0,0021	0,011
	2	0,0017	<0,0005	0,0017	<0,01
	3	0,0013	<0,0005	0,002	<0,01
GE2/0	1	<0,0005	<0,0005	0,001	<0,01
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE2/1005	1	0,0021	<0,0005	0,0021	0,01
	2	0,0021	<0,0005	0,0021	0,011
	3	0,0026	<0,0005	0,003	0,015
GE2/101	1	<0,0005	<0,0005	0,0019	<0,01
	2	<0,0005	<0,0005	0,0019	0,01
	3	<0,0005	<0,0005	0,00097	<0,01
GE2/247	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,0017	<0,01
	3	<0,0005	<0,0005	0,0017	<0,01
GE2/29	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE2/5	1	<0,0005	<0,0005	0,00058	<0,01
	2	<0,0005	0,0018	0,0046	0,031
	3	<0,0005	<0,0005	0,00098	<0,01
GE2/503	1	0,0016	0,0011	0,004	0,022
	2	0,00084	0,00085	0,0041	0,02
	3	0,0013	0,0012	0,0061	0,033
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,01
	2	<0,0005	<0,0005	0,00068	<0,01
	3	<0,0005	<0,0005	0,00089	<0,01
GE3/0	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd

Tab 6.2.3. PAH 16.

Station	Sample	PAH 16 **Naphtalene** (mg/kg dry matter)	PAH 16 **Phenanthrene** (mg/kg dry matter)	PAH 16 **Pyrene** (mg/kg dry matter)	PAH 16 EPA (sum) (mg/kg dry matter)
GE1/0	1	<0,0005	<0,0005	0,00058	<0,01
	2	<0,0005	<0,0005	0,00063	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/101	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	0,00076	<0,01
	3	<0,0005	<0,0005	0,00063	<0,01
GE1/22	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
1 GE1/249	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,00059	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/515	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,00095	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/53	1	<0,0005	<0,0005	0,00059	<0,01
	2	<0,0005	<0,0005	0,00072	<0,01
	3	<0,0005	<0,0005	0,00071	<0,01
GE1/6	1	<0,0005	<0,0005	0,0017	<0,01
	2	<0,0005	<0,0005	0,0028	0,014
	3	<0,0005	<0,0005	0,0033	0,019
GE1/991	1	0,0018	<0,0005	0,0021	0,011
	2	0,0017	<0,0005	0,0017	<0,01
	3	0,0013	<0,0005	0,002	<0,01
GE2/0	1	<0,0005	<0,0005	0,001	<0,01
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE2/1005	1	0,0021	<0,0005	0,0021	0,01
	2	0,0021	<0,0005	0,0021	0,011
	3	0,0026	<0,0005	0,003	0,015
GE2/101	1	<0,0005	<0,0005	0,0019	<0,01
	2	<0,0005	<0,0005	0,0019	0,01
	3	<0,0005	<0,0005	0,00097	<0,01
GE2/247	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,0017	<0,01
	3	<0,0005	<0,0005	0,0017	<0,01
GE2/29	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE2/5	1	<0,0005	<0,0005	0,00058	<0,01
	2	<0,0005	0,0018	0,0046	0,031
	3	<0,0005	<0,0005	0,00098	<0,01
GE2/503	1	0,0016	0,0011	0,004	0,022
	2	0,00084	0,00085	0,0041	0,02
	3	0,0013	0,0012	0,0061	0,033
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,01
	2	<0,0005	<0,0005	0,00068	<0,01
	3	<0,0005	<0,0005	0,00089	<0,01
GE3/0	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd

Tab 6.2.4. PAH 16.

Station	Sample	PAH 16 **Acenaphthene** (mg/kg dry matter)	PAH 16 **Acenaphthylene** (mg/kg dry matter)	PAH 16 **Anthracene** (mg/kg dry matter)	PAH 16 **Benzo(a)anthracene** (mg/kg dry matter)
GE3/105	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	0,00077
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	0,0016
GE3/510	1	<0,0005	<0,0005	<0,0005	0,00081
	2	<0,0005	<0,0005	<0,0005	0,00055
	3	<0,0005	<0,0005	<0,0005	0,00088
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	<0,0005	0,0013	<0,0005	0,00089
	2	<0,0005	0,00097	<0,0005	0,0011
	3	<0,0005	0,001	0,00059	0,0018

Tab 6.2.5 PAH 16.

Station	Sample	PAH 16 **Benzo(a)pyrene** (mg/kg dry matter)	PAH 16 **Benzo(ghi)perylene** (mg/kg dry matter)	PAH 16 **Benzo[b+j+k]fluoranthene** (mg/kg dry matter)	PAH 16 **Chrysene** (mg/kg dry matter)
GE3/105	1	<0,0005	<0,0005	0,00081	0,00053
	2	<0,0005	<0,0005	0,0013	0,001
	3	<0,0005	<0,0005	0,00077	<0,0005
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	0,0009	0,00066
	3	<0,0005	<0,0005	0,00075	<0,0005
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	<0,0005	<0,0005	0,00057	<0,0005
	2	<0,0005	<0,0005	0,00058	<0,0005
	3	0,0012	0,001	0,0018	0,0013
GE3/510	1	0,0005	0,00072	0,0018	0,0012
	2	<0,0005	0,00071	0,0015	0,00079
	3	0,00053	0,00071	0,0018	0,0012
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	0,00053	0,00095	0,0022	0,0014
	2	0,0007	0,001	0,0025	0,0017
	3	0,00095	0,001	0,0026	0,0021

Tab 6.2.6. PAH 16.

Station	Sample	PAH 16 **Dibenzo(a,h)anthracene** (mg/kg dry matter)	PAH 16 **Fluoranthene** (mg/kg dry matter)	PAH 16 **Fluorene** (mg/kg dry matter)	PAH 16 **Indeno(1,2,3-cd)pyrene** (mg/kg dry matter)
GE3/105	1	<0,0005	0,00082	<0,0005	<0,0005
	2	<0,0005	0,0012	<0,0005	<0,0005
	3	<0,0005	0,00066	<0,0005	<0,0005
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	0,0009	<0,0005	<0,0005
	3	<0,0005	0,00074	<0,0005	<0,0005
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	0,0018	<0,0005	0,0006
GE3/510	1	<0,0005	0,003	<0,0005	<0,0005
	2	<0,0005	0,0021	<0,0005	<0,0005
	3	<0,0005	0,0031	<0,0005	<0,0005
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	<0,0005	0,0035	<0,0005	<0,0005
	2	<0,0005	0,0036	<0,0005	<0,0005
	3	<0,0005	0,0043	<0,0005	<0,0005

Tab 6.2.7. PAH 16.

Station	Sample	PAH 16 **Naphtalene** (mg/kg dry matter)	PAH 16 **Phenanthrene** (mg/kg dry matter)	PAH 16 **Pyrene** (mg/kg dry matter)	PAH 16 EPA (sum) (mg/kg dry matter)
GE3/105	1	<0,0005	<0,0005	0,0008	<0,01
	2	<0,0005	<0,0005	0,0015	<0,01
	3	<0,0005	<0,0005	0,00075	<0,01
GE3/254	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	0,0015	<0,01
	3	<0,0005	<0,0005	0,0011	<0,01
GE3/26	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,01
	2	<0,0005	<0,0005	<0,0005	<0,01
	3	<0,0005	<0,0005	0,0016	0,011
GE3/510	1	0,0013	<0,0005	0,003	0,012
	2	0,0011	<0,0005	0,0023	<0,01
	3	0,00096	<0,0005	0,0033	0,013
GE3/52	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE3/998	1	0,0037	0,0008	0,0031	0,018
	2	0,0031	0,00064	0,0029	0,018
	3	0,0033	0,0013	0,0034	0,022

Table 6.3.1 THC

Stasjon	Hugg	THC (C12 - C35) (mg/kg dry matter)	Stasjon	Hugg	THC (C12 - C35) (mg/kg dry matter)
GE1/0	1	<1	GE2/29	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE1/101	1	<1	GE2/5	1	1,2
	2	<1		2	5,1
	3	<1		3	2,1
GE1/22	1	<1	GE2/503	1	28
	2	<1		2	3,6
	3	<1		3	34
GE1/249	1	7	GE2/53	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE1/515	1	1,5	GE3/0	1	<1
	2	2,6		2	<1
	3	<1		3	<1
GE1/53	1	<1	GE3/105	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE1/6	1	<1	GE3/254	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE1/991	1	3,2	GE3/26	1	<1
	2	1,4		2	<1
	3	1,2		3	<1
GE2/0	1	<1	GE3/5	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE2/1005	1	<1	GE3/510	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE2/101	1	<1	GE3/52	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE2/247	1	<1	GE3/998	1	<1
	2	<1		2	<1
	3	<1		3	<1

Table 6.4.1 NPD's

		NPD components	(mg/kg dry matter)			
Station	**Sample**	**Dibenzothiophene**	**Dibenzothiophene-C1**	**Dibenzothiophene-C2**	**Dibenzothiophene-C3**	**Naphtalene-C1**
GE1/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/6	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/22	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/53	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/101	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/249	1	<0,0005	0,00076	0,0029	0,0034	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/515	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/991	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/5	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/29	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/101	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/247	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/503	1	<0,0005	<0,0005	0,0014	0,0011	0,0013
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/1005	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005

Table 6.4.2 NPD's

Station	Sample	Naphtalene-C2	Naphtalene-C3	Phenanthrene-C1	Phenanthrene-C2	Phenanthrene-C3	Sum of NPDs
GE1/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE1/6	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	0,00098	0,00085	<0,01
GE1/22	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE1/53	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE1/101	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE1/249	1	<0,0005	<0,0005	0,00066	0,009	0,0085	0,025
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE1/515	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE1/991	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE2/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE2/5	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	0,00062	0,0012	<0,01
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE2/29	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE2/101	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE2/247	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE2/503	1	<0,0005	<0,0005	0,00092	0,0048	0,0033	0,013
	2	<0,0005	<0,0005	<0,0005	0,0042	0,0012	<0,01
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,0021	<0,01
GE2/1005	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd

Table 6.4.3 NPD's

		NPD components	(mg/kg dry matter)			
Station	**Sample**	**Dibenzothiophene**	**Dibenzothiophene-C1**	**Dibenzothiophene-C2**	**Dibenzothiophene-C3**	**Naphtalene-C1**
GE3/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/105	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	0,0026	0,0021	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	0,0035	0,0011	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/510	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005

Table 6.4.4 NPD's

Station	**Sample**	**Naphtalene-C2**	**Naphtalene-C3**	**Phenanthrene-C1**	**Phenanthrene-C2**	**Phenanthrene-C3**	**Sum of NPDs**
GE3/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE3/105	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	0,0011	0,0044	0,01
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	0,0027	0,00051	<0,01
	3	<0,0005	<0,0005	<0,0005	0,00053	<0,0005	<0,01
GE3/510	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
GE3/998	1	<0,0005	<0,0005	<0,0005	0,0009	<0,0005	<0,01
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	0,0017	<0,0005	<0,01

Table 6.5.1 PCB

Station	Sample	(Sum) PCB (7) (mg/kg dw)	PCB 101 (mg/kg dw)	PCB 118 (mg/kg dw)	PCB 138 (mg/kg dw)	PCB 153 (mg/kg dw)	PCB 180 (mg/kg dw)	PCB 28 (mg/kg dw)	PCB 52 (mg/kg dw)
GE1/0	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/101	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/22	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/249	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/515	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/53	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/6	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/991	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/0	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/1005	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/101	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/247	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/29	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/5	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/503	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/53	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/0	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/105	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005

Table 6.5.2 PCB

Station	Sample	(Sum) PCB (7) (mg/kg dw)	PCB 101 (mg/kg dw)	PCB 118 (mg/kg dw)	PCB 138 (mg/kg dw)	PCB 153 (mg/kg dw)	PCB 180 (mg/kg dw)	PCB 28 (mg/kg dw)	PCB 52 (mg/kg dw)
GE3/254	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/26	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/510	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/52	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005

Table 6.6.1 Dry matter

Station	Sample	MM284: Dry matter (%)	MM285: Ignition loss (%)	Station	Sample	MM284: Dry matter (%)	MM285: Ignition loss (%)
GE1/0	1	88	0,68	GE2/101	1	72	6
	2	81	1,2		2	66	5,5
	3	84	1,1		3	70	7,5
GE1/6	1	78	1,9	GE2/247	1	58	9,3
	2	78	1,8		2	54	10
	3	79	1,7		3	56	9
GE1/22	1	78	1,7	GE2/503	1	53	18
	2	69	3,4		2	49	11
	3	78	1,7		3	30	13
GE1/53	1	64	4,5	GE2/1005	1	52	15
	2	76	3,9		2	53	9,6
	3	72	4,5		3	48	11
GE1/101	1	67	6,4	GE3/0	1	95	0,22
	2	68	6		2	97	0,23
	3	68	5,1		3	97	0,73
GE1/249	1	64	5,3	GE3/5	1	79	0,96
	2	62	4,9		2	79	1,6
	3	67	5		3	77	0,16
GE1/515	1	54	9,5	GE3/26	1	82	2,1
	2	57	9,4		2	83	1,8
	3	52	8,3		3	82	1,2
GE1/991	1	56	10	GE3/52	1	74	2,9
	2	52	11		2	76	3,5
	3	56	9,3		3	73	3,6
GE2/0	1	82	0,74	GE3/105	1	64	7,1
	2	83	0,3		2	65	7,2
	3	82	0,65		3	72	5,2
GE2/5	1	81	1,4	GE3/254	1	55	9,2
	2	80	0,44		2	62	8
	3	79	1,2		3	60	8,6
GE2/29	1	69	1,9	GE3/510	1	48	24
	2	74	2,4		2	49	17
	3	78	1,4		3	53	12
GE2/53	1	75	3,8	GE3/998	1	51	7,6
	2	75	1,2		2	52	9,8
	3	76	3,4		3	51	10

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Title of report: Environmental monitoring Ghana 2011. Chemical analysis.	Date: 21/11-2012
	N.o. pages: 190
Authors: Tor Ensrud	Project leader: Bjørn Serigstad
	Survey number: 2011404

Client : Environmental Protection Agency Ghana. (EPA Ghana)	Accessibility: Open

Abstract: The monitoring regime for 2011 consisted of three transects in the central and western region of the Ghana coast starting from Winneba, Old Ningo and Denu going from the lower end of the beach to about 1000m water depth. The monitoring consisted of benthic soft bottom macrofauna analyses, grain size distribution of sediment and chemical analyses of hydrocarbons, heavy metals and PCB.

The results of the metal analysis Showed values within the lower part of what is defined as good conditions compared to available European and Norwegian standards. The leveles found represents no risk of ecological effects and compared to these standards and are mostly well below what is regarded as background levels. The other parameters also show low values. Most of the parameters shows an increase with depth most likely related to the finer grain size in the sediments associated with increasing water depth and the general pattern of sedimentation.

The biological samples support these findings, and reflect to the best of our knowledge natural conditions in relation to the investigated parameters.

The conditions in the investigated areas can be described as pristine and in good environmental condition with regards to the findings from the chemical and biological analysis. Station GE3/26 stands out from the other stations having a richer fauna both in terms of numbers and diversity. The reason for this can not be explained from investigated parameters. During the three year program, problems with waste, espesically plastic has been observed. Due to the goal of making a baseline study related to oil industry this investigation of the has not covered the areas close to the major cities and industrial centers.

Keywords: Marine survey, THC, PAH, NPD, heavy metals, PCB, offshore monitoring, Background concentration.

Responsible for:	Date:	Signature:
Professional evaluations and interpretations:	31/08-2014	
Project:	2011404	

Accreditation:

The following activities were performed accredited:

Sampling for analyses of: benthos, geology and chemical analyses **by** Ghana personnel under the supervision of Tor Ensrud.

Activities not accredited:
Geological analyses by:
Sorting of sediment by: University of Lodz Poland
Identification of marine fauna by: Kzryzstof Pabis, University of Lodz Poland
Reporting by: Tor Ensrud, Marek Ostrowski, Magne Olsen og Bjørn Serigstad.

SUPPLIERS
Research vessel: Dr. Fritjof Nansen
Chemical analyses by: Eurofins Norsk Miljøanalyse with accreditation number:003
Accredited: Heavy metals (Ba, As, Pb, Cd, Cu, Cr, Hg, Ni, Zn), Hydrocarbons (THC, PAH 16, NPD), PCB7.
-

THE EAF-NANSEN PROJECT

FAO started the implementation of the project “Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries (EAF-Nansen GCP/INT/003/NOR)” in December 2006 with funding from the Norwegian Agency for Development Cooperation (Norad). The EAF-Nansen project is a follow-up to earlier projects/programmes in a partnership involving FAO, Norad and the Institute of Marine Research (IMR), Bergen, Norway on assessment and management of marine fishery resources in developing countries. The project works in partnership with governments and also GEF-supported Large Marine Ecosystem (LME) projects and other projects that have the potential to contribute to some components of the EAF-Nansen project.

The EAF-Nansen project offers an opportunity to coastal countries in sub-Saharan Africa, working in partnership with the project, to receive technical support from FAO for the development of national and regional frameworks for the implementation of Ecosystem Approach to Fisheries management and to acquire additional knowledge on their marine ecosystems for their use in planning and monitoring. The project contributes to building the capacity of national fisheries management administrations in ecological risk assessment methods to identify critical management issues and in the preparation, operationalization and tracking the progress of implementation of fisheries management plans consistent with the ecosystem approach to fisheries.

LE PROJET EAF-NANSEN

La FAO a initié la mise en oeuvre du projet "Renforcement de la base des connaissances pour mettre en œuvre une approche écosystémique des pêcheries marines dans les pays en développement (EAF-Nansen GCP/INT/003/NOR)" en décembre 2006. Le projet est financé par de l'Agence norvégienne de coopération pour le développement (Norad). Le projet EAF-Nansen fait suite aux précédents projets/ programmes dans le cadre du partenariat entre la FAO, Norad et l'Institut de recherche marine (IMR) de Bergen en Norvège, sur l'évaluation et l’aménagement des ressources halieutiques dans les pays en développement. Le projet est mis en oeuvre en partenariat avec les gouvernements et en collaboration avec les projets grands écosystèmes marins (GEM) soutenus par le Fonds pour l’Environnement Mondial (FEM) et d'autres projets régionaux qui ont le potentiel de contribuer à certains éléments du projet EAF-Nansen.

Le projet EAF-Nansen offre l’opportunité aux pays côtiers de l'Afrique subsaharienne partenaires de recevoir un appui technique de la FAO pour le développement de cadres nationaux et régionaux visant une approche écosystémique de l’aménagement des pêches et la possibilité d'acquérir des connaissances complémentaires sur leurs écosystèmes marins. Ces éléments seront utilisés pour la planification et le suivi des pêcheries et de leurs écosystèmes. Le projet contribue à renforcer les capacités des administrations nationales responsables de l’aménagement des pêches en introduisant des méthodes d'évaluation des risques écologiques pour identifier les questions d’aménagement d’importance majeure ainsi que la préparation, la mise en œuvre et le suivi des progrès de la mise en œuvre de plans d’aménagement des ressources marines conformes à l'approche écosystémique des pêches.

Participants on the cruise

From Ghana 1st Group:
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Peter ……. (University of Cape Coast)
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Joshua Odonkor (EPA Ghana)
George Diawuo (EPA Ghana western region(Where the oil was found))
Tor Magne Ensrud (UNI Research Norway)
Maxwell Seyram Sunu

From Norway:
Bjørn Serigstad (Cruise leader) (IMR)
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Tore Mørk (IMR)
Ole Sverre Fossheim (IMR)
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We would like to thank the officers and the crew onboard *Dr. Fridtjof Nansen*.

ANALYSIS AND REPORTING

Sorting of biological samples:
University of Lodz Poland

Identification of biological samples:
Krzysztof Pabis

Organic chemical analyses:
Eurofins Environmental laboratory AS

Metal analyses:
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Physical analyses:
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Computer analyses (Bio):
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Reporting:
Tor Ensrud, Bjørn Serigstad, Marek Ostrowski, Magne Olsen

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INTRODUCTION

The coastal zone of Ghana stretches from the borders with the Republic of Togo in the east to the Republic of Cote d'Ivoire in the West and covers a total distance of 565 km. The coastal stretch may be divided into three geomorphologic zones with various characteristics as below:

The West Coast covers 95 km and is made up of fine sand, gentle beaches and coastal lagoons
The Central Coast covers 321 km, and is made up of embayed coast of rocky headlands, rocky shores, littoral sand barriers and coastal lagoons
The East Coast is 149 km long and has sandy beaches with the deltaic estuary of Volta River situated half way in between.

Ghana's coastal zones cover about 6.5 % of the country's land area, but inhabits about 25 % of the nations population. The current use of the coastal areas in Ghana are fishing; human settlements; tourism; industrial development; mining; sand winning, oil and gas exploration and exploitations. Marine fishing contributes about 4 % to the country's GDP. The living standards of people in the fishing communities in these areas are significantly lower than in the urban centres. Average welfare levels among food farmers in rural coastal areas, estimated by the Ghana Poverty Reduction Strategy, are 12 % below that of large urban centres such as Accra. Lack of healthcare, poverty and environmental degradation contribute to a vicious circle that inhibits human development in the coastal zone.

Consequently, the emerging oil industry poses a challenge to Ghana's coastal population, the majority being fishermen. The effects of the oil industry on other industrial and economical interests are also of concern to Ghana. These groups are concerned about the possible negative impacts of the petroleum activity in several areas, such as:

Operational discharges from oil production and transportation.
Accidetal discharges from well operations production and transport.
Discharges of untreated wastes from oil tankers and other vessels.
Loss of marine biodiversity due to drilling activity and pollution.
Reduced fish stocks.
Limited access to fishing grounds.
Limitations to settlements and recreational use of the coast line.
Fear of health problems relating to pollution.
Limitations to the emerging tourist industry.

The co-existence of the fishing communities and the oil industries among others, is necessary for a sustainable utilisation of marine resources, and protection of the marine environment. An effective Coastal Zone Management must therefore be based on a clear understanding of the complexities in relation to the natural resources of the coastal areas, and the coastal population that subsists on these resources.

An important factor in safeguarding and balancing the relation between different commercial users, the coastal inhabitants and the protection of the marine environment, is the development of legislations, political instruments, establishment of governmental institutions, NGOs and private institutions. These initiatives are being spearheaded by the Environment Protection Agency (EPA). Previous Ghanaian legislations that have been passed in the area of integrated coastal zone management and sustainable development includes the following:

Beaches Obstruction Ordinance, 1897 (Cap 240)

Rivers Ordinance, 1903 (Cap 226)
Wild Animals Preservation Act, Act 43, 1961
Oil in Navigable Waters Act, Act 235, 1964
Towns Ordinance, 1892
Volta River Development Act, 1961
Fisheries (Amended) Regulations, 1977 and 1984
Fisheries Law, PNDC 256, 1991
Fisheries Act 625, 2002.
Ghana National petroleum corporation law (1983)
The Environmental Protection Act (1994)
Environmental Assessment regulations (1999)
Guidelines on Environmental Assessment and Management (2011)

The legislation for marine environmental protection, sustainable use, and conservation of marine living resources is contained in *the Biodiversity Strategy and Action Plan* and the Coastal Wetlands Strategy of Ghana. For the purposes of the new found oil industry and the possible pollution that could result from an oil spill incident, various laws have been developed including the Oil Revenue Bill which have been passed by the parliament of Ghana. This Bill among others will provide safeguards to the nation including the coastal communities and also ensure that safety and environmental standards are commensurable with international practices.

In line with the mission of the EPA to co-manage, protect and enhance the country's environment, offshore environmental monitoring plan comprising both baseline surveys prior to oil and gas were developed. An initial marine environmental baseline survey was carried out in the western region in 2009 prior to oil production. In 2010, the second baseline survey covering the central part of the coast was conducted; the 2011 survey completes the coverage of the marine environment within the country's territorial waters with regards to parameters related to oil exploration and production.

The problems with pollution and transport of pollutants are complex and transboundary. Petroleum activities are not only limited to the Ghanaian territory but also to our neighbours in the West and East. It is therefore a shared problem between countries in the Guinea Current Large Marine Ecosystems (GCLME).

A detailed overview of the marine resources and the environmental state of the ecosystem is necessary for the management of the marine resources in a way that will benefit Ghana.

The initial surveys conducted at the Ghanaian continental shelf are aimed at providing useful data on the existing marine environment, fish stocks and the benthic fauna, which could help when designing a future monitoring program. Both field-specific monitoring and wider area monitoring has been adopted by the Environmental Protection Agency to ensure holistic environmental quality monitoring of the marine environment.

Consequently, a multisectorial approach for the baseline surveys were facilitated by the Ministries of Environment Science and Technology (MEST), Ministry of Energy (Petroleum), Ministry of Fisheries and the Universities.

The 2009 survey consisted of a station grid surrounding the Jubilee petroleum field and three transects; Ghana east, Ghana West and along the Ghana pipeline. (For later reference called transect G1, G2 and G3 going from East towards west.) The Ghana pipeline stretches from the Jubilee petroleum field to the shore of Axim, while Ghana east begins close to the town of Secondi and Ghana west is initiated close to New Town.

In 2010 the three transects Ghana central GC1, GC2 and GC3 were investigated in addition to the station grids around Mahogany oil rig (MA-Deep) and the Salt Pond oil rig (SP). The GC transects are positioned east the Ghana east transect sampled in 2009, with GC1 initiating at the shoreline close to Cape Coast, GC2 starting near Winneba and GC3 streching out from the outlet of the Volta River furthest east. The Mahogany and Salt Pond oil rigs are positioned off Bonyere and Salt Pond, respectively.
The 2011 survey consisted of three transects starting from Winneba, Old Nigo and Denu near the Togo Border. Eight stations were sampled along each transect stretching from the beach to about 1000m water depth. Transects length varied from about 25 to 38 km measured from the 25 meter station and out.

Denu beach. (Photo T. Ensrud)

Sampling in Denu 24.4.2011. (Photo T. Ensrud)

Chemical samples GE2. (Photo T. Ensrud)

Waiting for new samples on the 1st.leg. (Photo T. Ensrud)

Demersal trawling 2nd. leg (Photo T. Ensrud)

2. MATERIALS AND METHODS

2.1 Survey area

The dominant surface current flow, in this area is going from north-west to south-east, parallel to the shelf shown in fig 2.1.

2.2 Sampling design

The goal of this survey was to provide increased knowledge about the environmental status related parameters relevant to the oil industry in the marine ecosystem in the Coastal Regions of Ghana, to complete the coverage of the coastline from Ivory coast border to Togo. To achieve this, 24 grab sites on 3 transects were sampled in the coastal zone in the central and Eastern part of Ghana. The sampling sites were spread out on three transects at eight predefined depths (on approximately 0m (shoreline) 5m, 25 m, 50 m, 100 m, 250 m, 500 m and 1000 m depth) The 5m depth sites were sampled with a handheld 0.025m^2 Van Veen grab from canoes hired from local fishermen. Composite samples were collected at the shore (0m) within the tidal zone with the same equipment.
From 25 m and deeper, a 0.1 m^2 size Van Veen grab was used. A map of the 2009 and 2010 sampling stations together with the stations of 2011 is presented in Appendix.

The sediment sampling was executed in accordance with the OSPAR guidelines for sediment monitoring in offshore oil production areas. Some duplicate samples were collected for chemical and biological analysis for training purposes to benefit the local scientists and comparison of analytical results.

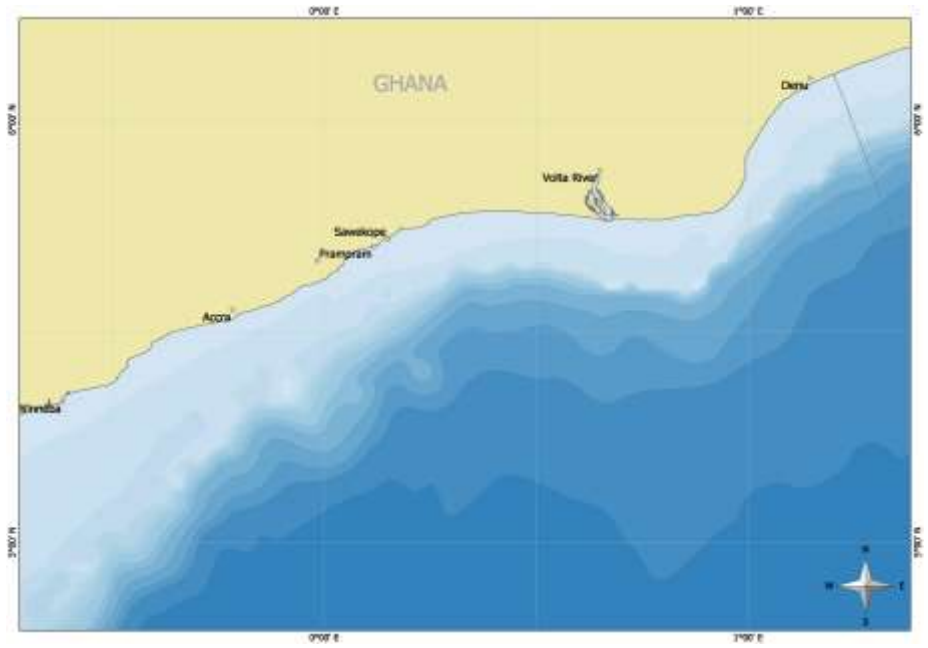


Figure 2.1. Map of sampling stations at the coast of Ghana in 2011.

Table 2.1. Date, position and depth of benthic sampling sites.

Transect/ area	Date	Grab station	Longitude WGS84	Lattitude WGS84	Depth (m)
Ghana East 1	28.04.2011	GE1/0	0˚34,814	5˚20,888	0
	28.04.2011	GE1/6			6
	20.04.2011	GE1/22	-0.5214	5.3048	22
	20.04.2011	GE1/53	-0.4254	5.1522	53
	20.04.2011	GE1/101	-0.3589	5.0691	101
	21.04.2011	GE1/249	-0.3428	5.0530	249
	22.04.2011	GE1/515	-0.3397	5.0297	515
	22.04.2011	GE1/991	-0.3177	5.0230	991
Ghana East 2	29.04.2011	GE2/0	0˚09,948	5˚44,036	0
	30.04.2011	GE2/5	0˚11,018	5˚44,402	5
	25.04.2011	GE2/29	0.1964	5.6607	29
	25.04.2011	GE2/53	0.2170	5.6097	53
	25.04.2011	GE2/101	0.2411	5.5570	101
	25.04.2011	GE2/247	0.2497	5.5350	247
	24.04.2011	GE2/503	0.2583	5.5145	503
	24.04.2011	GE2/1005	0.2706	5.4868	1005
Ghana East 3	29.04.2011	GE3/0	1˚09,724	6˚05,729	0
	30.04.2011	GE3/5			5
	07.05.2011	GE3/26	1.1980	6.0220	26
	07.05.2011	GE3/52	1.2359	5.9439	52
	07.05.2011	GE3/105	1.2552	5.8969	105
	07.05.2011	GE3/254	1.2616	5.8833	254
	07.05.2011	GE3/510	1.2719	5.8608	510
	07.05.2011	GE3/998	1.2844	5.8294	998

2.2.1 Hydrographic sampling

CTD profiles were deployed at selected sediment sampling 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 sea floor. The CTD data has ben post processed in the Quick cast database and displayed with the software package Ocean Data Veiw 4.

The SBE 21 Seacat thermosalinograph was running continuously during the survey, collecting data for salinity and relative temperature at 5 m depth every 10 seconds. An attached in-line Turner Design SCUFA Fluorometer was used to supplement these data with the underway measurements of Chlorophyll-a levels [RFU].

Meteorological data including wind direction and speed, air temperature and sea surface temperature (SST) were automatically logged into the system using a WIMDA meteorological station and averaged by every nautical mile distance sailed.

2.2.2 Sediment sampling and sample treatment

The sediment samples were collected by Ghanaian scientists under the supervision of experienced Norwegian scientists from accredited institutions that instructed and assisted them with the sampling. The sampling was performed in accordance to the Norwegian guidelines ”Aktivitetsforskriften”, OSPAR guidelines, the Draft “Requirements for Environmental Monitoring of the Petroleum Activities on the Ghanaian Continental Shelf” and International Standards (ISO 5667-19 and ISO 16665).
The positioning of *Dr. Fridtjof Nansen* was done by Differential Global Positioning System (DGPS). The sediment samples were collected using a Van Veen grab with adjustable weights and an opening of 0.1 m². The total volume of the grab was 21 litres.
Ten grab samples were collected at each grab station along the three transects. Five samples were used for biological analysis. The volume of each sample was measured, then the sample was sieved through a 5 mm sieve and a 0,5 mm mesh sieve placed in a water bath (For samples 25 meters and deeper). The material retained in the sieves were placed in 500-1000 ml plastic containers and fixed with 4% formaldehyde in seawater, borax was added to avoid acidity. Each sample was labelled for identification using the station ID, sample no., date etc. and stored on board in transport containers.
Three samples were used for chemical analysis (metals and oil hydrocarbons) and grain size analysis. Chemical samples were taken from 0-1 cm of the samples surface, and the samples for grain size were taken from 0-5 cm. The last two grab samples were sieved through a 0.5 mm mesh sieve in a water bath and fixed with 4% formaldehyde in seawater and the pH stabilised with borax. These two samples were meant for analyzes by The University of Ghana, Legon students.

The sediment samples for hydrocarbons and grain size analyses were taken with a specially designed metal spatula, to avoid contamination the samples for metal analyses were collected with plastic spoons. The spoons were washed with seawater before sampling. The samples for chemical analysis were packed in pre labelled Rilsan plastic bags and immediately frozen to prevent evaporation of

labile compounds. The samples were kept frozen for further analysis in the onshore laboratory. Samples for TOM and grain size analyses were taken from the upper 0-5 cm layer of the sediment and put in separate plastic bags, labelled and immediately frozen.

The samples for Chemical analysis were transported directly to the laboratory of the Environmental Protection Agency and stored in their fridge. The chemical samples for analyses in Norway, were later shipped frozen to Norway by air freight. The biological samples were transported from Tema Port to the IMR storage in Bergen, Norway and later transported to the University of Lodz in Poland. The chemical samples were later transported to Eurofins Norway, Environmental Laboratory AS.

Deviations:

Samples from one station GE3/5 was lost when the canoe overturned in the surf going to shore.
Due to relatively long storage some of the specimens were in poor condition and therefore difficult to identify. (e.g. Brachyura, part of the polychaetes).

Benthic material adapted to the temperatures in deep sea habitats, are more subjected to decay in surface temperature, than the ones living in shallow and thereby warmer habitats closer to thesurface temperature. For future sampling at deep stations immediate cooling/preservation, and/or other techniques to avoid degradation, has now been implemented.
In 2012 an upgrade was made to address this problem by installing a small RSW plant onboard the Nansen providing 5-10^{o}C seawater to wash the samples.

2.2.3 Seabed mapping with multibeam echosounder

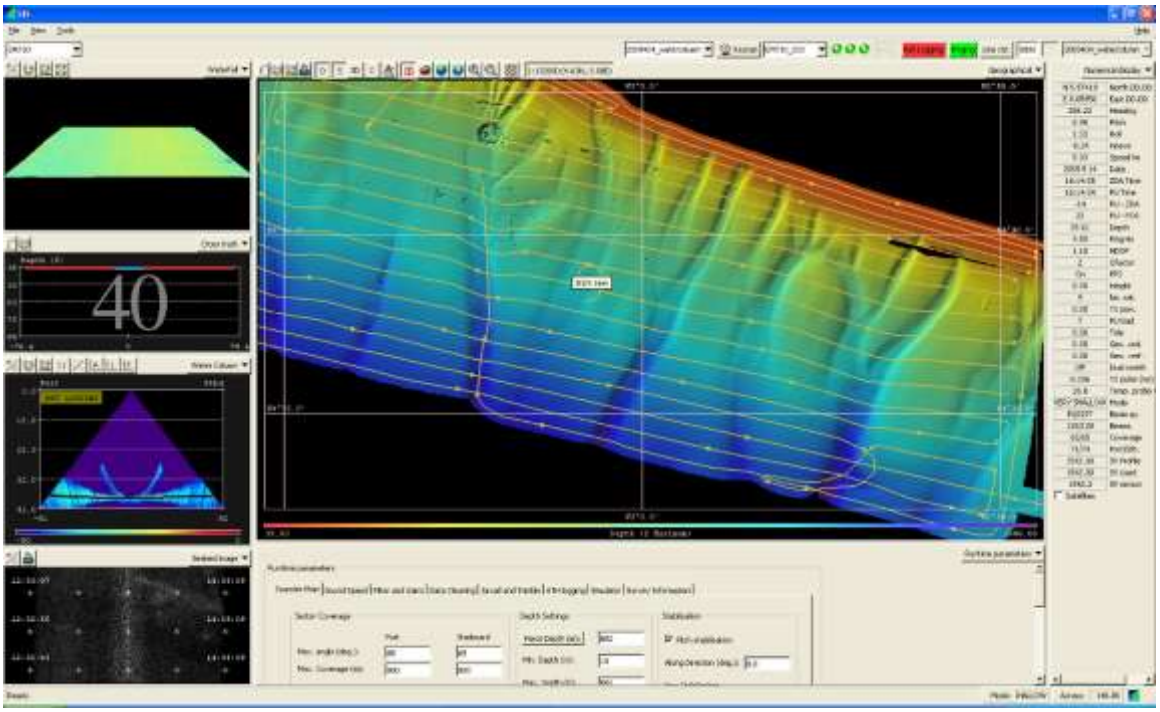
Location: Eastern coast of Ghana
Vessel: R/V Dr. Fridtjof Nansen
Period: May 2011

MULTIBEAM SURVEY
The multibeam survey covered an area of 800 km^2 between the border of the Ivory Coast and 20 nautical miles eastward, depth from 100 m to 1500 m. During the survey, local scientists were trained in the sampling methodology and equipment operation.

The survey was executed using the Kongsberg Maritime EM710 multibeam echosounder with positioning and motion data from Seapath 200. The positioning system used was Fugro SeaStar. Seabed Information System (SIS) software was used for online logging and echosounder control. Post-processing of data was performed using Neptune, which was also used for the calibration of the EM710.

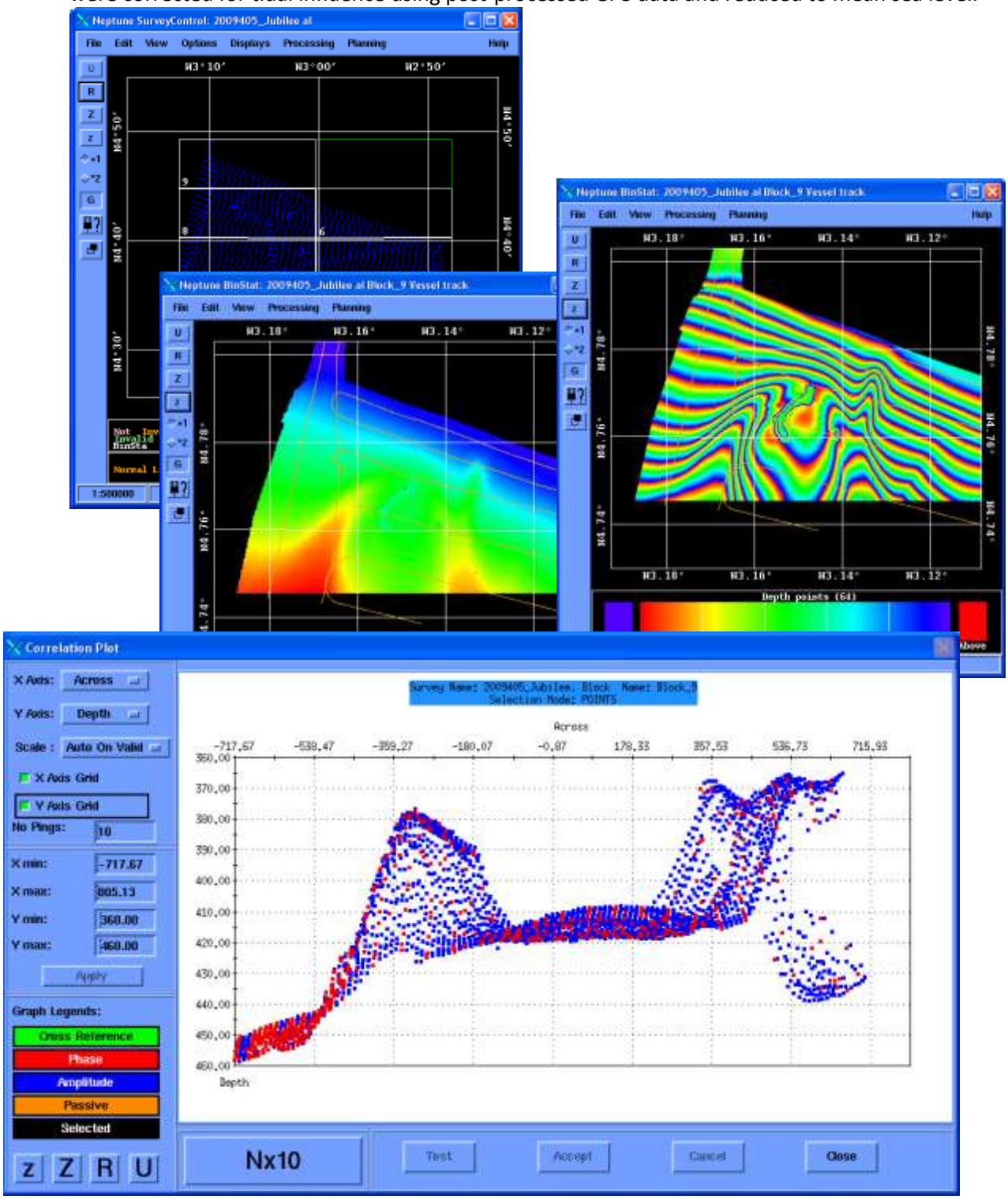
Seabed Information System (SIS)

SIS is used for the online operation of Kongsberg Maritime multibeam echosounder systems. The application was used by the operator to control all settings and logging during the survey.



NEPTUNE – Post Processing

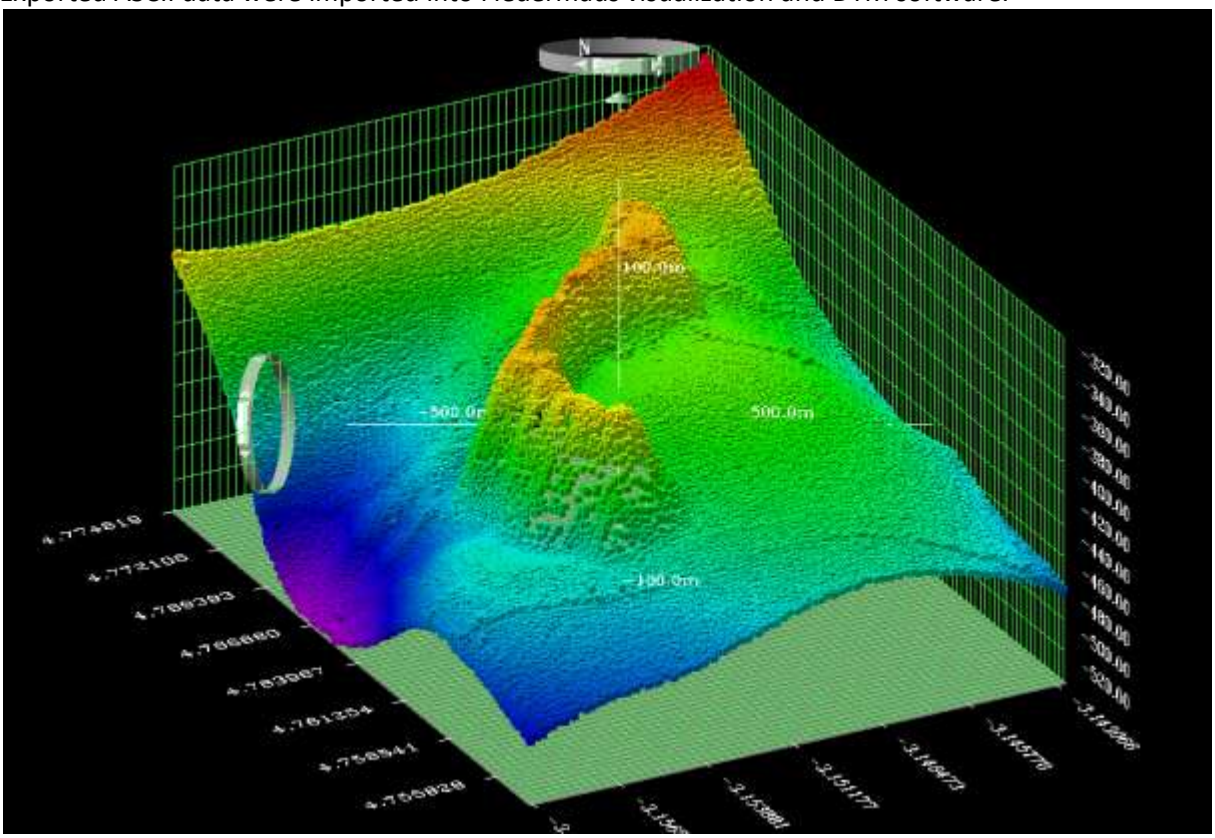
Prepared raw data from SIS were processed using Neptune post-processing software. All depths were corrected for tidal influence using post-processed GPS data and reduced to mean sea level.



Screenshots from Neptune Post-processing software

After tide correction, spurious soundings were removed/flagged invalid using the BinStat module.

Cleaned accepted data were exported to ASCII files as formatted as latitude, longitude and depth. In addition, mean depths were exported for each processing cell (30x30m).
The surveyed area is 780km2 containing approx. 14 million soundings ranging from 104m to 1474m.
Fledermaus – Visualization.
Exported ASCII data were imported into Fledermaus visualization and DTM software.



DATA DELIVERABLE
Exported data were stored on DVD.

2.2.4 Colour, grain size and Total Organic Matter (TOM)

The colour of the sediment was determined using a revised Munsell® Soil Colour Chart System year 2000 (GretagMacbeth, New Windsor, NY, USA). A mixture consisting of sediment from the upper 0-5 cm of three separate grab samples was used for the grain size analysis at each sampling site.

The particle size was analysed in the laboratory by dissolving the sediment in water and then sieving it through a 0,063 mm sieve. Particles larger than 0,063 mm, was then dry sieved trough Endecott sieves. The sieves had square holes with mesh sizes found in table 2.2. The analysis was performed at SAM.

The median diameter and sorting (Table 2.2) were calculated with the formulas below (Buchanan (1984) and Folk & Ward (1957)), and the program GradiStat version 4.01 (Blott & Pye 2001).

Particle diameter: x = Φ-value ($\Phi=-\log_2 x$)

Median particle diameter: Md Φ = Φ50.

Mean diameter $M_z = \frac{\Phi(16) + \Phi(50) + \Phi(84)}{3}$

Sorting: SD $\Phi = \frac{\Phi(84) - \Phi(16)}{4} + \frac{\Phi(95) - \Phi(5)}{6{,}6}$

Table 2.2. The mesh sizes of the sieves used for grain size analysis.

Size of the sieve (mm)	Phi class Φ	Description
16	-4	Gravel
16-8	-3	Gravel
8-4	-2	Gravel
4-2	-1	Gravel
2-1	0	Sand
1-0,5	1	Sand
0,5-0,25	2	Sand
0,25-0,0125	3	Sand
0,0125-0,063	4	Sand
< 0,063		Pelite

TOM
The total organic matter (TOM) was determined as the weight loss in a 2-3 gram dried sample (dried at 105° C for about 20 hours) after 2 hours of combustion at 480° C.

2.2.5 Chemical Compound Analysis

2.2.5.1 Oil Hydrocarbons Analysis

- Principle
The petroleum hydrocarbon content was determined by GC/FID analysis of the extracts obtained as outlined in Intergovernmental Oceanographic Commission, Manuals & Guides no 11, UNESCO (1982).

The petroleum hydrocarbons were isolated from the sediment sample by saponification with methanolic potassium hydroxide for two hours, followed by extraction with pentane. The pentane phase is reduced using a Rotavapor and is subsequently purified by solid phase extraction. The petroleum hydrocarbon components were eluted (extracted) from the solid phase column with pentane followed by dichloromethane. The extract was reduced using a heating jacket and analyzed using Gas Chromatography with Flame Ionisation Detection (GC/FID). The analyses of PAHs and Decalines were performed by Gas Chromatography with Mass Selective Detection operating in the Single Ion Monitoring mode (GC/MS SIM).

- Procedure
The sediment sample was homogenized by stirring and subsequently centrifuged at 2300 rpm for 5 minutes to remove excess water. The amount of dry matter in the centrifuged sample was determined by the differencial weight of a small part (about 10 g) of the sample before and after drying at 105°C for 16 hours.

- Soxtec extraction
The saponification was carried out using a Soxtec System equipped with glass cups and cellulose thimbles at 150°C. In order to reduce the background level of hydrocarbons in the blank samples, the empty cellulose thimbles were boiled for 1 hour in methanol prior to its use.

About 20 g of the sample was placed in the cellulose thimble and boiled for 1 hour (in the “boiling position” in 50 mL of a solution of potassium hydroxide in methanol (30 g/L). Before boiling, 1.0 mL of a mixture of internal standards is added to the extraction cups. The thimble was lifted to the “rinsing position” for 1 hour while the refluxing methanol extracted hydrocarbons from the sample. For every 20 samples, reference samples of HDF 200 (base oil in drilling fluid; for THC, olefins and decalines) and HS-4B (Harbour Marine Sediment Reference Material; for PAH and NPD) are extracted, purified and analysed according to this method for monitoring the accuracy of the method.

- Pentane extraction
The methanol extract was collected in a Duran bottle. After cooling, 25 mL of pentane was added and the bottle shaken for 10 minutes. The pentane phase was separated from the methanol phase and collected in a conical flask. Another 25 mL of pentane was added to the methanol, shaken, separated and added to the first pentane phase. The pentane was reduced to 1 mL using a Rotavapor with a water bath at 30°C.

- Solid phase clean up
The final clean up was carried out using 200 mg florisil solid phase columns. The columns were conditioned prior to use. The sample was then added to the column which was eluted with 2x2 mL pentane and 2 mL dichloromethane. The elute was reduced to dryness using a heating jacket at 40°C. The residue was redissolved in 1 mL of dichloromethane and analyzed by GC/FID (THC) and GC/MS-SIM (PAH, NPD).

Quantification of components

- THC

The content of THC was quantified in the nC_{12}-nC_{35} boiling point range by using external and internal standards. The external standard was a solution of n-alkanes in dichloromethane (5 mg/L of each component; Restek # 57257). This external standard was also used to establish the retention time window. The internal standards (bromobenzene, *o*-terphenyl and squalane; all 5 mg/L) were added to the sample before boiling as well as to the external standard. The average THC value from blank samples was subtracted before the final quantification of the THC content of the sample. A chromatogram illustrate the presence of specific compounds within the samples (Figure 2.1) while the analytical conditions of the GC/FID system are presented in Table 2.3.

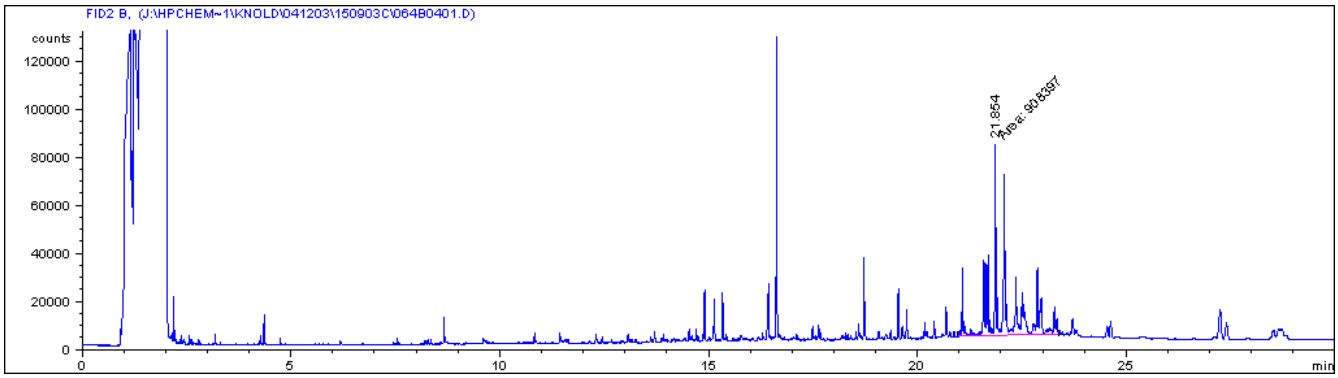


Figure 2.2. Chromatogram showing the subtracted phytosterol fraction of sediment sample.

Table 2.3. GC/FID conditions

GC system	Hewlett-Packard 5890 Series II Gas Chromatograph with split/splitless injector, Flame Ionisation Detector
Column	Agilent DB-5, length: 25 m, ID: 0,2 mm, film: 0,33 µm
Injector temperature	290°C
Detector temperature	300°C
Temperature program	35°C (3 min) - 15°C/min - 315°C (9,5 min)
Carrier gas	H_2, 1,4 mL/min
Injection	1 µL, splitless

- PAH and NPD

The PAHs/NPDs analysis was performed by GC/MS operating in the SIM (single ion monitoring) mode. The analytical conditions of the GC/MS system are shown in Table 2.4.

Table 2.4. GC/MS conditions

GC system	Agilent Technologies 6890N Network GC System
MS	Agilent 5973 Network Mass Selective Detector
Column	Agilent DB-5ms, length: 30 m, ID: 0,25 mm, film: 0,25 μm
Injector temperature	300°C
Temperature program	60°C (2 min) - 12°C/min - 300°C (8 min)
Carrier gas	He, 1,0 mL/min
Injection	1 μL, splitless, purge flow: 40 mL/min in 1 min

The amounts of PAHs and NPDs were quantified using internal deuterium marked standards and calibration curves made from 3 levels of standards containing the 16 EPA PAHs and selected NPDs (Table 2.5). The internal standards were added to the sample before boiling as well as to the external standard. The 16 standard EPA PAHs were obtained in PAH cocktail ampoules from Ehrensdorfer (20952500 PAH Mix 25) and Chemservice (PP-HC6JM). A NPD cocktail containing 1 compound representing each of the NPD clusters was obtained from Chiron (NPD Cocktail 3, S-4046). The NPD compounds in the cocktail were: Dibenzothiophene, 4-methyldibenzothiophene, 2,8-dimethyldibenzothiophene, 2,4,7-trimethyldibenzothiophene, naphthalene, 2-methylnaphthalene, 2,3-dimethylnaphthalene, 2,3,6-trimethylnaphtalene, phenanthrene, 2-methylphenanthrene, 1,6-dimethylphenanthrene and 1,2,8-trimethylphenanthrene. Table 2.3.3 shows target ion, qualifier ion, and the corresponding internal standard for each PAH compound and NPD cluster. Before the final quantification was carried out, the corresponding average concentration of blank samples was subtracted.

Table 2.5 Analyzed PAH compounds and NPD clusters

Compound / cluster	Target ion m/z	Qualifier ion m/z	Corresponding internal standard
Naphthalene	128	102	Naphthalene-d8
C1-naphthalene	142	141	Naphthalene-d8
C2-naphthalene	156	141	Acenaphthylene-d10
Acenaphthylene	152	151	Acenaphthylene-d10
Acenaphthene	153	154	Acenaphthylene-d10
C3-naphthalene	170	155	Acenaphthylene-d10
Flourene	166	165	Acenaphthylene-d10
Dibenzothiophene	139	168	Acenaphthylene-d10
Phenanthrene	178	176	Phenanthrene-d10
Anthracene	178	176	Phenanthrene-d10
C1-dibenzothiophene	198	-	Phenanthrene-d10
C1-phenanthrene	192	191	Phenanthrene-d10
C2-dibenzothiophene	212	-	Phenanthrene-d10
C2-phenanthrene	206	191	Phenanthrene-d10
Fluoranthene	202	101	Fluoranthene-d10
C3-dibenzothiophene	226	-	Fluoranthene-d10
Pyrene	202	101	Pyrene-d10
C3-phenanthrene/antracene	220	-	Pyrene-d10
Benzanthracene	228	114	Pyrene-d10
Chrysene/triphenylene	228	114	Pyrene-d10
Benz[bjk]fluoranthenes	252	250	Benz[a]pyrene-d12
Benz[a]pyrene	252	250	Benz[a]pyrene-d12
Indeno(1,2,3-cd)pyrene	276	274	Benz[a]pyrene-d12
Dibenzo[a,h]anthracene	278	-	Benz[a]pyrene-d12
Benzo(ghi)perylene	276	274	Benzo(ghi)perylene-d12
Internal standards			
Naphthalene-d8	136		
Acenaphthylene-d10	160		
Phenanthrene-d10	188		
Fluoranthene-d10	212		
Pyrene-d10	212		
Benz[a]pyrene-d12	264		
Benzo(ghi)perylene-d12	288		

2.2.5.2 Pesticide analyses

Used for solid matrix, sediment

Basic principal:
The analysis of organochloropesticides (OCP) based on DIN EN ISO 10382

Procedure:
Solid samples were weighted at the state as received. Sediment samples were weighted freeze dried. One aliquot (10 g) of the sample is extracted with 40 ml of an n-hexane/acetone (1:1) mixture and an internal standard (PCB 155) for one hour by shaking. After this time water is added. The organic phase is separated from the water phase and dried. Depending on the amount of OCP, the extract has to be concentrated. Subsequently the analysis is done by GC ECD under following conditions:

Gas chromatograph:	HP 5890 II
Injector:	split/split less
Detector:	ECD
Column:	ZMR 1 (30 m x 0,25 mm x 0,25 µm)
Carrier gas:	Nitrogen

Evaluation:
The internal Standard is quantified by peak area. The result are given in mg/kg with an LOQ of 0,01.

2.2.5.3 Metal Analysis

Principle
The metal content is determined by Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP-AES) except mercury which was determined by Cold Vapour Atomic Emission Spectrometry (CVAAS) after drying, sieving and digestion.

Procedure
The sediment samples were dried at 105°C or 40°C for samples containing mercury. The sample was sieved through a 0.5 mm sieve and the fraction <0.5 mm was digested with nitric acid in accordance with NS4770.

Digestion by nitric acid
Digestion was performed in an autoclave. About 1g of sample was weighed into a sterile PP test tube with 4 mL of nitric acid. The samples were then autoclaved at 120°C for 30 min. After digestion, the samples were filtered and diluted to 50 mL.

Metal analysis by ICP-AES
The metals, except mercury, were analysed by a Varian Vista-PRO ICP-AES method. The analytical conditions are found in Table 2.6.

Table 2.6 ICP-AES analytical conditions

Element	Wavelength	Power (kW)	Background correction
Ba	233.527	1.35	Fitted
Cd	228.802	1.35	One point, left
Cr	267.716	1.35	Fitted
Cu	324.754	1.35	Fitted
Pb	220.353	1.35	Fitted
Zn	213.857	1.35	Fitted

Mercury Analysis by CVAAS
Mercury was analyzed using the mercury analyser instrument, Cetac M6000-A. The mercury in the solution was reduced by $SnCl_2$ to its elementary form Hg^0. Elementary mercury is volatile and was separated from the solution in a gas liquid separator by an argon carrier gas. The absorption at 254 nm was measured to determine the concentration of mercury.

Reference materials
CRM015-050 metals on sediment and CRM031-040 metals on soil (Resource Technology Corporation) was use as a reference.

2.2.6 Biological Analyses

Prior to sorting and species identification, each sample was washed through a 0,5 mm sieve to remove formalin. Specimens were then sorted out under a dissecting microscope, split into taxonomic groups and fixed on small tubes containing ethanol. The specimens were then identified and enumerated before being returned to the fixation fluid.
.
A complete species list is presented in the appendix. Only the bottom fauna (benthos) was used for further analyses which included:
Total number of species
Total number of specimens standardised to 0.5 m² of sea floor
The ten most abundant species at each site (species name, number of specimens and percent of total number of specimens)
Species diversity as "Shannon Wiener index" on a $\log_2$ base (Shannon & Weaver 1963)
Evenness as Pielous's "J" (Pielou 1966)
Cluster analysis based on "Bray-Curtis dissimilarity index" (Bray & Curtis 1957), followed by "group average sorting" on 4^{th} root transformed data
Ordination by "multidimensional scaling"

All data was analysed using the data program PRIMER, from Plymouth Marine Laboratory in England.

- Univariate analyses:
The mathematical bases for the diversity indices are outlined by (Shannon & Weaver 1949)

Evenness is an estimate of how the individuals are distributed among the species. It varies between 0 and 1, with a value close to 0 if all individuals belong to one or a couple of species and a value closer to 1 if all the individuals are equally distributed between the species.

The species-area curve is produced by the program EstimateS from The University of ticut. (For more information about the method see Colwell & al 2004).

- Log-normal curve
An indication of the environmental condition is gained by using geometrical classes. Geometrical classes are the relations between the species and the number of individuals. For example, species which are represented by one individual, 2-3 individuals, 4-7 individuals among others are defined as geometrical class I, class II, and class III respectively. Geometrical classes are plotted against number of species for each station. Good environmental conditions are indicated by the presence of many species with few individuals and few species with many individuals. Impoverished environmental conditions are indicated by the presence of only a few species with very many individuals. For further information, see Gray & Mirza (1979) and Pearson & al. 1983.

- Multivariate analyses
Multivariate analyses were done to compare the actual species composition at the sites. Two different types of multivariate analyses where executed, a classification (cluster analysis) and an ordination (non-metric multidimensional scaling). The species abundance data were double square root transformed prior to analysis to reduce the effect of the most abundant species and to include more of the rare species. The calculation was done using the program PRIMER from Plymouth Marine Laboratory in England.

- Cluster analysisThe cluster analysis is a hierarchical agglomerative clustering of stations with the most similar species composition grouped together first at a high similarity level and then grouping the other stations at lower and lower similarity levels together, until all stations are grouped in a single cluster. The comparisons of the fauna at each station were based on Bray-Curtis similarity index (BRAY & CURTIS, 1957), while the linking of the groups is based on group average sorting of the similarity indices.

- Ordination procedure (MDS)
The non-metric multidimensional scaling (MDS) groups the stations with the most similar fauna. This analysis presents the results such that the distance between the stations on the plot reflects the similarity in fauna. Thus the MDS can be used to support the cluster analysis results. More importantly the MDS reveals any existing continuum or gradient in the sampled fauna. The MDS analysis is based on the same similarity matrix as the cluster analysis and the calculation was done using the PRIMER program.

2.2.7 Linking biota to multivariate environmental patterns

The correlation between biological patterns and environmental variables (all combinations of the environmental variables: pelite; TOM; Cu; Ba; Zn; Cd; Cr; Pb and THC) was studies in the computer program Canoco (Braak and Smilauer 1997). Chemical variables were log(x+1) transformed prior to analysis. The statistical significance of each envirnmental variable was determined by using Monte Carlo Permutation Tests.

2.2.8 Quality Control

mical analysis in accordance with the criteria of Norwegian Accreditation unEurofins Analyse AS/Ltd is an accredited chemistry laboratory and performed the cheder accreditation- number Test043. Biological samples were sorted and identified by personnel from University of Lodz in Poland, who is not accreditated. in accordance with the criteria of the Norwegian. Analyses of grain size were preformed in Poland by Dr. Ewa Szymczak
From The Faculty of Oceanography and Geography at The
University of Gdańska
not performed accreditated. The species identification was done by the subcontractor University of Lodz, who is not accreditated. Biological and geological samples were also subject to quality control according to CDCFs internal routines. Any deviations from the sampling procedures were noted in the sampling journal.

2.2.9 Storage of samples

The biological samples were stored at The IMR in Bergen until shipment to the University of Lodz in Poland.

3. OCEANOGRAPHIC CONDITIONS

Hydrography and structure of the coastal current off Ghana in April 2011.

Method:

This report considers results obtained along the two hydrographic sections (Figure 1): Senya Beraku (Winneba) occupied on 21.04.2011 with the position of the inshore-most station: at lat: 05°17.77'N, lon: 00°31.72'W and Prampram occupied on 24.04.2011, the inshore stat. at lat: 05°40.82'N, lon: 00°11.59'E.

CTD data were collected with the Sea Bird 911 probe using a set of factory calibrated sensors installed in the beginning of 2011. A salinity validation against water bottles that was performed in the open waters of the Gulf of Guinea in May 2011 (two weeks after the reported here survey) indicated that the deviation between the sampled and electronically measured salinities was less than 0.01. This accuracy is sufficient to use the electronically measured salinity collected during the survey without additional corrections.

Underway current data were collected with the Ocean Surveyor 150 kHz ADCP by TRDI. The validation of this instrument using the ADCP data from the same May survey, applying the so-called water track calibration method (Joyce, 1982). The result revealed an angular offset of 0.7962 degree from the true heading in the recorded data(Figure 6). This correction was subsequently used during the data postprocessing.

To collected ADCP data, the ship crossed each section three times: twice at the steady transit speed of 10 knots and once with stops to occupy CTD stations. The total measurement time was about 24 hours per section. The multiple measurements yielded very similar results, suggesting the presence of a steady flow and a marginal impact of tidal cycle.

The following software were used to perform this analysis: Quick Cast database and Survey Mapper to manage, subset and visualize the CTD data, and xADCP for the ADCP postprocessing. The resulting sections were plotted with the Surfer ™ program.

The resulting currents use the coordinates rotated to follow the azimuth of the local bottom gradient, measured seawards from inshore. This azimuth was converted to the Cartesian angle required by the prostprocessing system according to this simple formula:

$A_{rot} = -1 \times (A_{azimuth} - 90°)$

The following values were adopted as A_{rot}

Section	Time	Angle
Senya Beraku	21.04	-65°
Prampram		-58°

The locations of the occupied sections is shown in Figure 1.

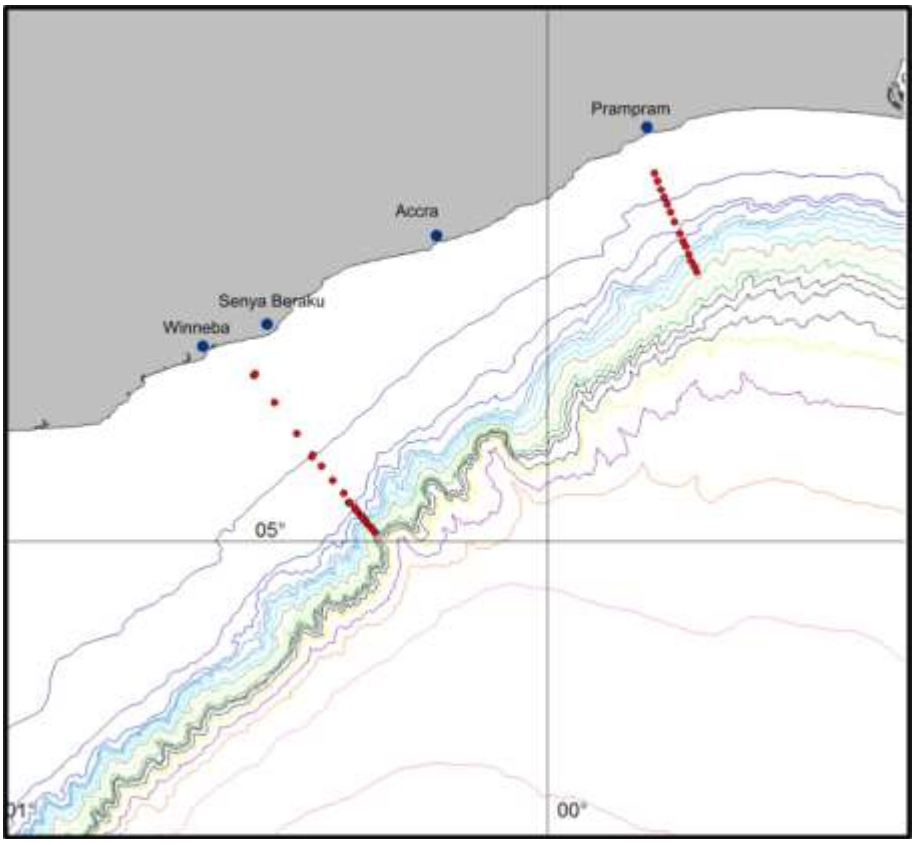


Figure 1 Location of the sections occupied with the Dr. Fridtjof Nansen in April 2011. The red dos denote positions of the CTD stations. The bathymetry contours at 50, 100 m; from 200 to 2000 m with step of 200 m and below the 200 m depth with step 500 m.

Results:

Hydrography

The April-June period is characterized by a development of a thermal stratification on the Ghanaian shelf (Wiafe et al. 2008). The conditions observed during the survey between April 21 and 25th clearly adhere this seasonal characteristics. Figure 2 depicts the distribution of temperature across the Senya Beraku

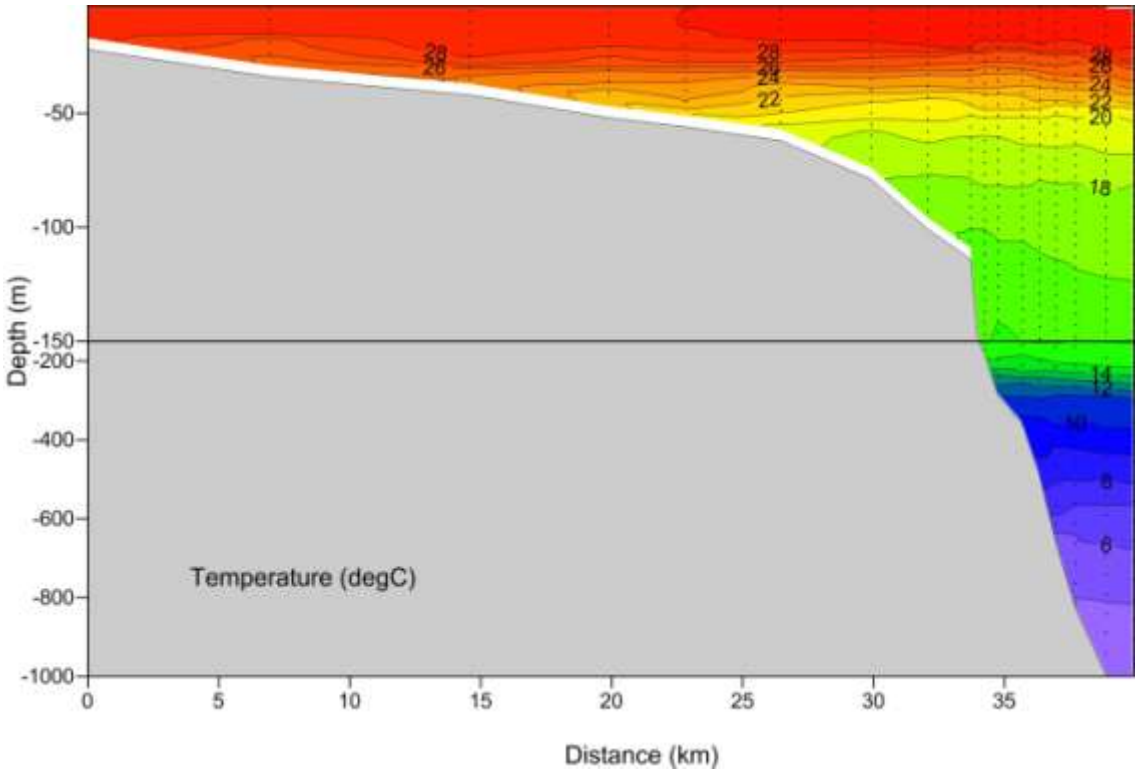


Figure 2: Temperature distribution across the Senya Beraku section, 21.04.2011. The depth scale enlarged in the top 150 m.

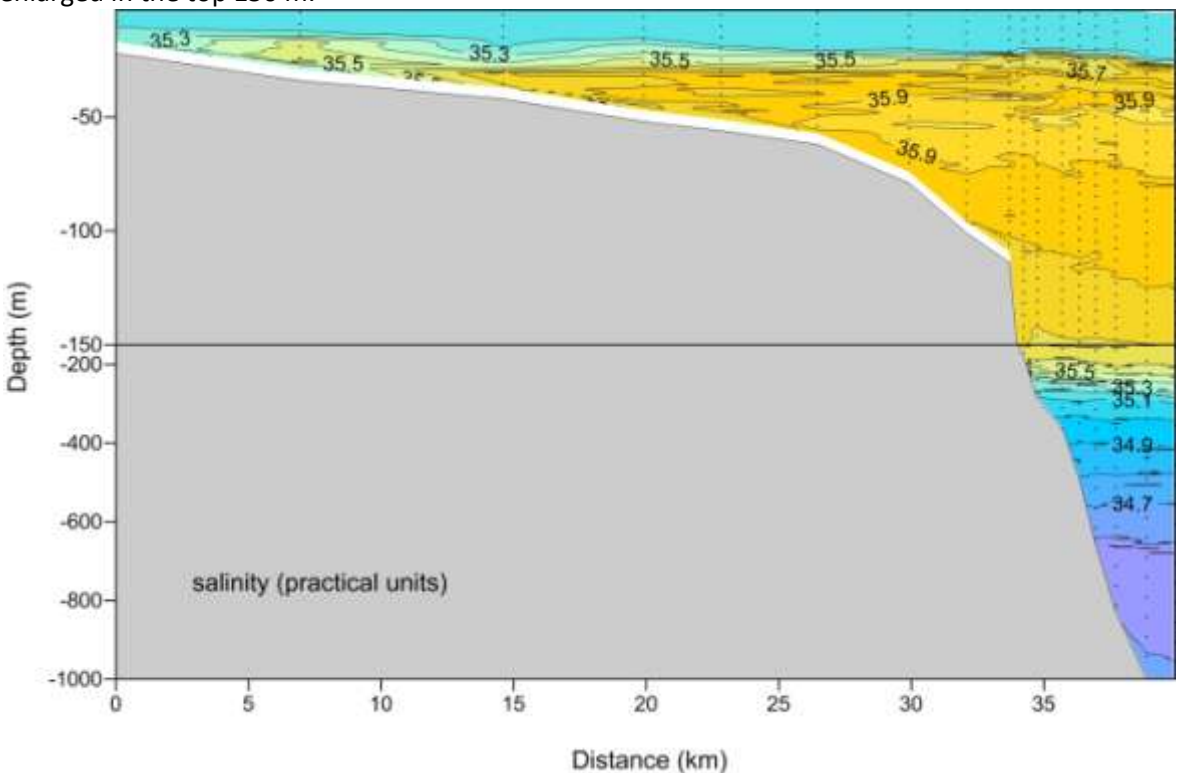


Figure 3: Salinity distribution across across the Senya Beraku section, 21.04.2011. The depth scale enlarged in the top 150 m.

section. The sloping down isotherms from offshore towards the mid-shelf manifest the downwelling condition. The 30-m thick layer of warm Tropical Surface Water (TSW) has the temperature above 28°C .

Between the 30 and 40m depth, the thermocline, which separates this layer from the cooler (T < 20°C) subsurface waters hits the seabed of the continental shelf. The inner part of this shelf, inshore of this contact zone (within the first 15 km from the coast) is effectively cut off from the source of subsurface oceanic water - the main source of nutrients over the shelf.

Figure 3 exhibits the downwelling condition in the salinity distribution (Figure 3b). The TSW layer displays a nearly constant salinity, off less than 35.4. The entire shelf is capped by this 30m thick layer of low salinity water. Underlying it is South Atlantic Central Water (SACW) with salinity greater than 35.8 and temperature less than 20°C. There si a salinity maximum > 35.9 in the depth range 70-120 m. This maximum is a benchmark of thesalinity distribution in Gulf Guinea region. It has an advective origin: originated in the Western tropical Atlantic and transported eastwards with the system of zonal currents. In the vicinity of the equator

Currents

The current observed at Sanya Beraku section on 21 April was mainly westwards, following the direction of the coastline (Figure 4). A limited eastward reversal of this current can be identified, located seawards of the shelf break, just below the thermocline (Figure 2) and above salinity maximum (Figure 3).

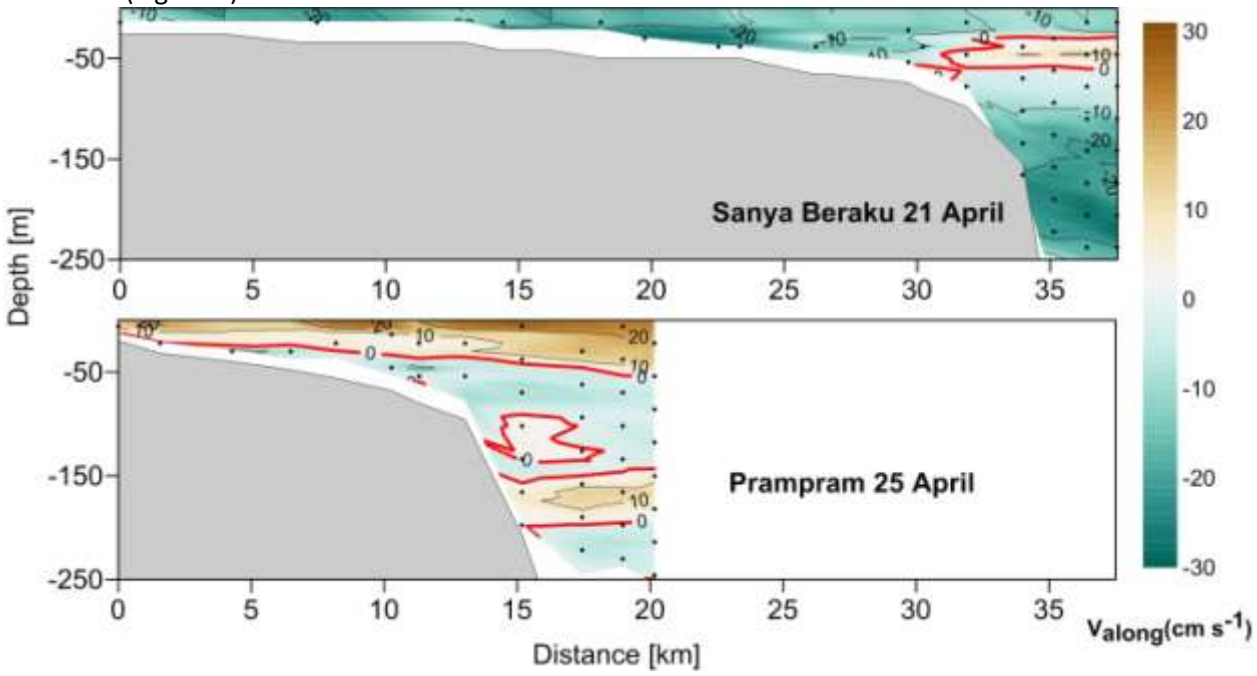


Figure 4 Distribution of alongshore component of the current at the Sanya Beraku (top) and Prampram sections

Observed four days later, on April 25 across the Prampram section, the current reversal develops strongly, affecting the entire Tropical Surface Water layer. The speed of this current exceeds 20 cm s^{-1} towards east, which is opposite to the current observed off Sanya Beraku just four days earlier.

The Sanya Beraku and Prampram sections are separated by a distance of about 80 km. Both are located along a relatively uniform stretch of the continental shelf with a regular bottom topography (Figure 1). It is therefore unlikely that the observed differences in the flow patterns aroused because of the spatial separation. Rather, these appear to suggest to a sudden synoptic change synoptic.

The nature of these presumably synoptic-scale fluctuations of the current is not yet understood. The coastal wind was low through the survey period, thus an unlikely contributor to the change in the current direction. The upwelling and downwelling seasons off Ghana are known to be controlled by coastally trapped waves forced at the equator and propagating westward along the Ghana coast through an oceanic teleconnection. From the simplified theory of those waves, the westward current is associated with the depression of the thermocline and downwelling along the coast while the eastward current signals the rise of the thermocline and upwelling along the coast.

It requires a further investigation to determine the process that lead to the sudden change in flow the current observed between April 21 and 25 off the Ghana coast.

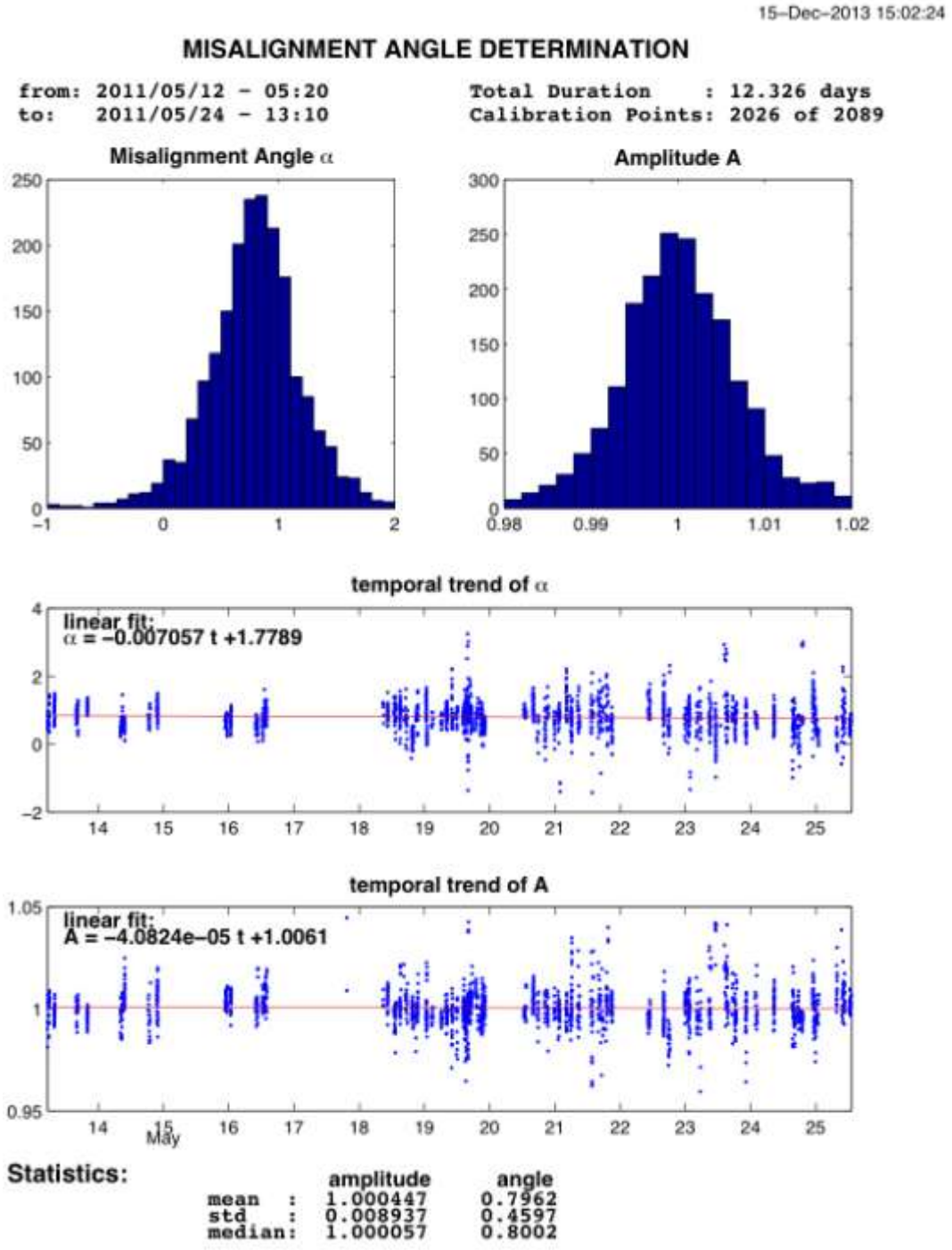


Figure 5 The result of ADCP misalign angle analysis adopted for this survey. The software courtesy Marcus Dengler, GEOMAR Kiel

3.1 Vertical Sections

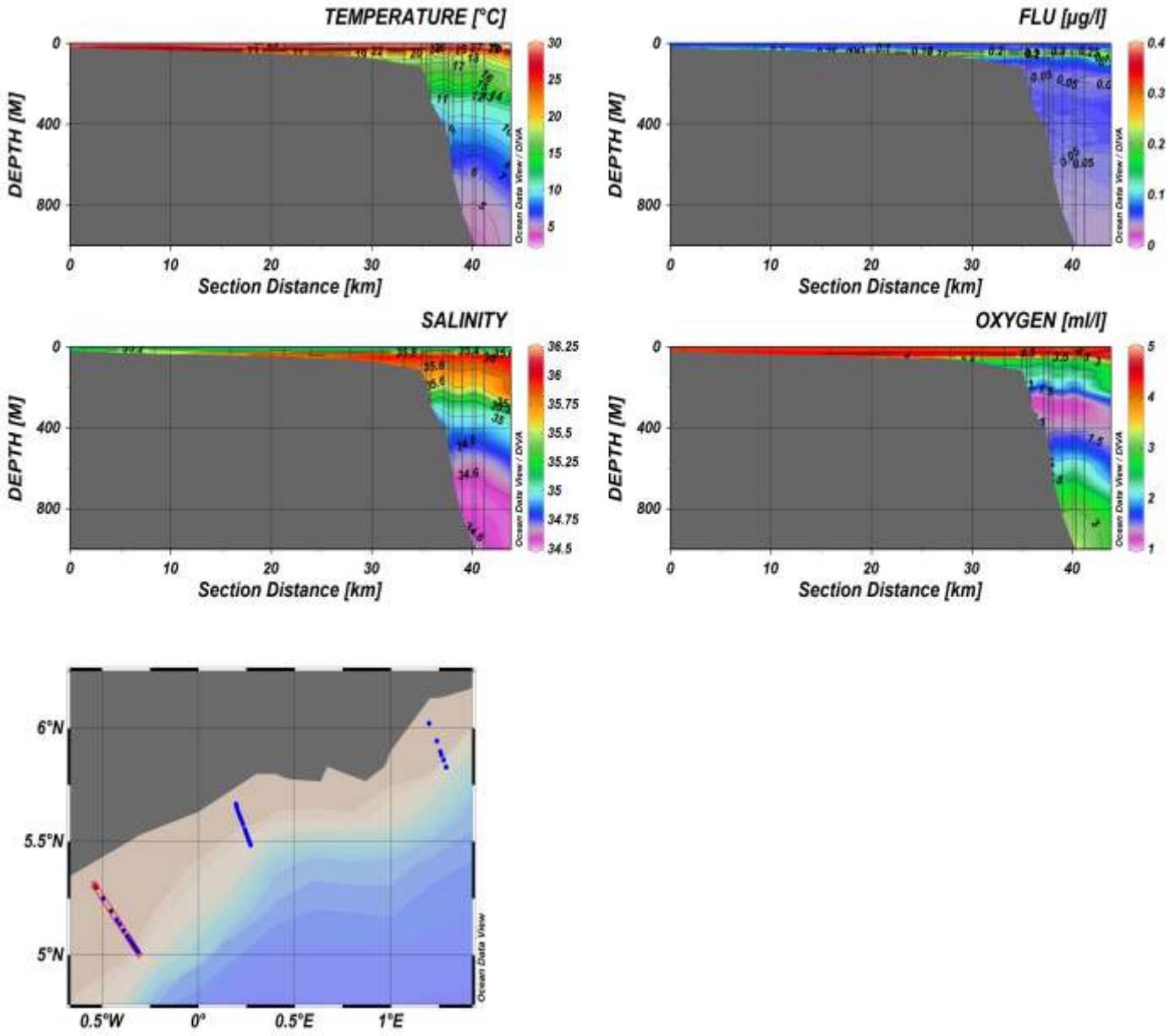


Figure 3.1.1 CTD Sections showing distributions of temperature,salinity, oxygen and fluorescence as a measure of chlorophyll A along transect GE1.

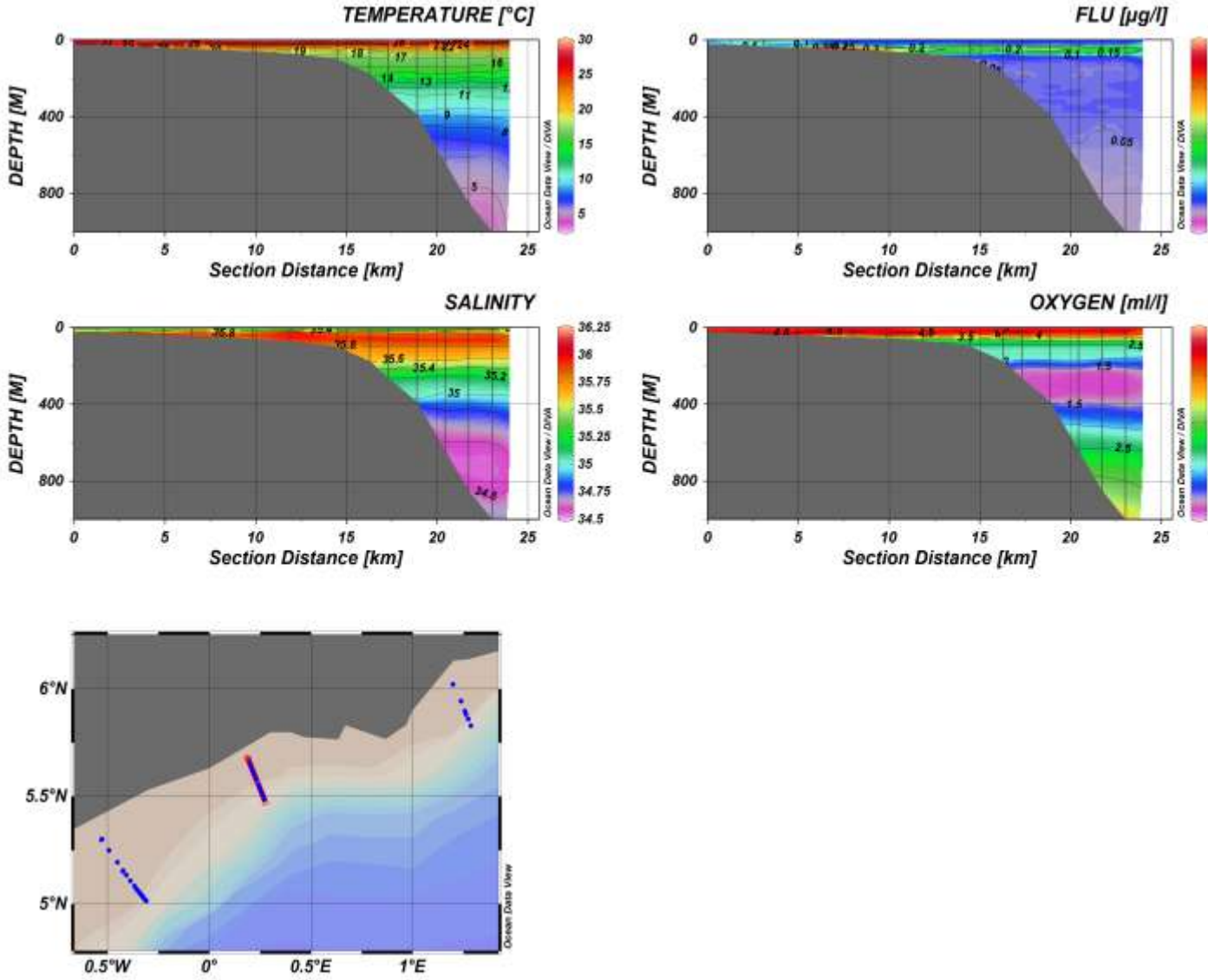


Figure 3.1.2 CTD Sections showing distributions of temperature,salinity, oxygen and fluorescence as a measure of chlorophyll A along transect GE2.

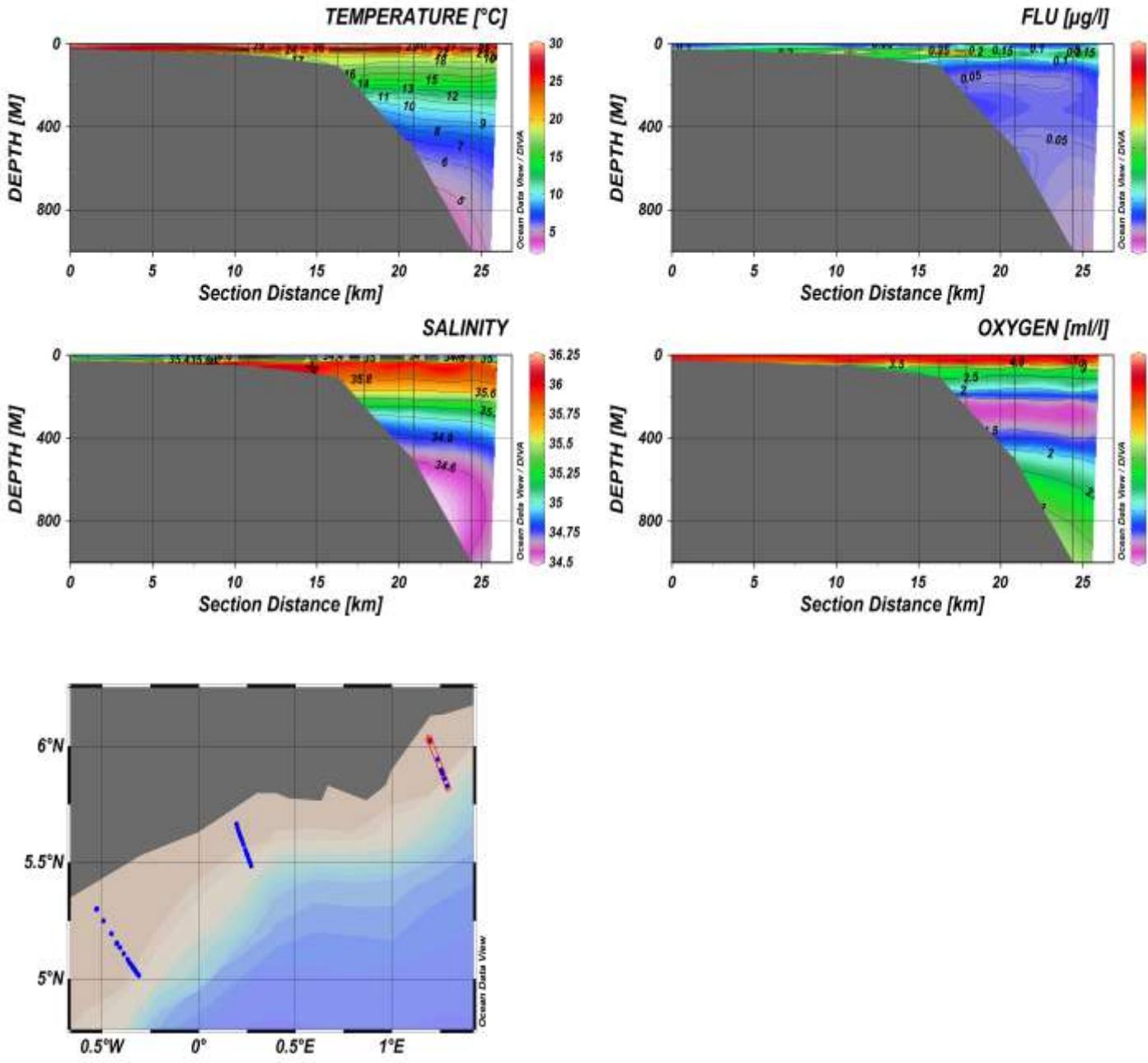


Figure 3.1.3 CTD Sections showing distributions of temperature,salinity, oxygen and fluorescence as a measure of chlorophyll A along transect GE3.

Ctd sections.

4. SEABED MAPPING

Raw data from the multibeam ecco sounder was collected from all the transects covered in the cruise period. The data has been passed on along with the rest of the raw data for processing.

5. SEDIMENT SAMPLING

The shoreline consisted of sand and shellsand from relatively fine sand in the western transects to coarser sand in Denu.
The 5 meter samples was made up of fine sand silt and some clay.
In the range between 25 and 100 meter
The deeper part of the three transects, going from 250 meters and deeper was dominated by fine sediments (pelite). Except for station GE/254, that consists mainly of medium and fine sand. The shallower areas contained sand, pelite and some gravel.
Table 5.1.1 shows the sampled stations inkl. a brief sediment description.
The content of total organic matter (TOM) correspond to the content of pelite, with higher TOM content in the deepest part compared to the more shallow part of the investigated area.
Sediment characteristics, Total organic matter (TOM), amount (%) of gravel, sand, pelite, median (Φ) and sorting in the sediment are presented in Table 5.1.2

Table 5.1.1 Sampling stations and sediment composition.

Grab station	Longitude WGS84	Lattitude WGS84	Depth (m)	Sediment description
GE1/0	0,5802	5,3481	0	Light grey sand
GE1/5			5	Dark grey clay and sand
GE1/22	-0,5214	5,3048	22	Sand and shell sand
GE1/53	-0,4254	5,1522	53	Dark grey sand
GE1/101	-0,3589	5,0691	101	Olive grey sand and silt
GE1/249	-0,3428	5,0530	249	Grey fine sand and shellsand
GE1/515	-0,3397	5.0297	515	Grayish black fine sand and silt
GE1/991	-0,3177	5,0230	991	Dark gray clay
GE2/0	0,1658	5,7339	0	Pale brown sand/shellsand
GE2/5	0,1667	5,7400	5	Very dark greyish olive fine sand.
GE2/29	0,1964	5,6607	29	Brown fine sand with some corals
GE2/53	0,2170	5,6097	53	Olive grey sand and shellsand
GE2/101	0,2411	5,5570	101	Dark brown sand/silt with shell fragments
GE2/247	0,2497	5,5350	247	Dark greyish olive clay with shell fragments
GE2/503	0,2583	5,5145	503	Dark grey clay
GE2/1005	0.2706	5,4868	1005	Very dark olive grey clay
GE3/0	1,1621	6,0955	0	Light brown coarse sand
GE3/5			5	Dark olive grey fine sand and silt.
GE3/26	1,1980	6.0220	26	Olive grey sand and shell sand.
GE3/52	1,2359	5,9439	52	Dark greyish brown
GE3/105	1,2552	5,8974	105	Olive grey silt
GE3/254	1,2616	5,8833	254	Dark grey Sand/silt
GE3/510	1,2719	5,8608	510	Dark grey clay.
GE3/998	1,2844	5,8294	998	Dark gray soft clay

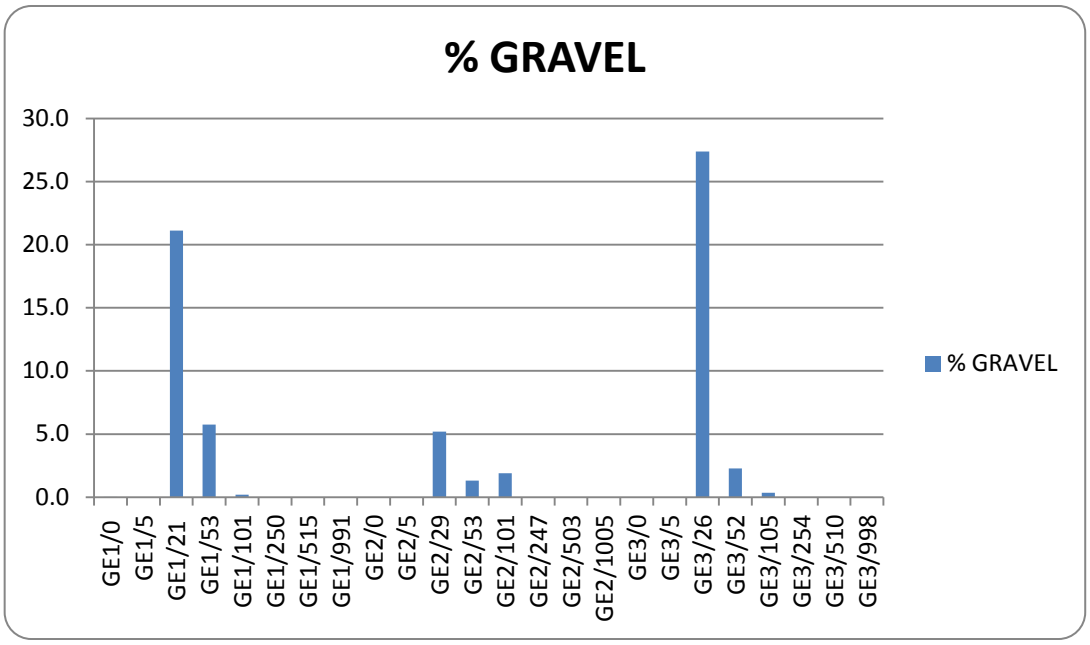
Table 5.1.2 Total organic matter and sediment grain size at sites along the three transects Ghana East GE1-3. The size of mud particles or pelite are < 0.063 mm.

St./ depth	% GRAVEL	% SAND	% MUD	% TOM	D50 (f):	MEAN	SORTING	SKEWNESS	KURTOSIS
GE1/0	0,0	100,0	0,0	1,0	2,327	2,233	0,586	-0,269	1,005
GE1/5				1,8					
GE1/21	21,1	78,2	0,7	2,3	0,406	0,210	1,414	-0,202	0,837
GE1/53	5,7	77,9	16,4	4,3	1,830	2,005	2,204	0,188	1,247
GE1/101	0,2	61,8	38,0	5,8	2,987	3,614	2,221	0,359	0,834
GE1/250	0,0	8,2	91,8	5,1	5,818	5,818	1,443	-0,076	0,870
GE1/515	0,0	6,0	94,0	9,1	5,871	5,871	1,354	-0,039	0,801
GE1/991	0,0	7,9	92,1	10,1	5,826	5,826	1,428	-0,070	0,857

St./depth	% GRAVEL	% SAND	% MUD	% TOM	D50 (f):	MEAN	SORTING	SKEWNESS	KURTOSIS
GE2/0				0,6					
GE2/5				1,0					
GE2/29	5,2	94,7	0,1	1,9	1,618	1,483	1,202	-0,250	1,219
GE2/53	1,3	88,2	10,5	2,8	2,392	2,432	1,541	0,142	1,405
GE2/101	1,9	90,3	7,8	6,3	1,793	1,895	1,646	0,165	1,246
GE2/247	0,0	5,3	94,7	9,4	5,886	5,886	1,301	-0,005	0,745
GE2/503	0,0	1,6	98,4	14,0	5,965	5,965	1,236	0,010	0,723
GE2/1005	0,0	1,9	98,1	11,9	5,960	5,960	1,240	0,009	0,724

St./Depth	% GRAVEL	% SAND	% MUD	% TOM	D50 (f):	MEAN	SORTING	SKEWNESS	KURTOSIS
GE3/0				0,4					
GE3/5				0,9					
GE3/26	27,4	71,9	0,7	1,7	0,606	0,504	1,822	-0,048	0,714
GE3/52	2,3	94,7	3,0	3,3	1,802	1,760	1,187	-0,063	1,177
GE3/105	0,4	96,7	2,9	6,5	1,883	1,968	0,992	0,113	1,081
GE3/254	0,0	96,7	3,3	8,6	1,768	1,942	1,029	0,225	1,048
GE3/510	0,0	4,6	95,4	17,7	5,902	5,902	1,284	0,002	0,735
GE3/998	0,0	4,2	95,8	9,1	5,910	5,910	1,278	0,003	0,734

sediment sample from the survey. (Photo T. Ensrud



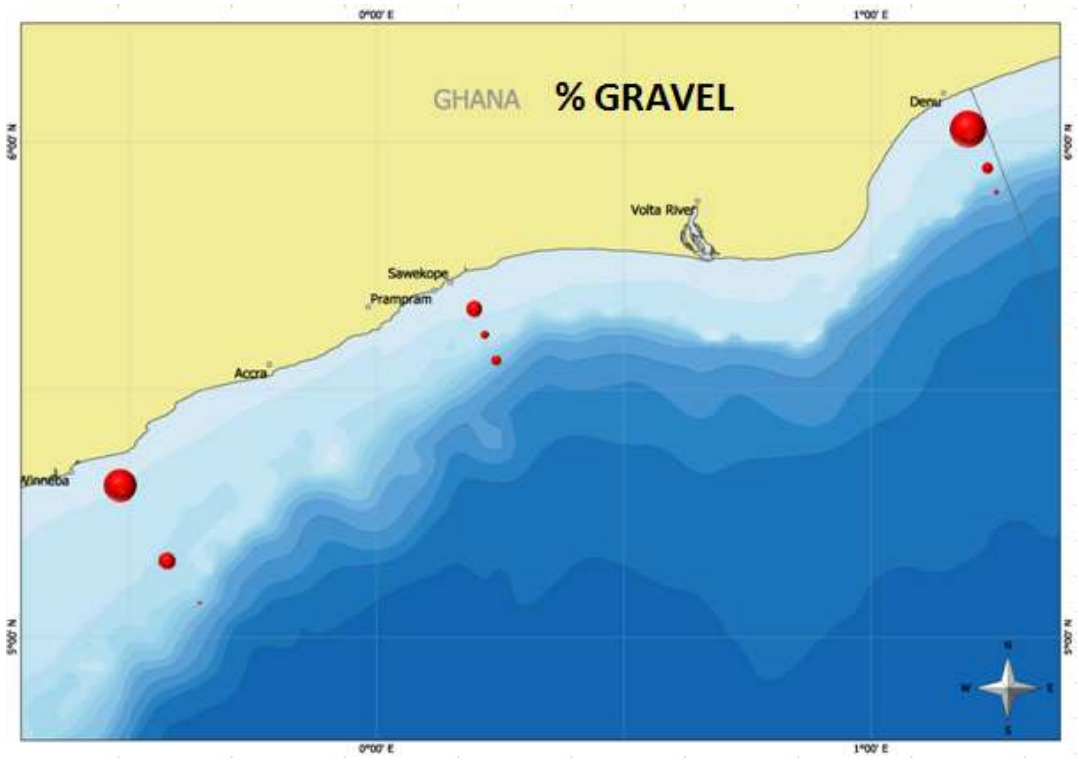


Figure 5.1-2 Content of gravel along the three transects of Ghana East (GE). The circled area in the map illustrates the relative amount of gravel at each station.

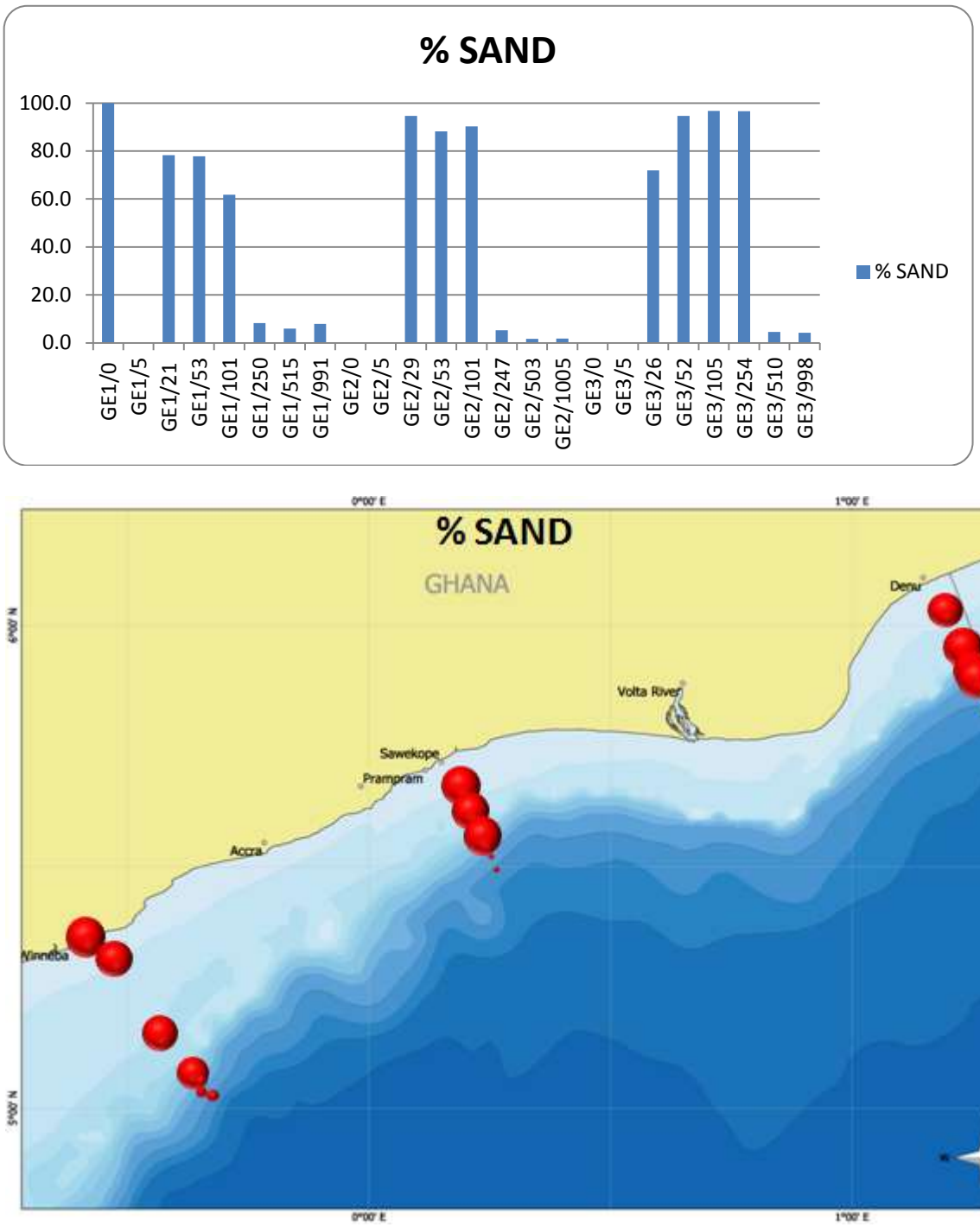
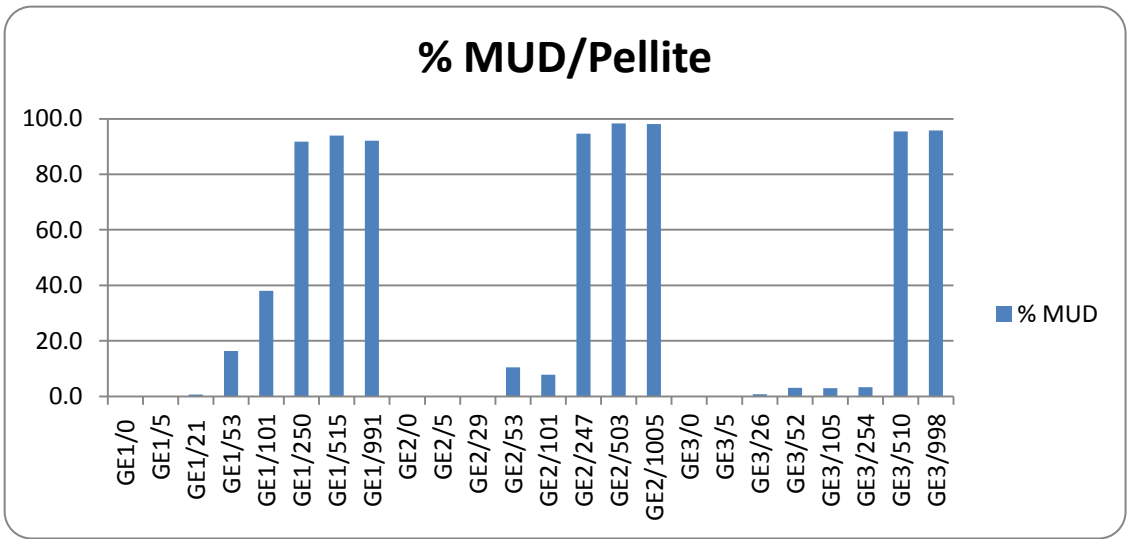


Figure 5.3-4 Content of sand along the three transects of Ghana East (GE). The circle area in the map illustrates the relative amount of sand at each station.



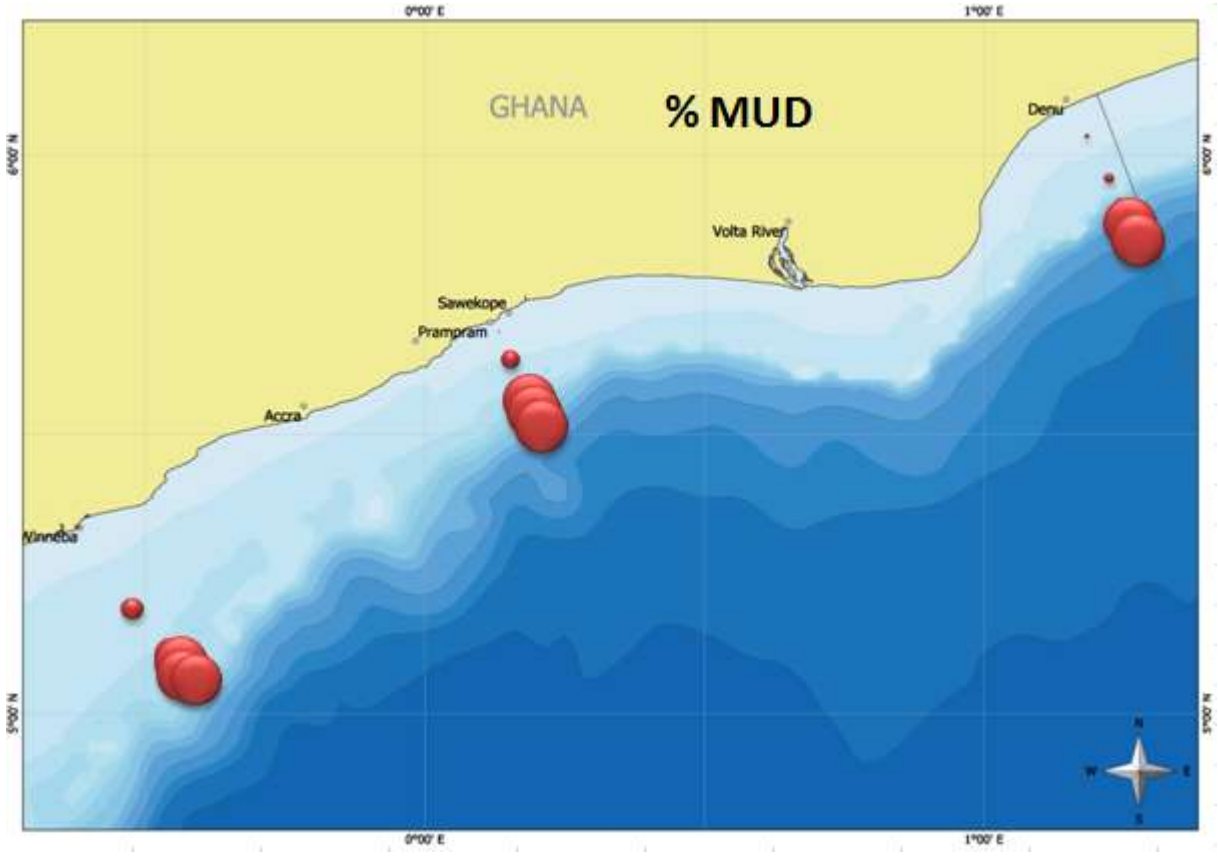
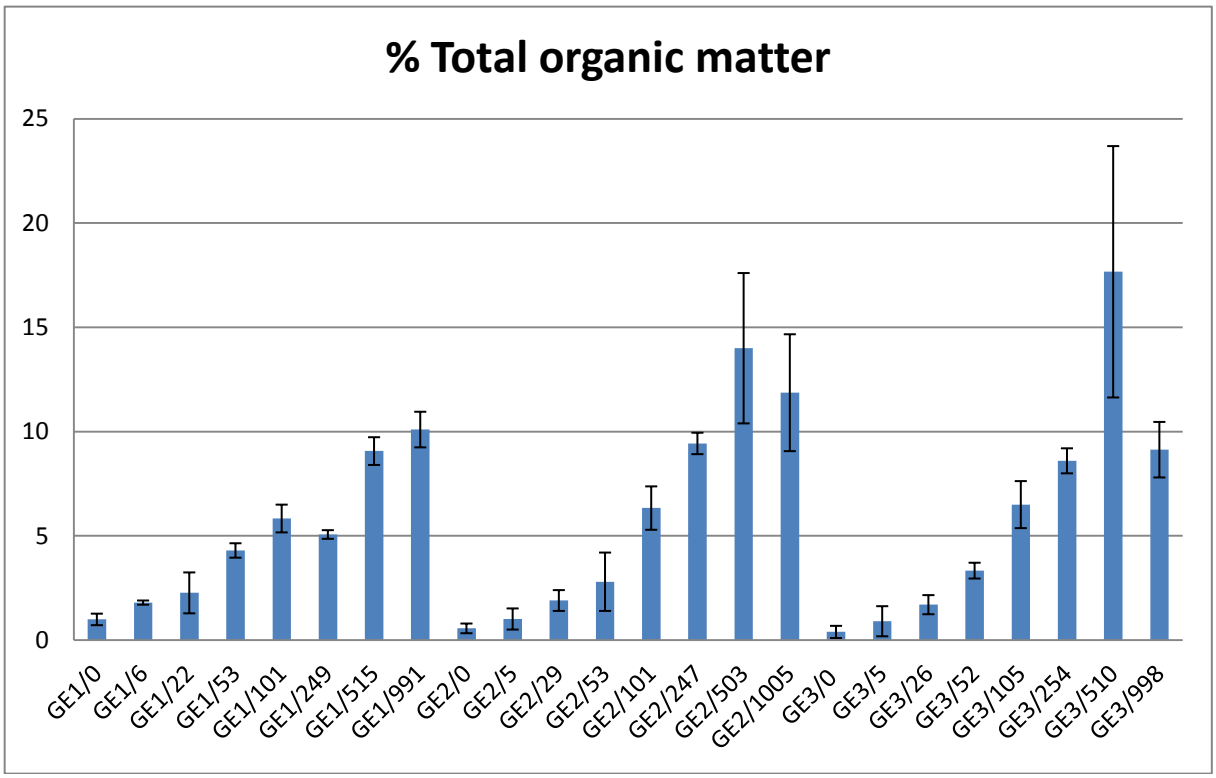


Figure 5.5-6 Content of pelite along the three transects of Ghana East (GE). The circle area in the map illustrates the relative amount of pelite at each station.


% Total organic matter
25
20
15
10
5
0
GE1/0
GE1/6
GE1/22
GE1/53
GE1/101
GE1/249
GE1/515
GE1/991
GE2/0
GE2/5
GE2/29
GE2/53
GE2/101
GE2/247
GE2/503
GE2/1005
GE3/0
GE3/5
GE3/26
GE3/52
GE3/105
GE3/254
GE3/510
GE3/998

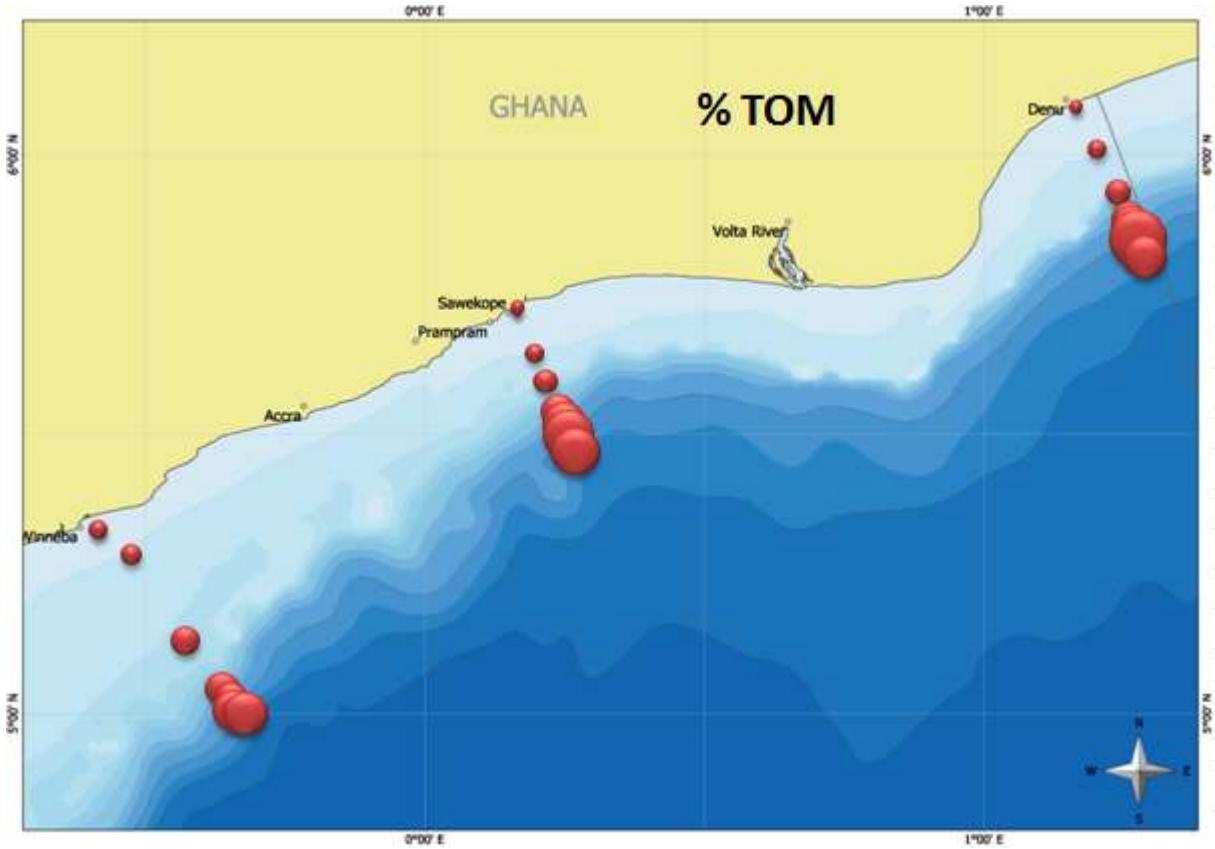

GHANA
% TOM
Volta River
Sawekope
Prampram
Accra
Ninneba
Denu
0°00' E
1°00' E
6°00' N
5°00' N

Figure 5.7-8 Content of total organic matter TOM along the three transects of Ghana East (GE). The circle area in the map illustrates the relative amount of pelite at each station.

5.2 Chemistry Ghana 2011

The sampling for chemical analysis was conducted according to the OSPAR guidelines for monitoring of offshore oil activities. The results of the analysis were then compared to the Background concentrations found in the OSPAR guidelines and KLIF's (The Directorate of climate and pollution, Norway) TA 2229-2007, Classification of metals and organic poisons in water and sediments. These two standards are developed for use in the North West Atlantic region based on measurements mainly from upon the shelf. The measurements are taken in what is regarded as prestine areas, and from sedment layers thought to be formed prior to industrialisation. Because of the depth gradient with gradually finer sediments, and from that higher affinity to chemical compounds and metals, espesically the metals are expected to show higher levels in deeper waters than upon the shelf (NGU Rapport 2011.035 TA-2683/2011). The general pattern of sedimentation also contrbutes to this.
The KLIF classification system is based on risk assesment regarding ecological effects. None of the measurements in the 2011 survey showed concentrations above the lower part of class II, defined as Good conditions, with no risk of ecological effects when compared to this standard.

Pecticides

In 2010 the following pesticides were analysed: Aldrin; alpha-endosulfane; alpha-HCH; beta-HCH; Dieldrin; gamma-HCH; Hexachlorobenzene; Hexachlorobutadien; Heptachlor; o,p-DDD; o,p-DDE; o,p-DDT; p,p-DDT; p,p-DDD; p,p-DDE and Pentachlorobenzene. Due to a high detection limit of 0.01 mg/kg, most results were below detection limit. The relatively high detection limits on these analysis and advise from our chemical consultant suggested against these analysis in the 2011 budget.

Metals

Table 5.2.1 and 5.2.2 summarises the results of metal analysis. The complete data set including replicates is given in the Appendix table. The sediment samples were analysed for the following heavy metals: arsene (As), cadmium (Cd), copper (Cu), barium (Ba), mercury (Hg), chromium (Cr), lead (Pb), Nickel (Ni) and zink (Zn) (figure. 5.2.1-5.2.18).

Table 5.2.1 Overview over results of the metal analysis compared to background concentrations (Bc).

Parameter	Arsen (As)		Barium (Ba)		Lead (Pb)		Copper (Cu)		Chromium (Cr)		Mercury (Hg)		Nickel (Ni)		Zink (Zn)		Cadmium (Cd)	
	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac	Bc	Bac
KLIF	<20				<30		<35		<70				<30		<150		<0,25	
OSPAR	<15	<25			<25	<38	<20	<27	<60	<81	<0,05	<0,07	<30	<36	<90	<122	<0,2	<0,31
Highest measurement	38		100		12		14		72		0,037		26		65		0,27	
Singles over Bc Klif/ospar	8/14				0/0		0/0		1/2		0/0		0/0		0/0		1/3	

All samples shows low values of the measured heavy metals including Arsene. The measured values were **well below** levels that are assumed to represents a risk of ecological effects.

A quick search in the Ghana Standards Authority did not give any results for metals in marine sediments. Because of this the values were compared to Ospar and Klif (Norwegian Pollution Authority) standards for xxx waters. The background levels for these natural occurring substances however might differ considerably from one area to another depending on geological conditions, and should as such be regarded as guidance levels rather than strict limits (NGU Rapport 2011.035 TA-2683/2011 p: 6). Arsene is often associated with sulphites and Arsene and Cadmium are associated with the type of rock called shales in Europe, an estimate of background levels for these parameters is therefore dependent on knowledge of geological conditions in this specific geological area including runoffs and possible anthropogenic sources.

The comparison to these standards might therefore not be relevant, nevertheless: With the exception of Arsene on four sampling sites, Chromium on one station and Cadmium on one station the concentrations of heavy metals were below what is regarded as background concentrations according to Ospar and Klif standards

Barium, Mercury, Copper, Nickel, Zink and to some extent Chromium and cadmium showed a trend of increasing concentration with depth.

The gradually finer grain size which is more common in the deep water areas is an important parameter to explain this. The literature states that finer sediments contain higher concentrations of metals and other pollutants than coarser sediments from the same sample. (NGU Rapport 2011.035 TA-2683/2011 p: 24). The most likely explanation for this is that the reduced particle size gives a higher suface ratio and therefore higher affinity to these metals as well as other chemical compounds. The grain size analysis is yet to be finished and the results will be included in the final report.

Until local background levels are established or brought to our attention Klifs approach to look for ecological effects of the substances in question might a be more relevant approach and should apply regardless of local conditions.

Mercury: All stations shows average values below the upper limit for background levels, and no single measurements were higher than what is regarded as background levels (Ospar 2005-06, North Atlantic).

None of the samples were collected close to any city centre, known sources of sour or runoffs from densely populated areas, fillings, mining areas or any other sources of pollution brought to our attention. It is therefore recommended to do analysis of bioaccumulation in stationary demersal fish and shellfish in selected areas with dense population and industrial activities for assessment of environmental poisons and food safety.

Table 5.2.2 Average concentrations and standard deviations from three parallel samples (mg/kg dry weight) of metal at eight depths of transects GE1, GE2 and GE3. Samples were collected in April and May 2011. The highest mean value for each parameter is highlighted and values above background concentrations (Bc) are marked red.

		Arsene (As)		Barium (Ba)		Lead (Pb)		Copper (Cu)		Cromium (Cr)	
Transect	Depth	Av	Std	Av	Std	Av	Std	Av	Std	Av	Std
GE1	0	9,867	1,848	1,9	0,2	4,233	1,097	3,1	0,755	9,667	2,021
	6	6,467	0,321	5,233	0,611	5,167	0,252	3,6	0,265	25,333	0,577
	22	24,667	2,309	3,267	0,666	2,667	0,153	0,833	0,201	18	0
	53	20,333	3,215	11	1	4,567	0,208	2,433	0,252	30,667	2,309
	101	5,567	1,012	11,667	0,577	3,8	0,346	3,5	0,1	32,667	1,528
	249	5,2	0,3	10,4	1,039	3,5	0,4	3,033	0,289	36	2,646
	515	4,8	0,458	38	3,464	5,567	0,416	7,733	0,635	34	3,464
	991	6,9	0,265	96,667	5,774	7,567	0,252	8,633	0,723	40,333	2,082
GE2	0	2,033	0,252	2	0,1	1,033	0,058	0,753	0,086	2,6	0,557
	5	4,7	0,5	31,333	18,771	3,667	1,002	1,14	0,277	12,667	1,155
	29	13,1	3,439	2,9	0,608	1,8	0,4	0,577	0,368	6,733	1,85
	53	9,667	0,493	8,833	0,351	5,2	0,173	2,033	0,208	25,667	1,528
	101	28,667	8,083	12,333	0,577	10,067	1,701	4,233	0,351	40	3,606
	247	5,6	0,458	19,333	0,577	7,333	0,351	8,433	0,451	40	1
	503	9,533	3,87	51	5,292	8,433	0,577	11,333	0,577	47	1
	1005	5,333	0,462	94,333	4,933	8,5	1,212	12,667	1,528	46,667	4,509
GE3	0	1,9	0,265	0,913	0,023	0,94	0,139	1,227	0,361	8,967	0,306
	5	7,833	0,208	3,767	0,321	2,467	0,153	0,8	0,079	11	0
	26	2,817	2,302	2,32	1,958	1,183	0,9	0,875	0,743	10,433	8,79
	52	6,733	1,563	14,333	2,887	5,633	1,361	5,6	1,127	33,333	6,429
	105	10,667	2,309	14,333	2,887	6,167	0,777	4,867	1,115	28,667	6,807
	254	18,333	3,055	17,667	1,528	9,767	0,252	6,833	0,751	65,667	6,028
	510	12,733	5,605	45	4,583	10,2	0,721	11,333	0,577	45,667	0,577
	998	8,5	0,458	78,667	4,726	10,667	1,155	12,667	1,155	44,667	2,887

Table 5.2.2 continued. Average concentrations and standard deviations from three parallel samples (mg/kg dry weight) of metal at eight depths of transects GE1, GE2 and GE3. Samples were collected in April and May 2011. Values in mg/kg dry weight. The highest mean value for each parameter is highlighted and values above background concentrations (Bc)are marked red.

		Mercury (Hg)		Nickel (Ni)		Zink (Zn)		Cadmium (Cd)	
Transect	Depth	Av	Std	Av	Std	Av	Std	Av	Std
GC1	0	0,001	0	1,833	0,416	15,667	3,786	0,005	0
	6	0,003	0,001	3,733	0,153	27,333	2,309	0,013	0,001
	22	0,004	0,001	1,8	0,1	13,7	5,645	0,065	0,048
	53	0,01	0,001	7,3	0,985	24	1	0,086	0,007
	101	0,013	0	11	0	34,333	1,528	0,075	0,004
	249	0,012	0,001	9,267	0,666	39,667	3,512	0,096	0,005
	515	0,021	0,001	17	1,732	37,333	3,786	0,112	0,017
	991	0,03	0,001	18,333	1,155	45,333	2,082	0,102	0,008
GC2	0	0,002	0	0,617	0,025	3,367	0,777	0,005	0
	5	0,004	0,002	2,533	0,153	22	1	0,009	0,003
	29	0,002	0,002	0,96	0,231	4,6	1,308	0,035	0,007
	53	0,009	0,001	7,5	0,4	26,667	0,577	0,044	0,005
	101	0,017	0,001	13	1	37,333	3,215	0,059	0,001
	247	0,02	0,001	17,333	0,577	39	1	0,084	0,014
	503	0,023	0,001	23,333	0,577	46,333	1,528	0,127	0,012
	1005	0,027	0,002	25,333	3,055	49	5,568	0,14	0,026
GC3	0	0,001	0	1,933	0,153	4,767	0,907	0,005	0
	5	0,001	0	2,8	0,173	12	0	0,005	0
	26	0,002	0	2,3	1,908	7,4	6,235	0,06	0,001
	52	0,011	0,002	13,3	2,944	34,667	8,505	0,227	0,045
	105	0,017	0,009	11,367	3,001	33,333	4,041	0,153	0,029
	254	0,017	0,002	16,667	1,155	60,667	4,041	0,113	0,016
	510	0,032	0,005	23	0	48,667	1,155	0,2	0,03
	998	0,033	0,002	23,333	1,528	51	2,646	0,17	0,02

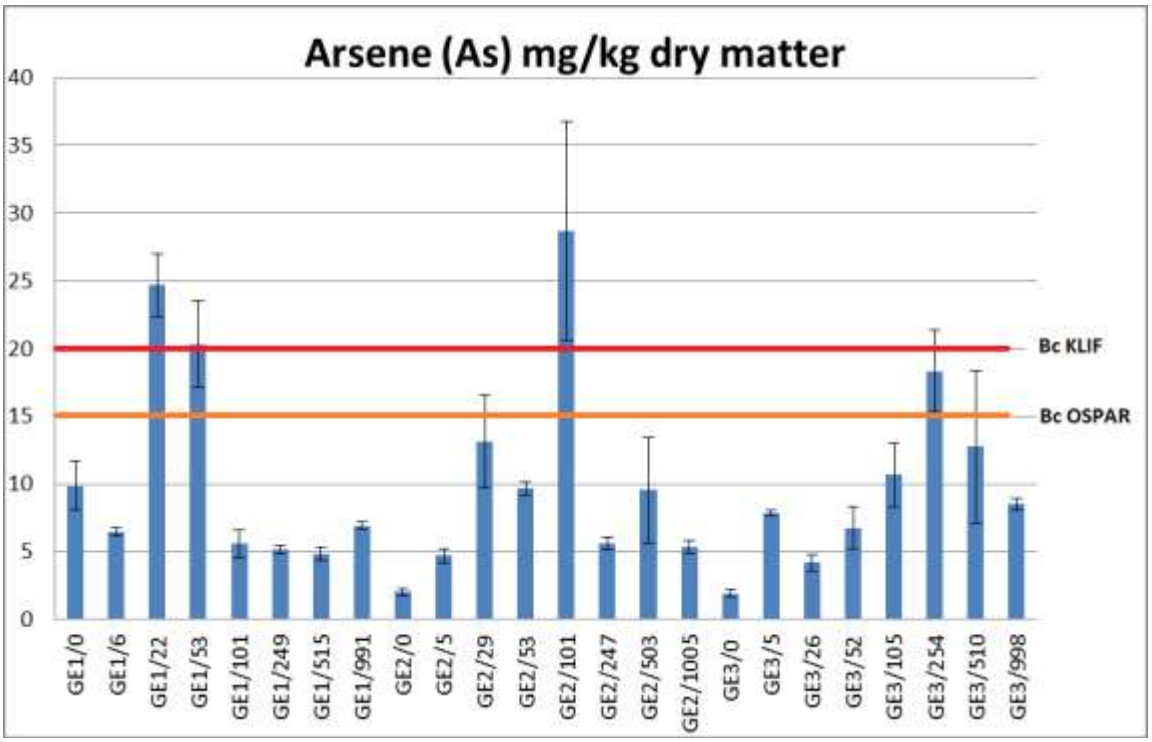


Figure 5.2.1 Distribution of Arsene (average and stdev) at different depths along the trasects GC1, GC2 and GC3.

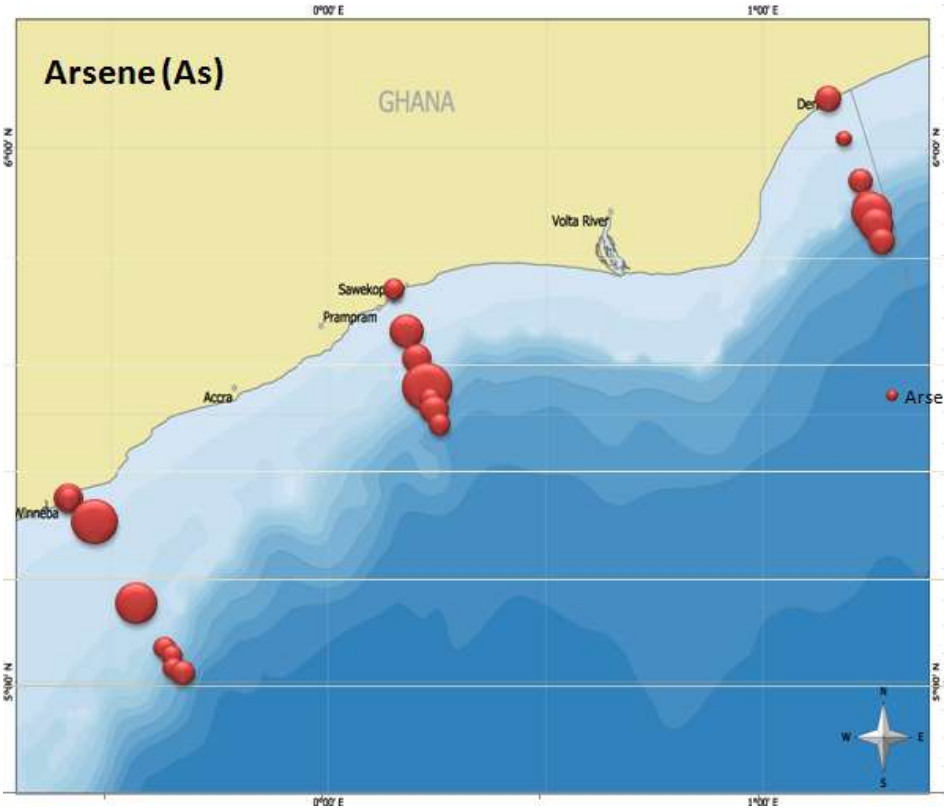


Figure 5.2.2 Distribution of Arsene. The circles shows the relative abundance.

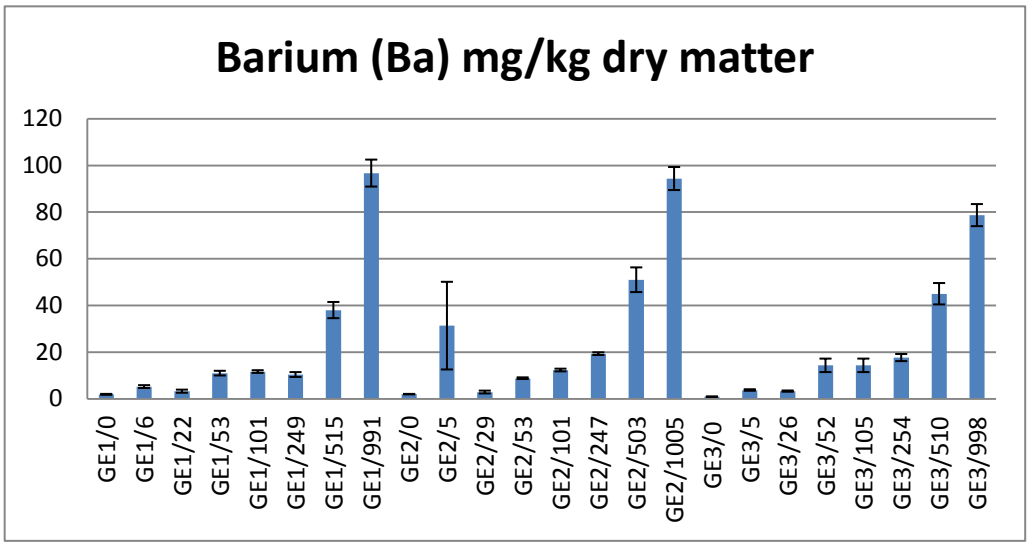


Figure 5.2.3 Distribution of Barium (average and std) at different depths along the trasects og GE1, GE2 and GE3. The sizes of the circles in the map illustrates the relative concentration of barium at each station.

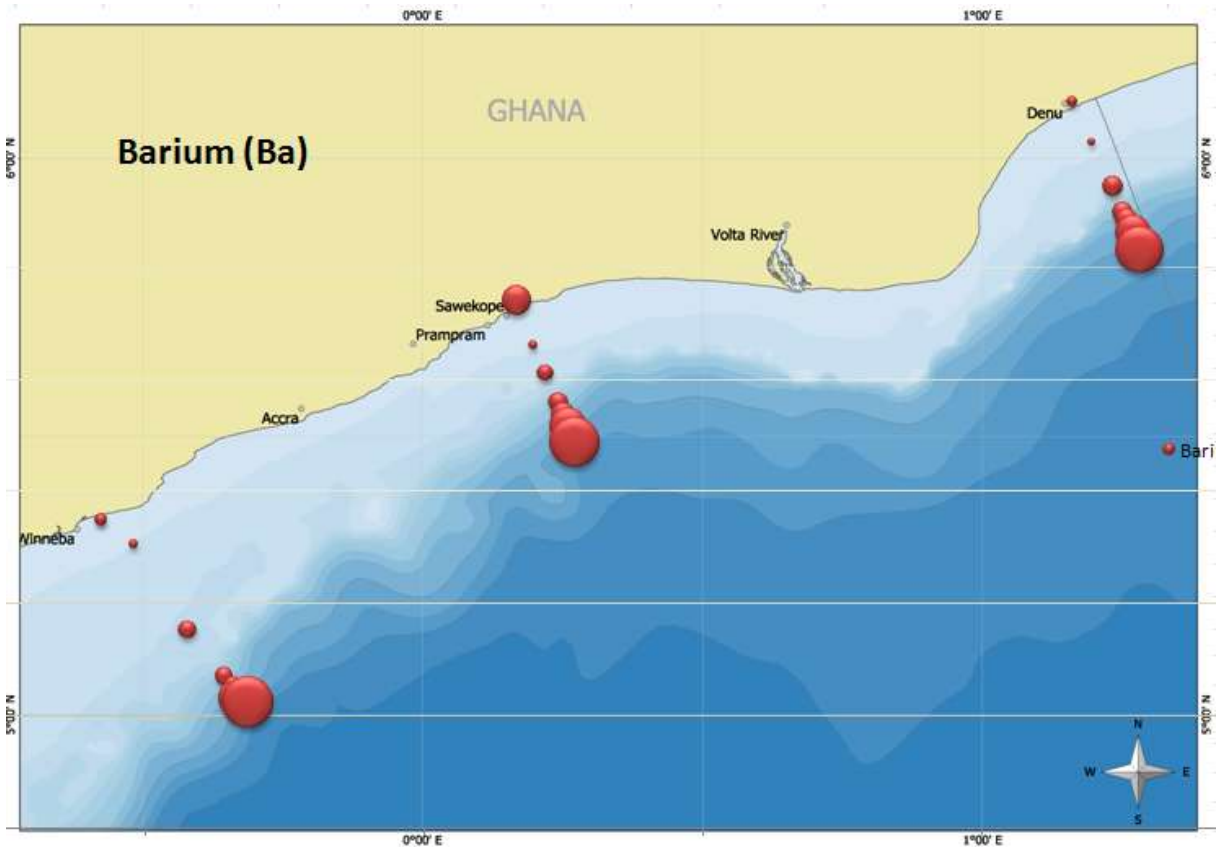


Figure 5.2.4 Distribution of Barium. The circles shows the relative abundance.

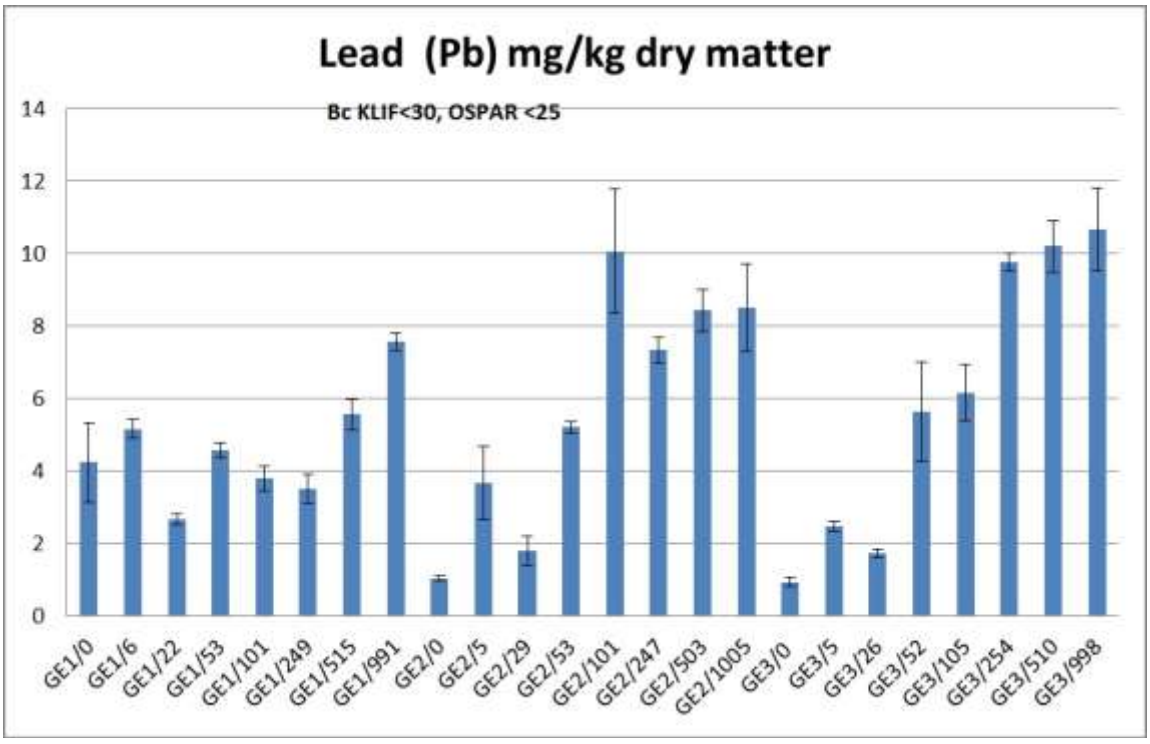


Figure 5.2.5 Distribution of lead (average and std) at different depths along the trasects GE1, GE2 and GE3. Bc KLIF <30, OSPAR <25.

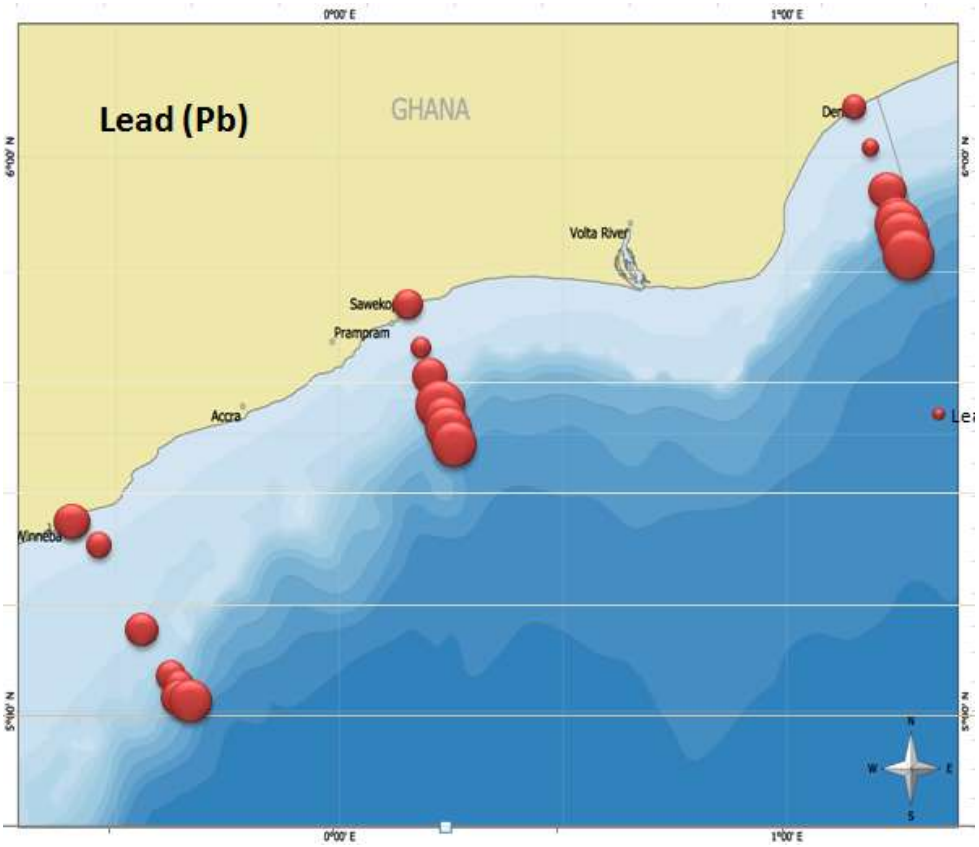


Figure 5.2.6 Distribution of Lead (Pb). The circles shows the relative abundance.

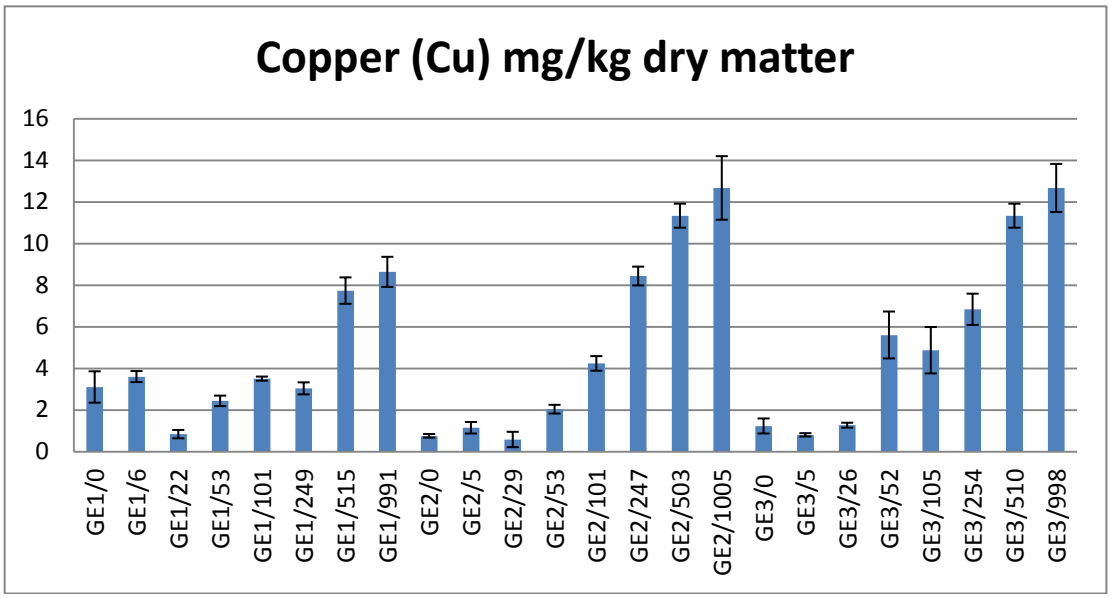


Figure 5.2.7 Distribution of copper (average and std) at different depths along the trasects GE1, GE2 and GE3.

Bc KLIF : <35, OSPAR <20.

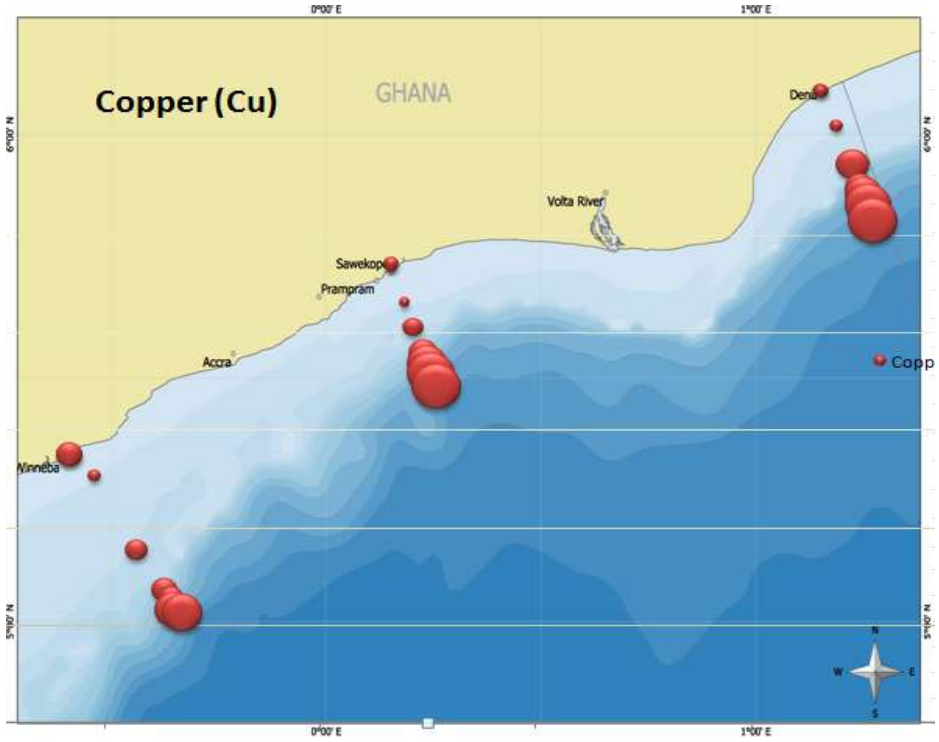


Figure 5.2.8 Distribution of Copper. The circles shows the relative abundance.

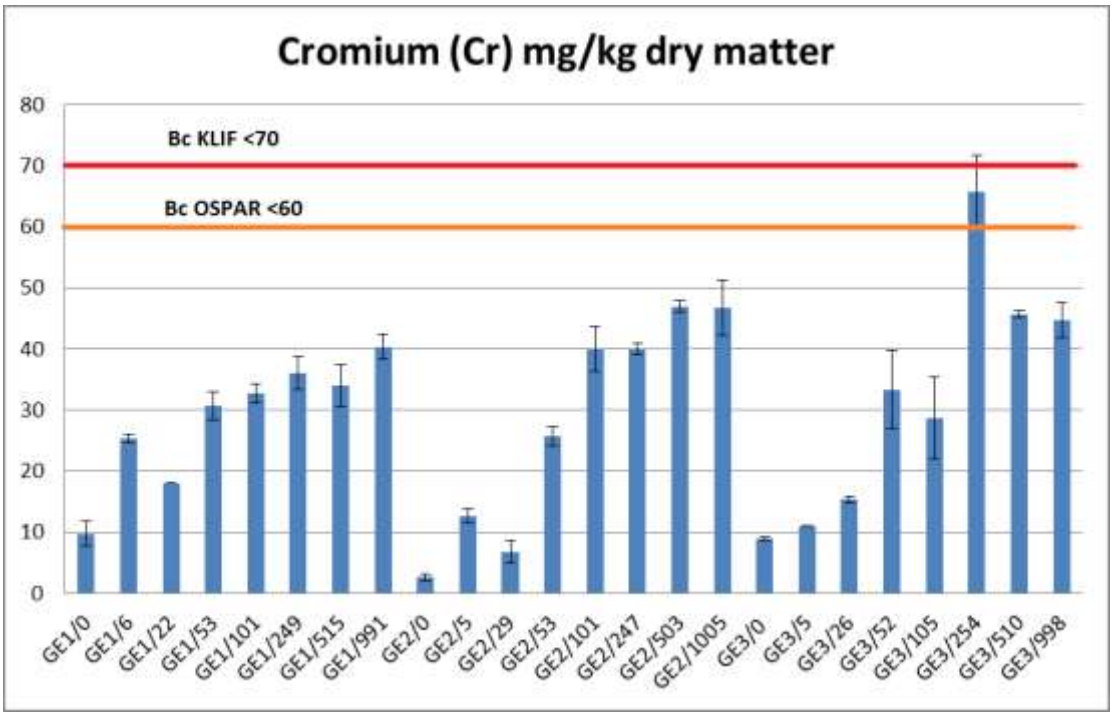


Figure 5.2.9 Distribution of Chromium (average and std) at different depths along the trasects GE1, GE2 and GE3.

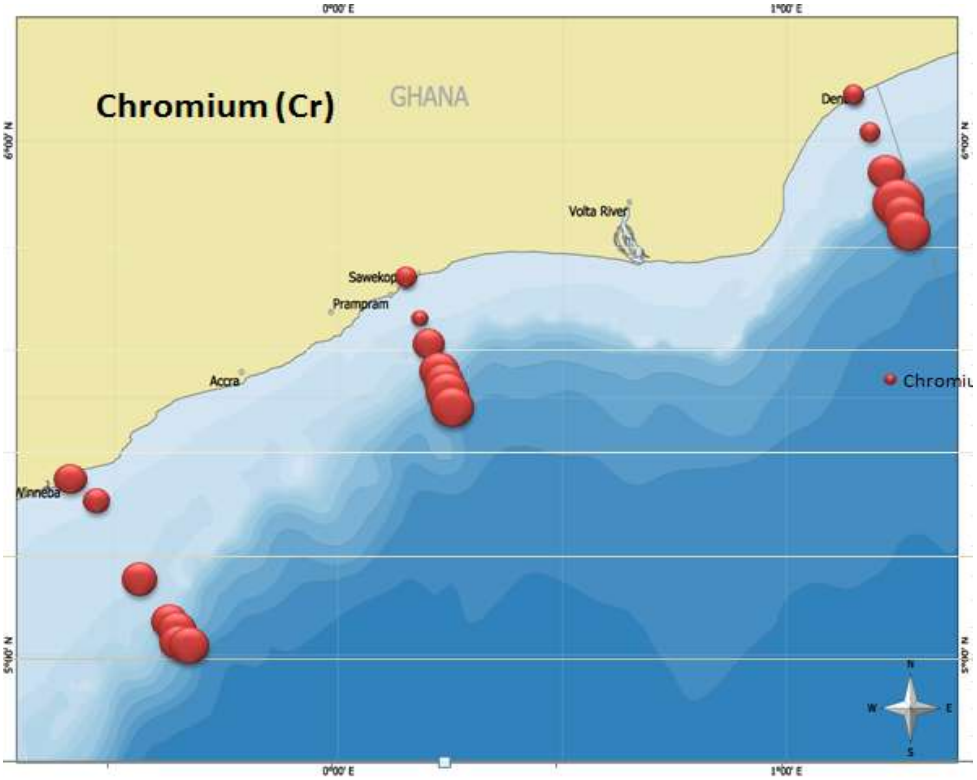


Figure 5.2.10 Distribution of Chromium. The circles shows the relative abundance.

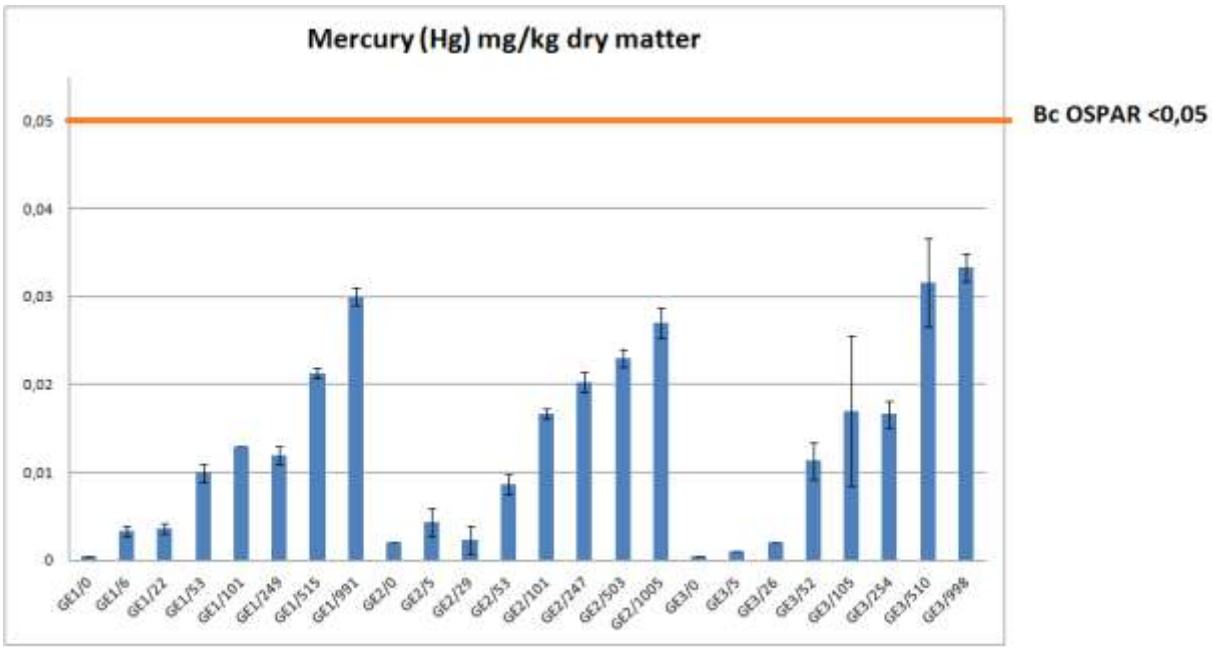


Figure 5.2.11 Distribution of mercury (average and std) at different depths along the trasects og GE1, GE2 and GE3.

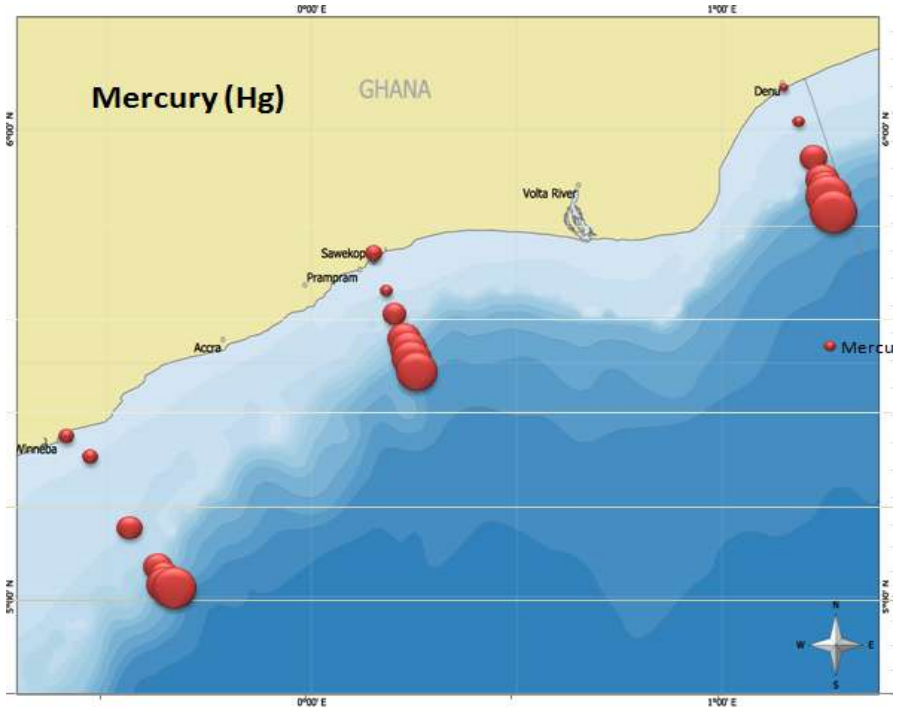


Figure 5.2.12 Distribution of Mercury. The circles shows the relative abundance.

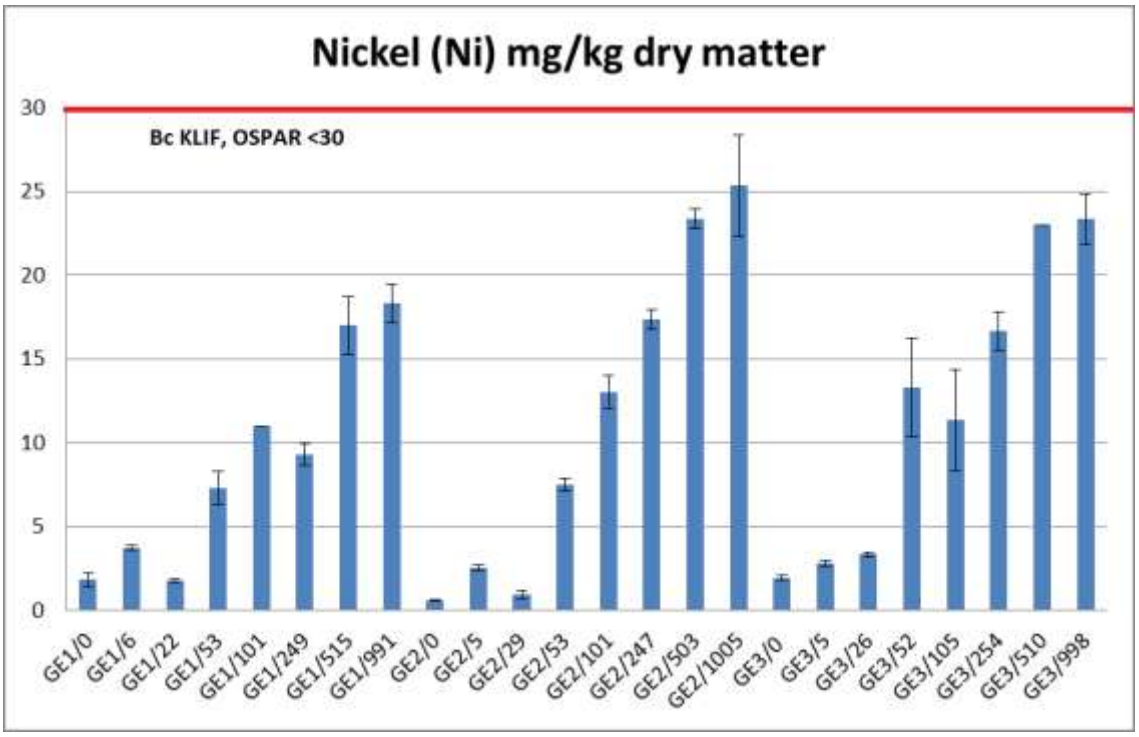


Figure 5.2.13 Distribution of Nickel (average and std) at different depths along the trasects GC1, GC2 and GC3.

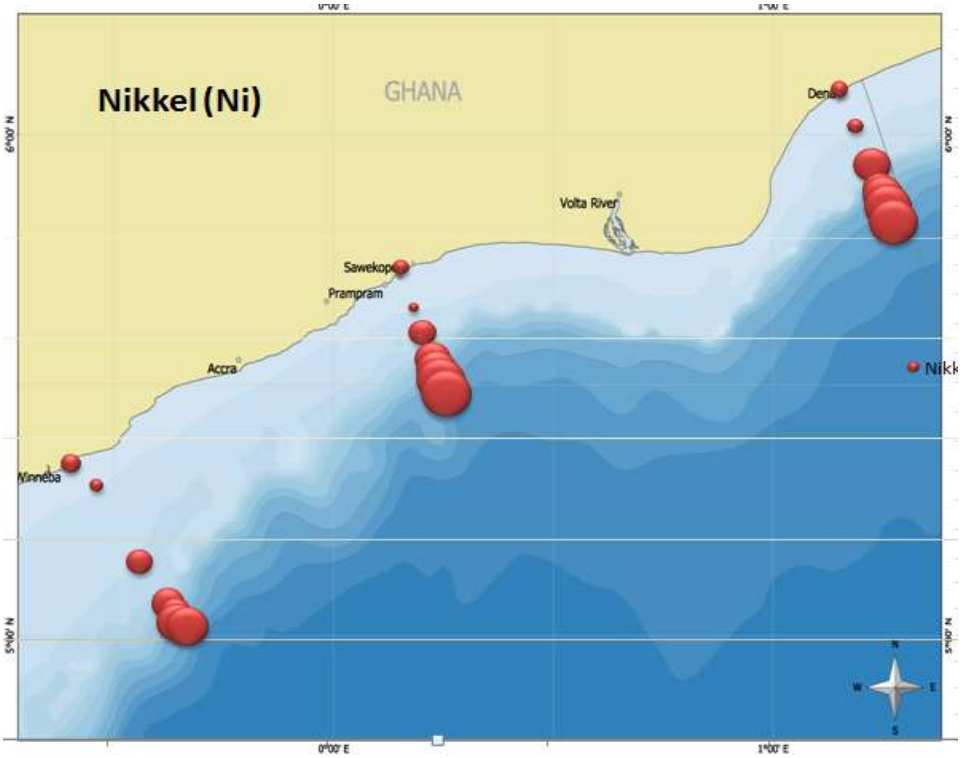


Figure 5.2.14 Distribution of Nickel. The circles shows the relative abundance.

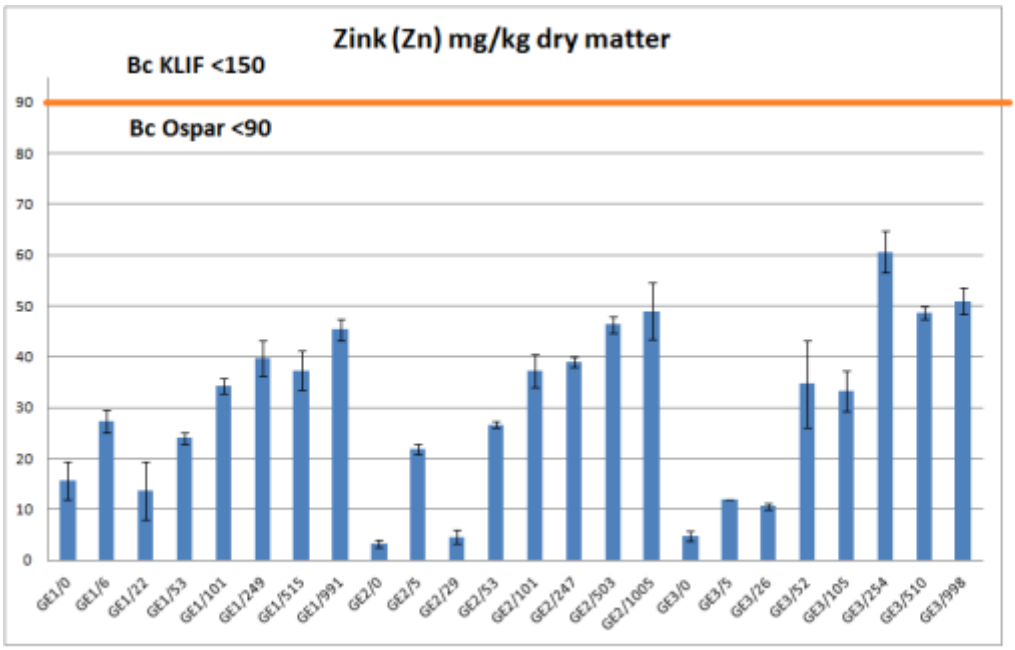


Figure 5.2.15 Distribution of zinc (average and std) at different depths along the trasects GE1, GE2 and GE3.

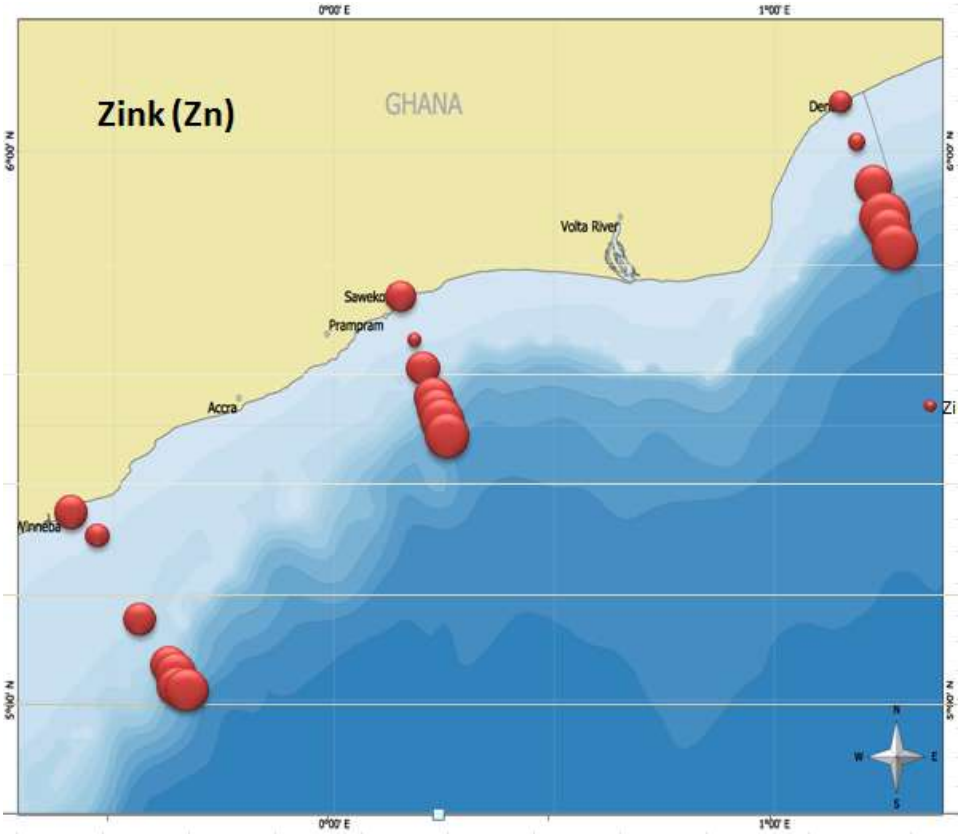


Figure 5.2.16 Distribution of Zink. The circles shows the relative abundance.

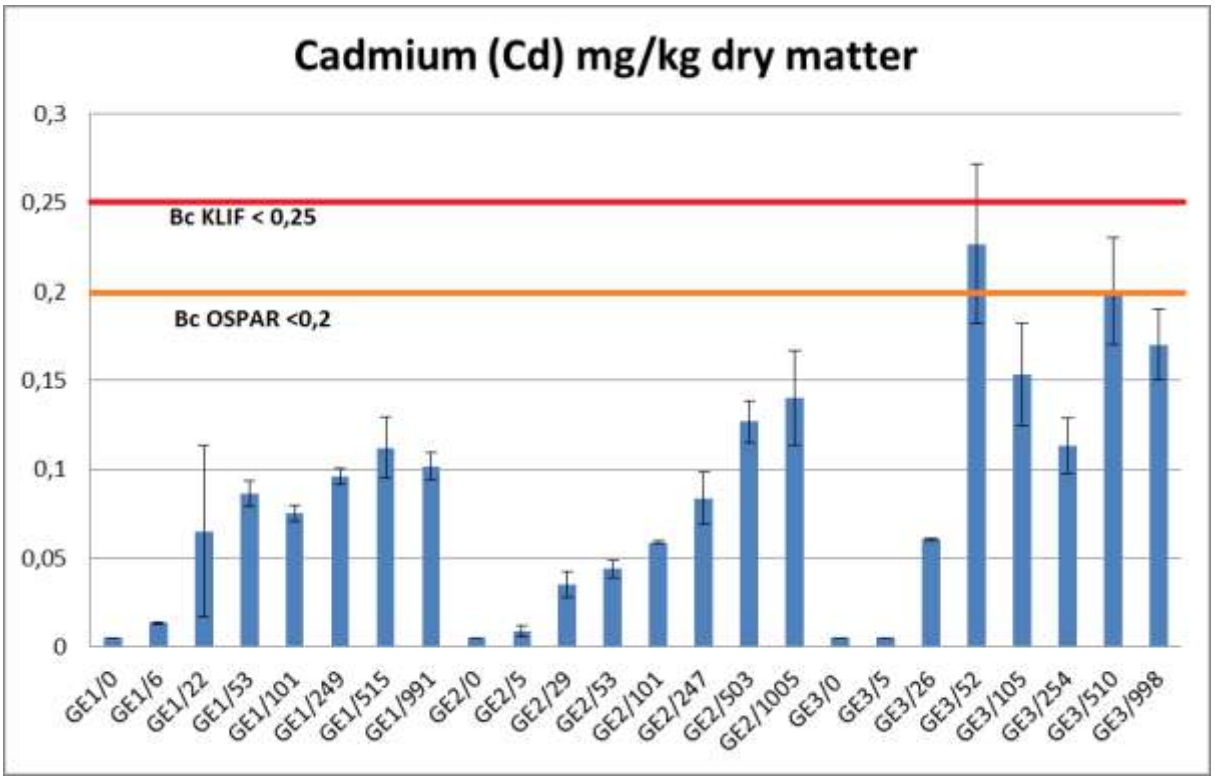


Figure 5.2.17 Distribution of cadmium (average and std) at different depths along the trasects GC1, GC2 and GC3.

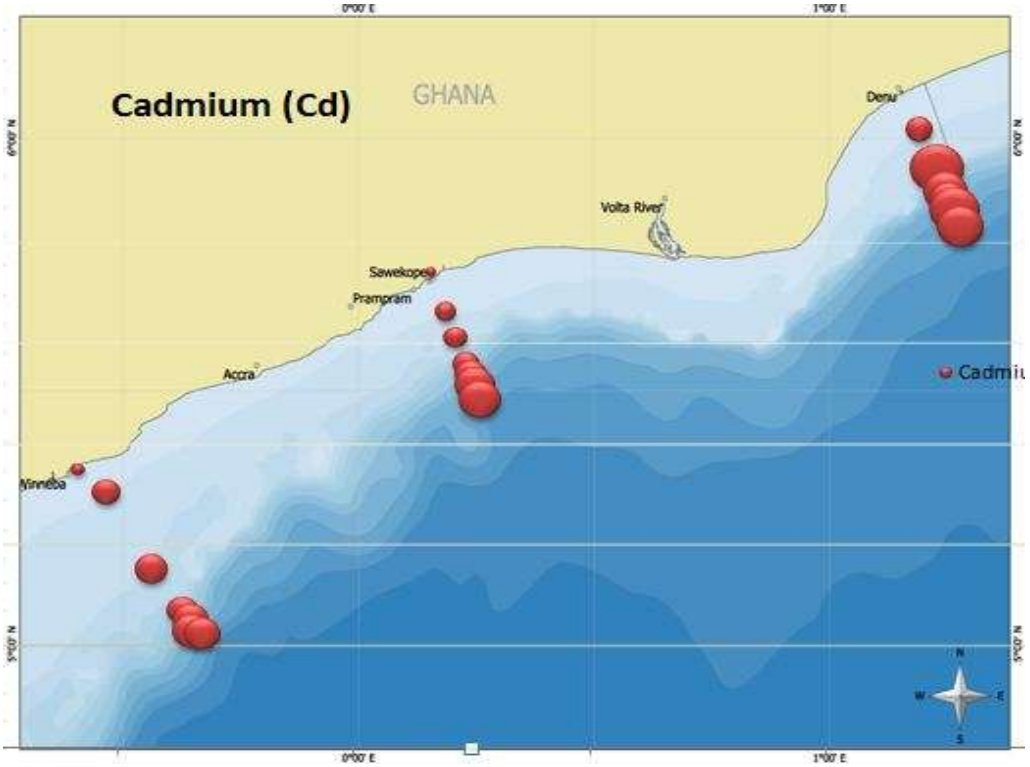


Figure 5.2.18 Distribution of Cadmium (Cd). The circles shows the relative abundance.

5.2.3 Hydrocarbons

Table 5.3.1 summarises the results of the hydrocarbon analysis. The complete data set including replicates is presented in Appendix.

Table 5.3.1: Average concentrations and standard deviations of THC (C12-35), PAH16, NPD's and PCB (mg/kg dw) at eight stations with different depths along the transects GE1, GE2, GE3.

	THC (TPH) C12-C35 (mg/kg dry matter)		PCB (7)(Sum) (mg/kg dry matter)		NPD's Sum (mg/kg dry matter)		PAH 16 EPA (sum)15 parametere (mg/kg dry matter)	
Station	Av	Stdev	Av	Stdev	Av	Stdev	Av	Stdev
GE1/0	<1		nd		nd		<0,01	
GE1/6	<1		nd		<0,005		0,013	0,007
GE1/22	<1		nd		nd		nd	
GE1/53	<1		nd		nd		<0,01	
GE1/101	<1		nd		nd		<0,01	
GE1/249	2,67	3,75	nd		0,01041	0,0137	<0,01	
GE1/515	1,53	1,05	nd		nd		<0,01	
GE1/991	1,93	1,10	nd		nd		<0,01	
GE2/0	<1		nd		nd		<0,01	
GE2/5	2,80	2,04	nd		<0,005		0,014	0,015
GE2/29	<1		nd		nd		nd	
GE2/53	<1		nd		nd		<0,01	
GE2/101	<1		nd		nd		<0,01	
GE2/247	<1		nd		nd		<0,01	
GE2/503	21,87	16,10	nd		0,00852	0,0048	0,025	0,007
GE2/1005	<1		nd		nd		0,012	0,003
GE3/0	<1		nd		nd		nd	
GE3/5	<1		nd		nd		<0,01	
GE3/26	<1		nd		nd		nd	
GE3/52	<1		nd		nd		nd	
GE3/105	<1		nd		0,00557	0,0053	<0,01	
GE3/254	<1		nd		<0,005		<0,01	
GE3/510	<1		nd		nd		0,010	0,004
GE3/998	<1		nd		<0,005		0,019	0,002

PCB's, PAH's and NPD's

No PCB values from the 2011 transects (GE1, GE2 and GE3) were seen above the detection limit of 0,5 µg/kg dry weight. The whole dataset is presented in the Appendix in table 1.5.1.
The concentrations of hydrocarbons were low at all sites and most compounds of PAH (polyaromatic hydrocarbons) and NPD (naphthalene, phenanthrene and dibenzothiophene) were below the detection limits. No values were found to be higher than Bc. for any of the parameters.

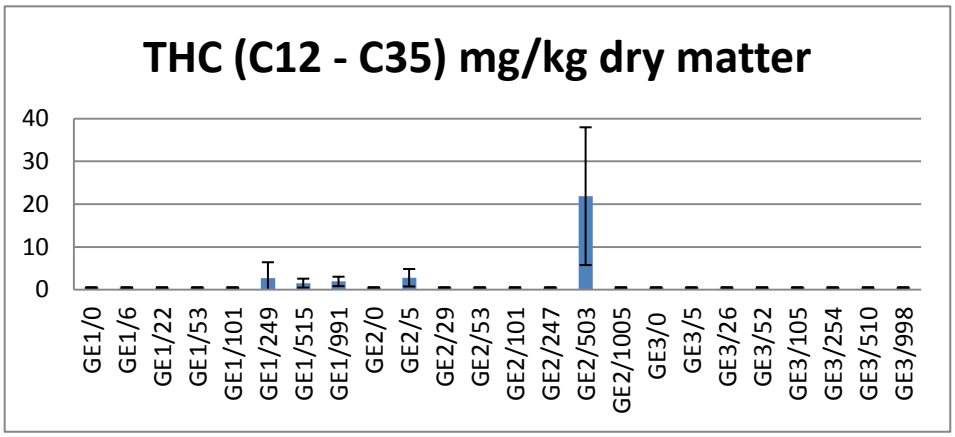


Figure 5.3.1. Distribution of THC (C12-35) (average and standard deviation) along the transects GE1, GE2 and GE3. Data lower than the detection limit are presented as half the detection limit.

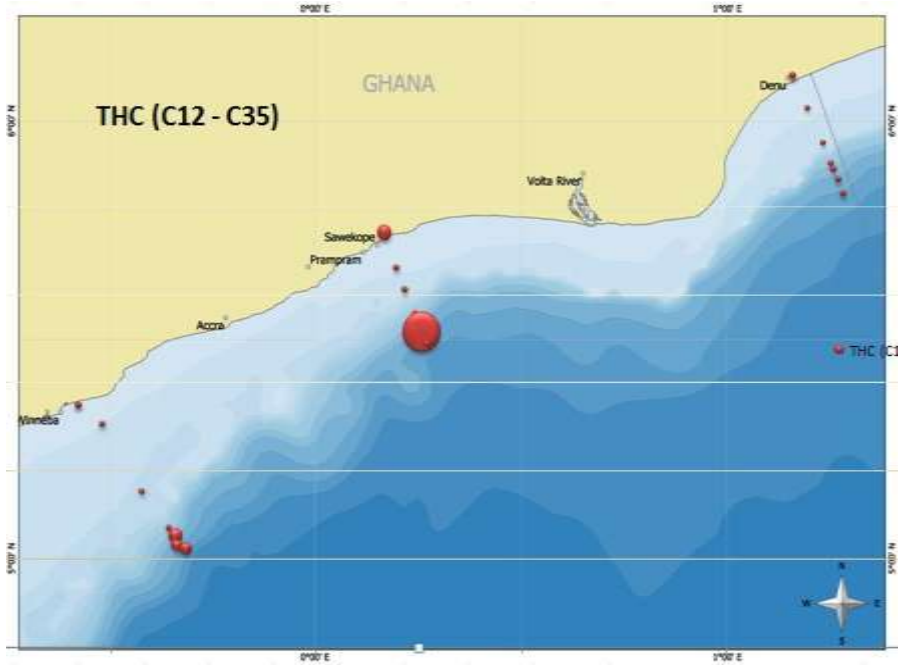


Figure 5.3.2 Distribution of THC (C12-C35). The circles shows the relative abundance.

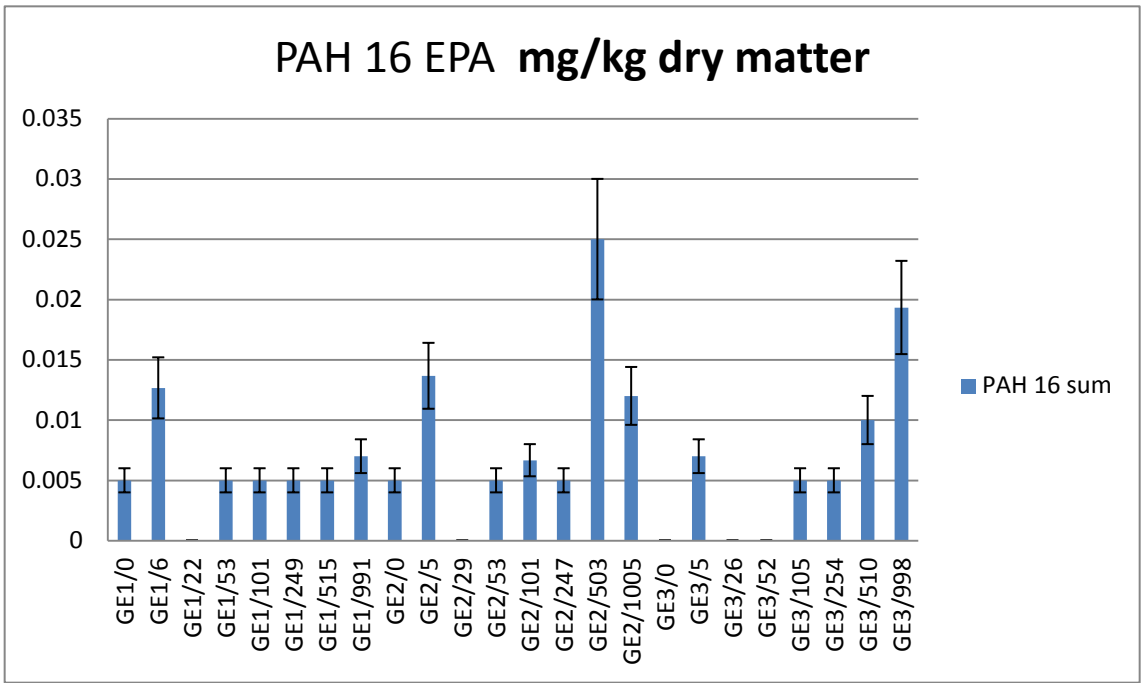


Figure 5.3.3. Distribution of the 16 EPA PAH (average and standard deviation) along the transects GE1, GE2, GE3. Data lower than the detection limit are presented as half the detection limit.

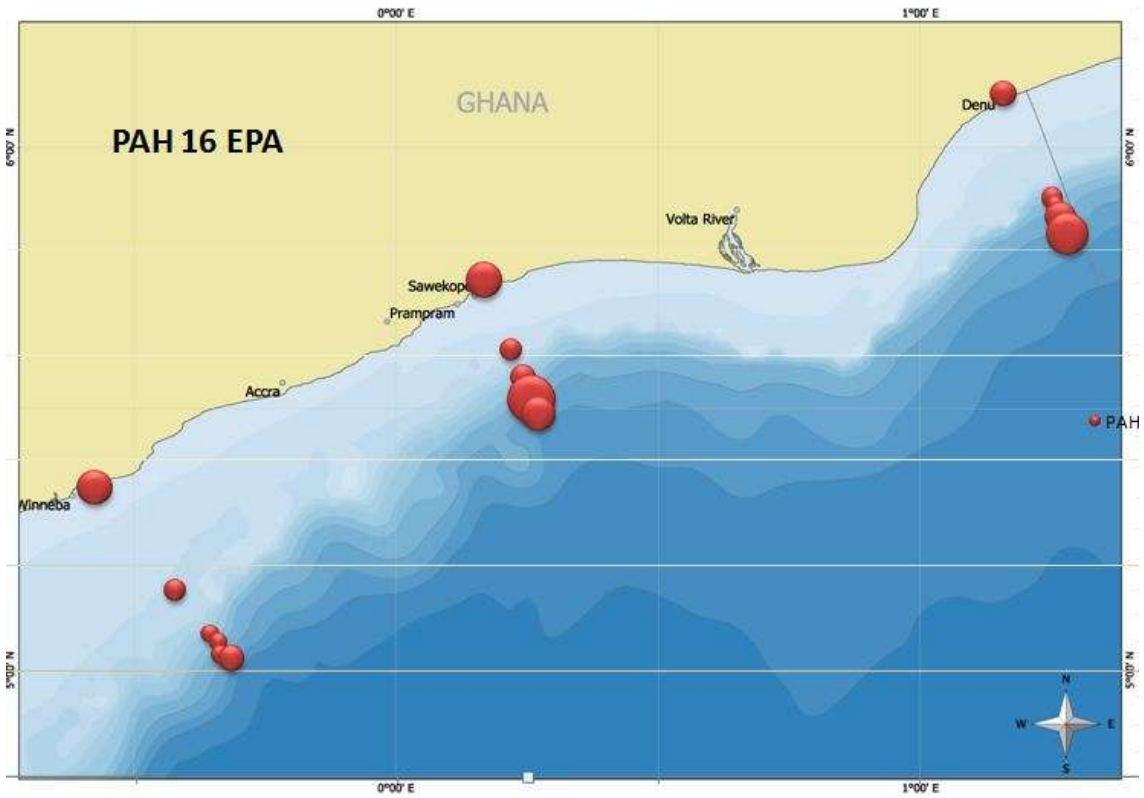


Figure 5.2.4 Distribution of PAH's. The circles shows the relative abundance.

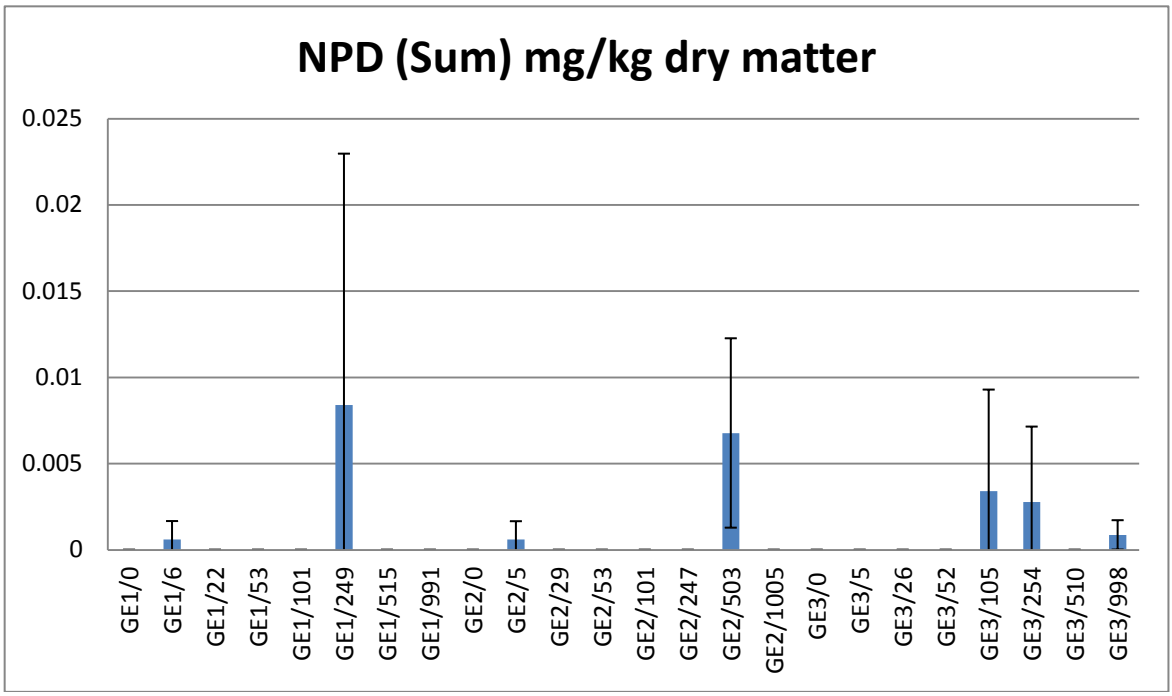


Figure 5.3.5. Distribution of NPD's (sum Naphtalene C1,C2,C3, Phenanthren C1,C2,C3 and Dibenzothiophene C1,C2,C3) (average and standard deviation) along the transects GE1, GE2, GE3. Data lower than the detection limit are presented as half the detection limit.

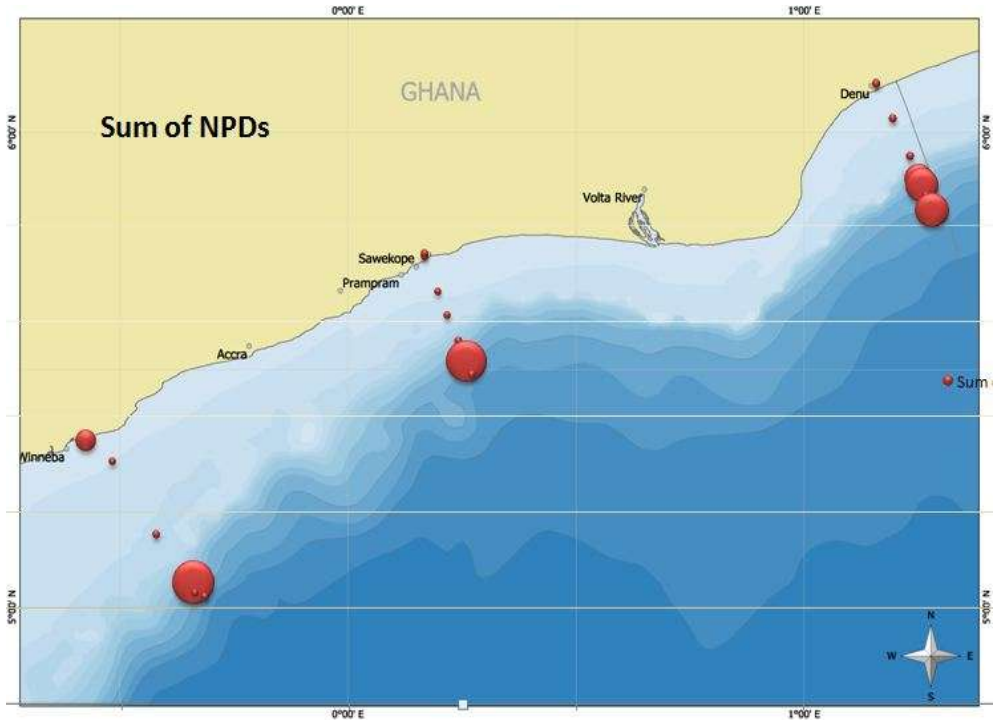


Figure 5.3.6 Distribution of NDP's. The circles shows the relative abundance.

5.3 Biology

Benthic fauna from selected samples. (Photo T. Ensrud)

The 2011 survey consisted of three transects starting from Winneba, Old Nigo and Denu near the Togo Border. Eight stations were sampled along each transect stretching from the beach to about 1000m water depth. Transects length varied between about 55 GE1 to 30 GE2 km.

There are several natural gradients defining the stations going from the beach and shallow waters to the deepest stations at 1000 meters depth.
The beach and the 5m stations are largely characterized by the influence of the heavy wave activity creating a grinding effect this effect seems to increase towards the eastern part of the coast line.
Regarding the other stations a matrix of light conditions, temperature, oxygen, pressure, surface currents, counter currents, distance from land based discharges, upwelling areas, seasonal changes and bathymetric features create different habitats and sediment composition, making up different strata. Some of these features are yet to be investigated and described in further detail for this area.
As mentioned in the oceanography chapter the survey took place between late April and early May when there is stratified conditions. Available litterature describes the surface currents to be 0-15 m inshore and 0-25m offshore. (Longhurst 1964) from the data collected on the survey a change in the surface current were observed shifting from a western to an Eastern direction. These currents were observed in down to about 30-50 meters (Chapter 3 p.31).
The oxygen minimum zone between approximately 200 and 500 meters is very distinct.
Each station for biology consisted of 5 replicates except for the 5 m samples, these were limited to 3 replicates for practical reasons.
A complete species list is available in the Appendix.

The 2011 material was collected using a 0,5 mm sieve from the 25 meter stations and deeper, the 2009 and 2010 material was sieved on 1mm mesh size. This fact must be considered when comparing the three surveys.

Abundance and diversity.

7031 individuals of bentic invertebrates were found in 111 grab samples collected from the three transects. Macro invertebrates were identified to the lowest possible taxonomical level. 307 taxa were identified in the material.
The most numerous and diverse groups: Polychaeta, Mollusca and Amphipoda were identified mostly to the family or genus level.
The rest of the crustaceans as well as echinoderms were identified to the morphospecies or genus level. Poor condition of some specimens made the identification of particular groups (e.g. Brachyura, part of the polychaetes) very difficult.

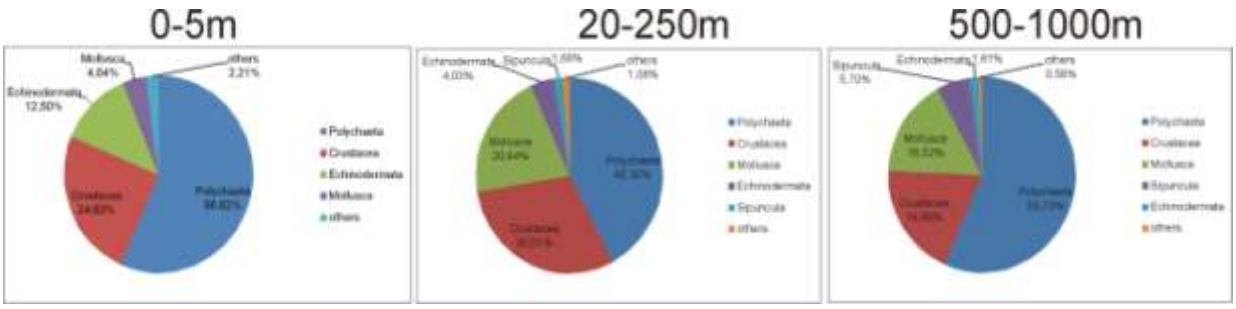
A summary of number of individuals and taxa within the main taxonomic groups is presented in Table 5.3.1.
Annelida was the main taxonomic group in the samples, contributing with 40,6% of the total amount of individuals in the sampling area. The second largest taxonomical group was Mollusca contributing 26,7 % and the third Crustaceans making up for 26,2 % of the material.

The diversity and evenness was fairy high and indicates habitats in their natural condition.
Number of individuals, species, diversity, evenness and Es(100) is presented in table 5.3.2 and figure 5.3.1-9.

Depth gradient
Two important depth related boundaries were found in the studied material. Significant differences in the abundance, number of taxa and diversity were noted between the three depth ranges (Fig. 3).
High values of all the indices were noted on shelf depth range (22-100m) and two of the 250 meter stations (GE1/249 and GE3/254)
The largest aggregations of benthic animals were found in shallow parts of the transects. The three 25 meter stations accounted for 57,8 % of the individuals from the whole material. Adding the 50 and 100m stations the percentage accumulates to 68,5 and 79,5 % of the total count. A relatively high number of individuals and taxa are expected in this depth range (22-100 m) due to relatively high primary production in the photic zone.
The highest number of individuals (2934/ 0,5m^2) was found at 26 meters depth on transect GE3, starting off the coast near Denu. There was a large variation in the numbers of individuals (645,461 and 2943) and taxa (70, 61 and 126) between the three 25 meter stations.
This could be consistent with some degree of organic enrichment, this is however not included in this study. The lowest values of abundance, number of taxa and diversity were noted in the littoral and one of the 5 meter stations (GE2/5) . This shallow area was characterized by extremely low abundance, number of taxa and subsequently diversity on transect GE1 (0 m) and GE2 (GE3/5 was lost when the cano overturned in the surf going in) the grinding effect powered by the wave activity is the most likely explaination for this observation. The GE1/5 meter however was rich in abundance and taxa considering the sampling effort with only three paralells.
At greater depths (slope 500-1000m and GE2/250) the abundance, number of taxa and diversity strongly decreased.

The number of taxa follows the same trend as for number of individuals although the trend is weaker. Using Hurlberts formula to calculate the estimated number of species standardised for 100 individuals it seems that this might be due to more scattered and dispersed fauna rather than a significant loss in diversity.

The dominance structure differed between the depth ranges studied. Fauna was dominated by polychaetes and crustaceans at all depths. However, in the shallowest area the third important taxon were echinoderms, while at greater depths this taxon was replaced by mollusks. Sipuncula were important element of the slope fauna (500-1000m) but were almost absent from the shelf depths (Fig. 4).



The ten most abundant species/groups for each site are presented in Table 5.3.3-5.3.5. No species or group dominate to a great extent. This indicates a good benthic environment, which can also be seen in the graphs of geometrical classes, where the curves indicate a good distribution of species/taxa. The relatively low resolution in the species list should be taken into concideration when reading the graphs in figure 5.3.13-21. (page 22 ch. 2.2.6)

The results of the multivariate analyses are given in the dendrogram (Figure 5.2.22) and the MDS plot (Figure 5.2.23). A more detailed presentation of each sampling area is given in Appendix. In the cluster analyses, all sampling sites were linked together at 17,7 % similarity using group average and root transformation. Depth seems to be the main factor determining the fauna composition and based on this, the stations group together in three clear groups. The deepest stations (500 and 1000 m) of the transects group together with around 38% similarity, the intermediate and shallow stations link together at about 45 % respectively and around 42 % in between. The littoral and 5 meter stations on the transects do not compare with any of the other stations sampled due to the sampling effort and the physical conditions.

The correlation between distribution of bottom fauna and the chemical and geological data was tested with the bioenv routine in the Primer 6 software package. The abiotic data was standardised to presentage of the total and of the sum of each parameter and run without getting any clear signals linked to the species list.
Since the chemical parameters related to oil activites are within background levels this is the expected outcome, we would however have expected a stronger signal from the oxygen distribution in the depth gradient.

Using an MDS plot overlaying grain size data gives an impression of a correlation between sediment composition and the benthic communites analysed. Fig. 5.3.24.
The bottom fauna collected in the sampled areas at the coast of Ghana are rich and diverse.

Table 5.3.1 Number of individuals and taxa of the main taxonomic groups for each station along the transects of Ghana East (GE1), GE2 and GE3.

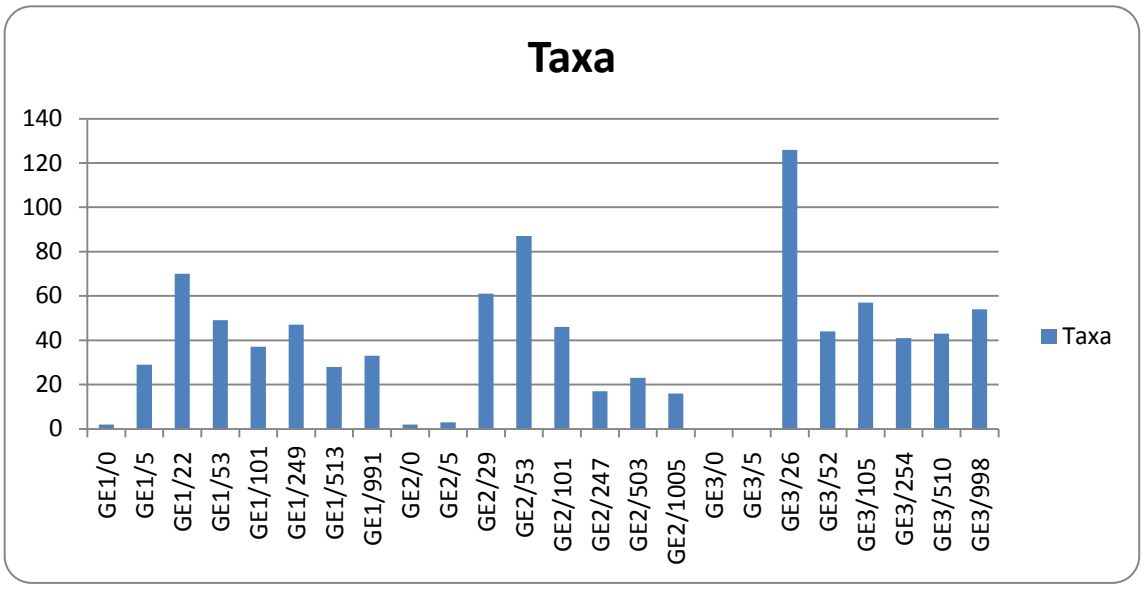
GE1			Area sampled:	0,5 m^2
Large taxomic groups	individuals	%	Taxa	%
Annelida	848	51,0	30	20,8
Arthropoda	396	23,8	60	41,7
Mollusca	260	15,6	31	21,5
Ehinodermata	69	4,1	16	11,1
Miscellaneous groups	90	5,4	7	4,9
Total	1663	100,0	144	100,0

GE2				
Large taxomic groups	individuals	%	Taxa	%
Annelida	622	45,8	27	18,5
Arthropoda	226	16,6	63	43,2
Mollusca	388	28,6	29	19,9
Ehinodermata	89	6,5	23	15,8
Miscellaneous groups	34	2,5	4	2,7
Total	1359	100,0	146	100

GE3				
Large taxomic groups	individuals	%	Taxa	%
Annelida	1386	34,6	36	18,1
Arthropoda	1217	30,4	97	48,7
Mollusca	1223	30,5	39	19,6
Ehinodermata	108	2,7	20	10,1
Miscellaneous groups	75	1,9	7	3,5
Total	4009	100,0	199	100,0

Table 5.3.2 Number of individuals, species, diversity (H'), evenness (J) and max. diversity (H'max) for each station along the transects of Ghana East (GE1), GE2 and GE3.

Transect/depth	Taxa S	TOTAL individs N	richness d	Shannon diversity H' LOG2	Evenness J =H'/H'max	H'max LOG2	ES(100)
GE1/0	2	40	0,27	0,17	0,17	1,00	2,00
GE1/5	29	224	5,17	3,78	0,78	4,86	20,71
GE1/22	70	645	10,67	4,93	0,80	6,13	33,92
GE1/53	49	134	9,80	5,00	0,89	5,61	42,47
GE1/101	37	118	7,55	4,55	0,87	5,21	34,39
GE1/249	47	240	8,39	4,47	0,80	5,55	30,50
GE1/513	28	91	5,99	4,16	0,87	4,81	28,00
GE1/991	33	149	6,39	4,11	0,82	5,13	28,25
GE2/0	2	4	0,72	0,81	0,81	1,00	2,00
GE2/5	3	4	1,44	1,50	0,95	1,58	3,00
GE2/29	61	461	9,78	4,36	0,74	5,93	30,09
GE2/53	87	454	14,06	5,33	0,83	6,44	42,77
GE2/101	46	254	8,13	4,78	0,86	5,52	33,12
GE2/247	17	55	3,99	3,55	0,87	4,09	17,00
GE2/503	23	103	4,75	3,69	0,82	4,52	22,76
GE2/1005	16	24	4,72	3,50	0,88	4,00	16,00
GE3/0							
GE3/5							
GE3/26	126	2943	15,65	4,01	0,57	6,98	27,45
GE3/52	44	175	8,33	4,50	0,83	5,46	33,31
GE3/105	57	407	9,32	4,23	0,72	5,83	31,48
GE3/254	41	192	7,61	4,65	0,87	5,36	31,41
GE3/510	43	147	8,42	4,49	0,83	5,43	34,43
GE3/998	54	143	10,68	5,03	0,87	5,75	43,39



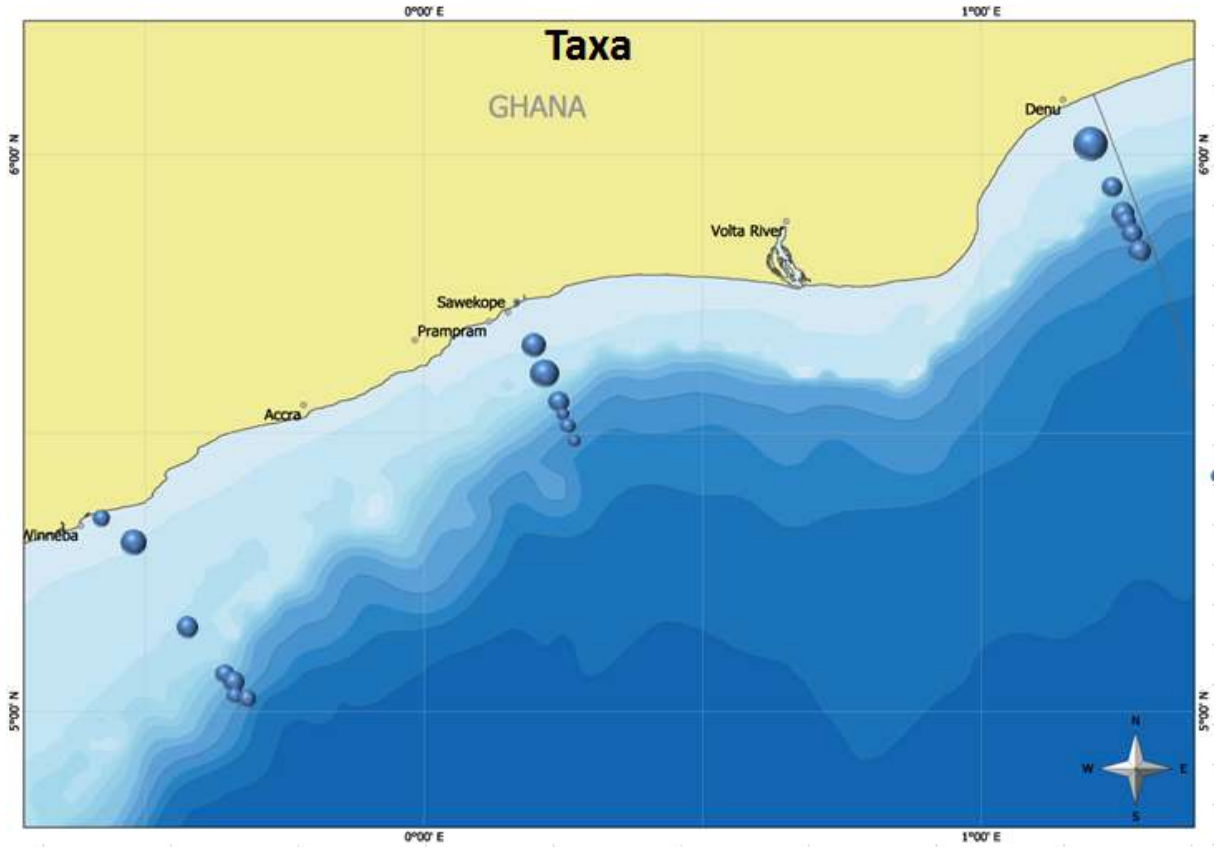
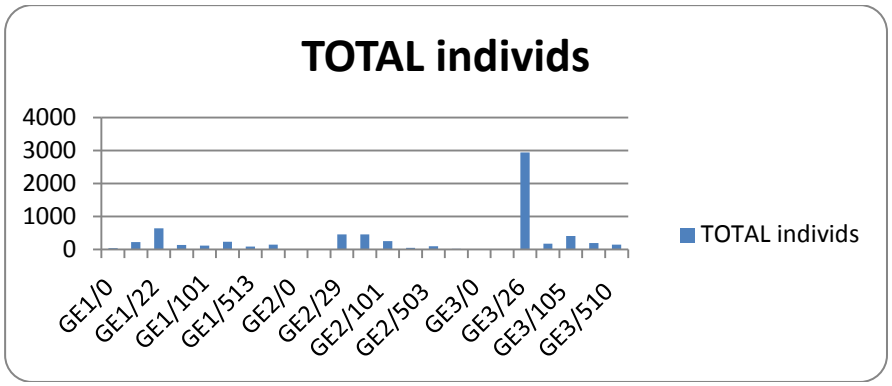
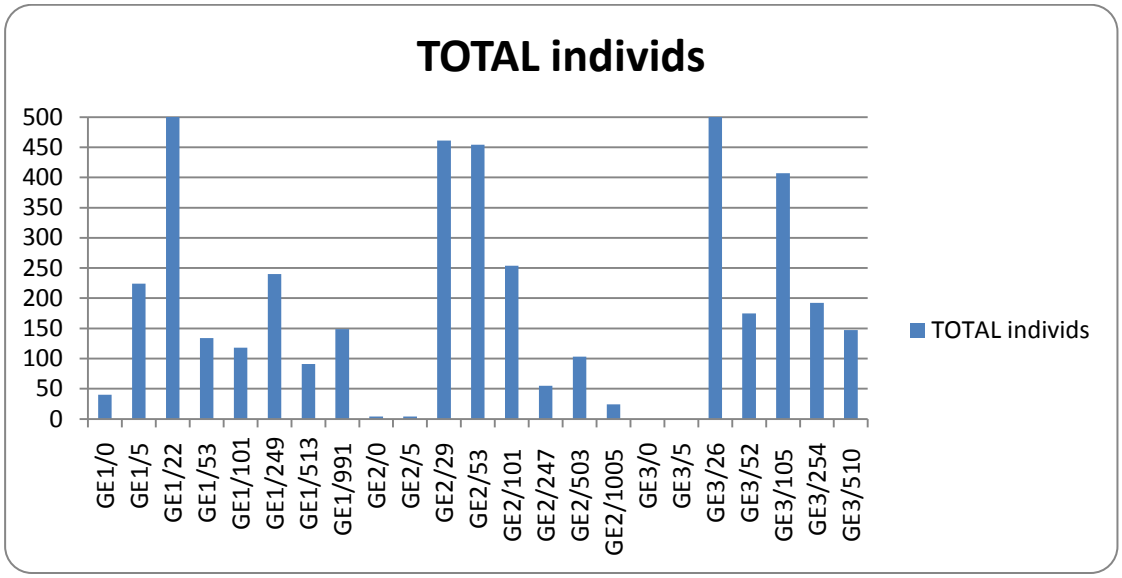


Figure 5.3.1-2 Number of taxa for each station along the transects of Ghana East, GE1, GE2 and GE3. The size of the circles illustrates the relative amount of taxa at each station.





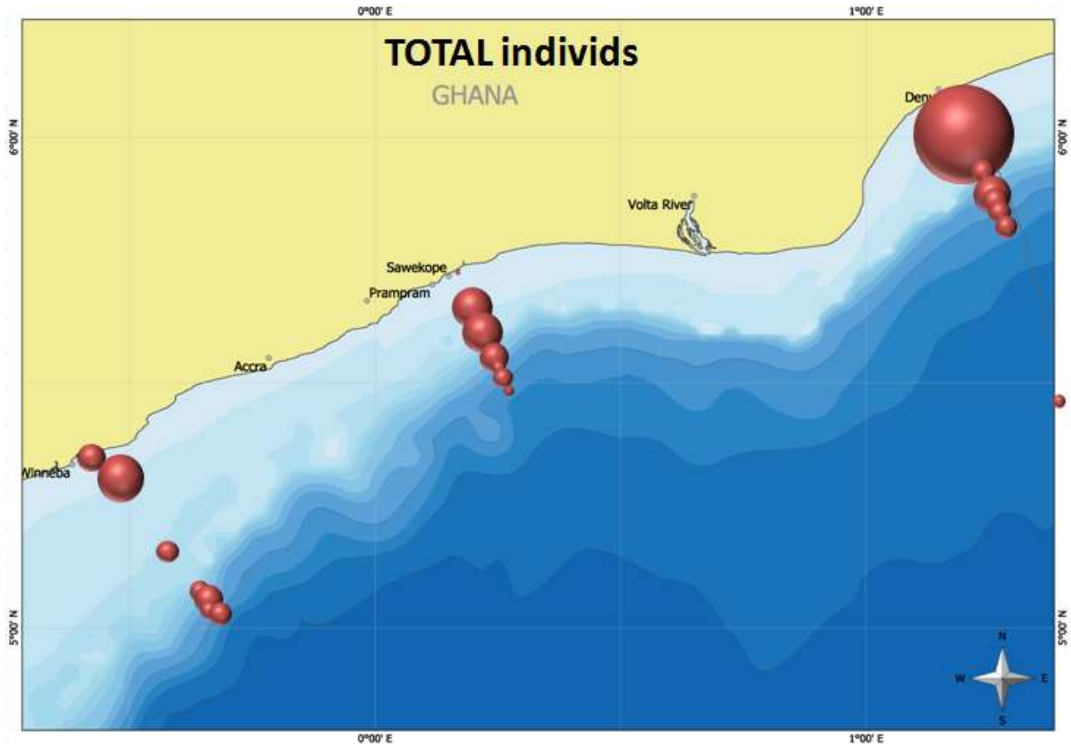


Figure 5.3.3-5 Number of specimens for each station along the transects of Ghana East, GE1, GE2 and GE3. The size of the circles illustrates the relative abundance at each station.

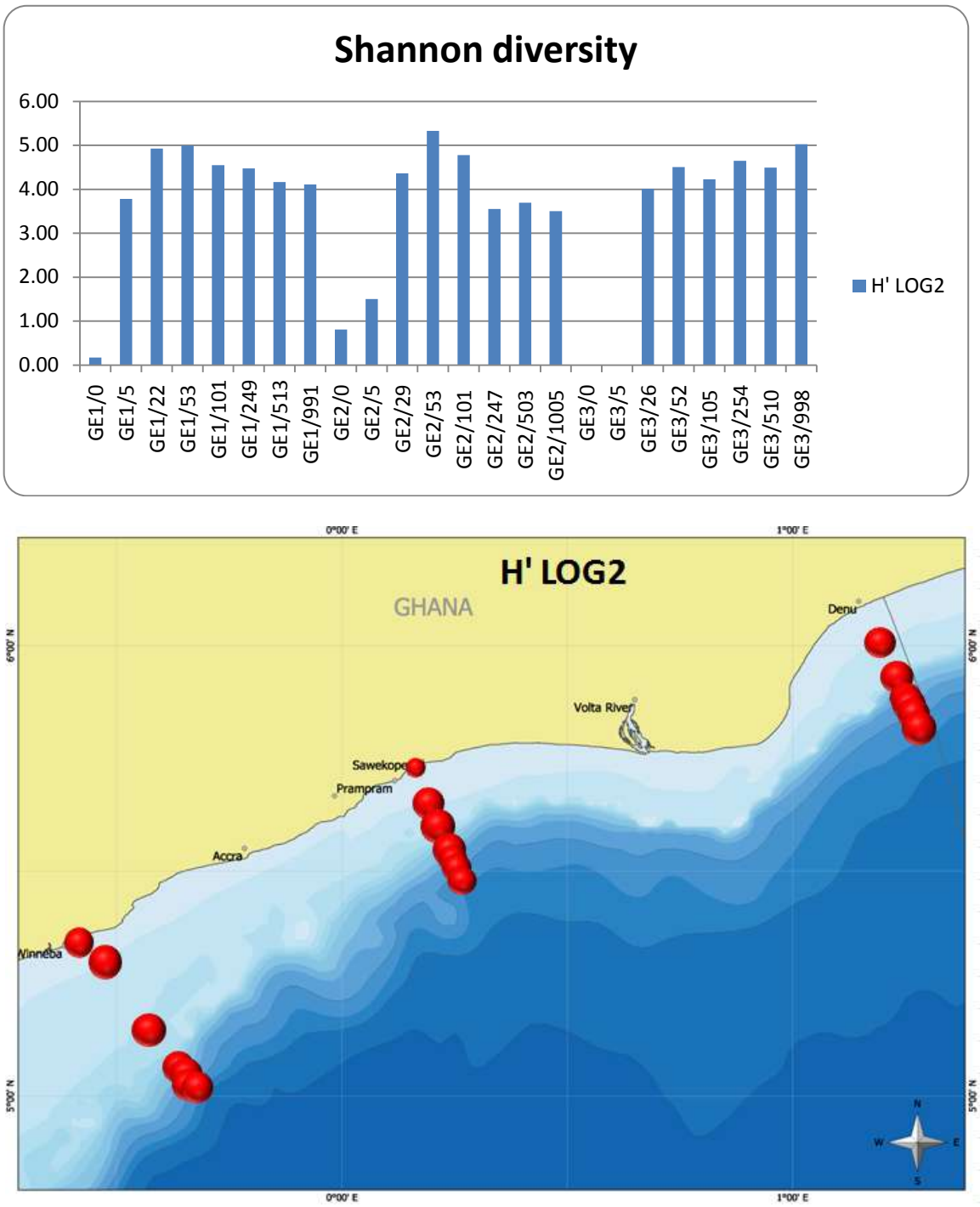


Figure 5.3.6-7 Diversity (H') for each station along the transects of Ghana East, GE1, GE2 and GE3. The size of the circles illustrates the relative diversity at each station.

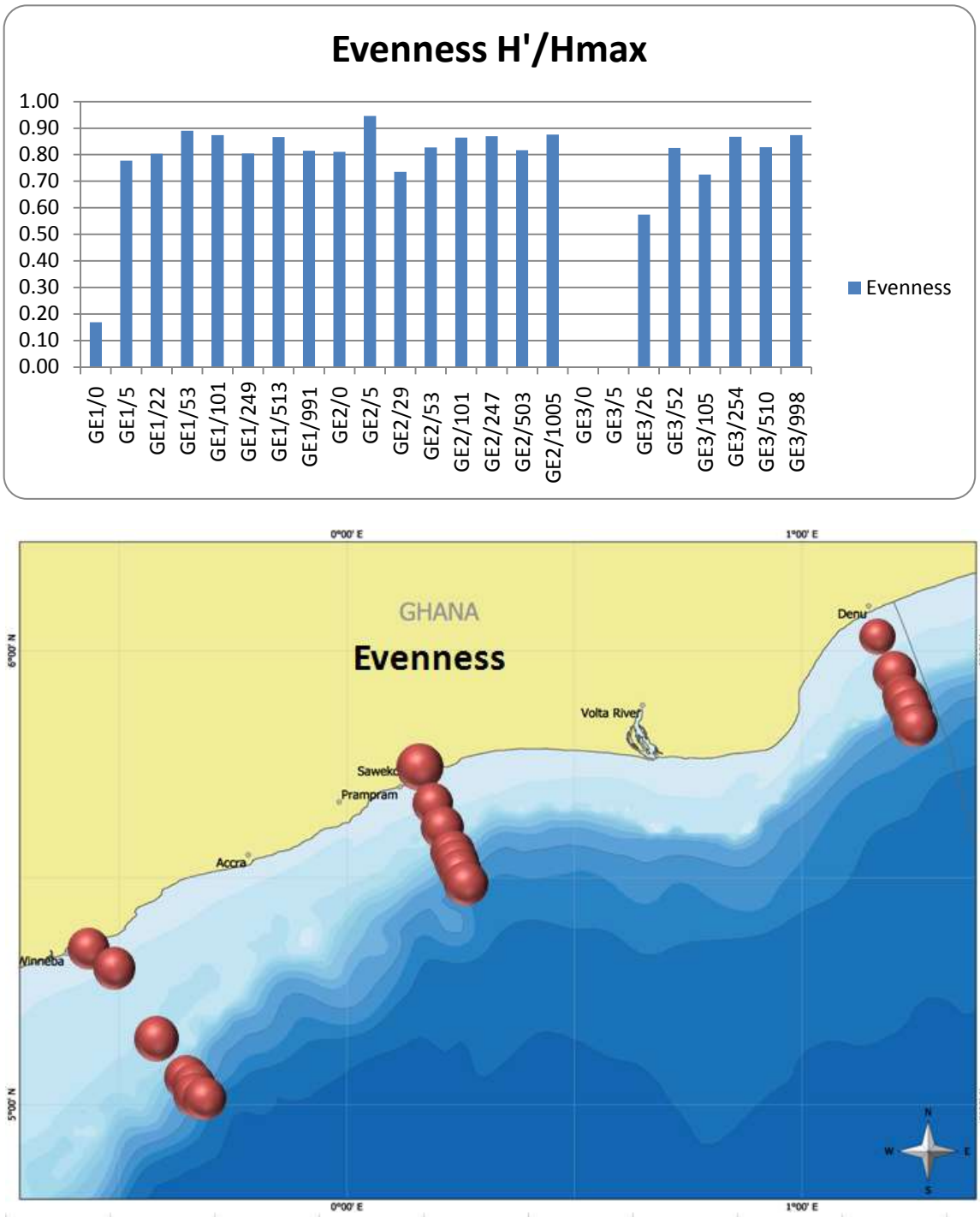
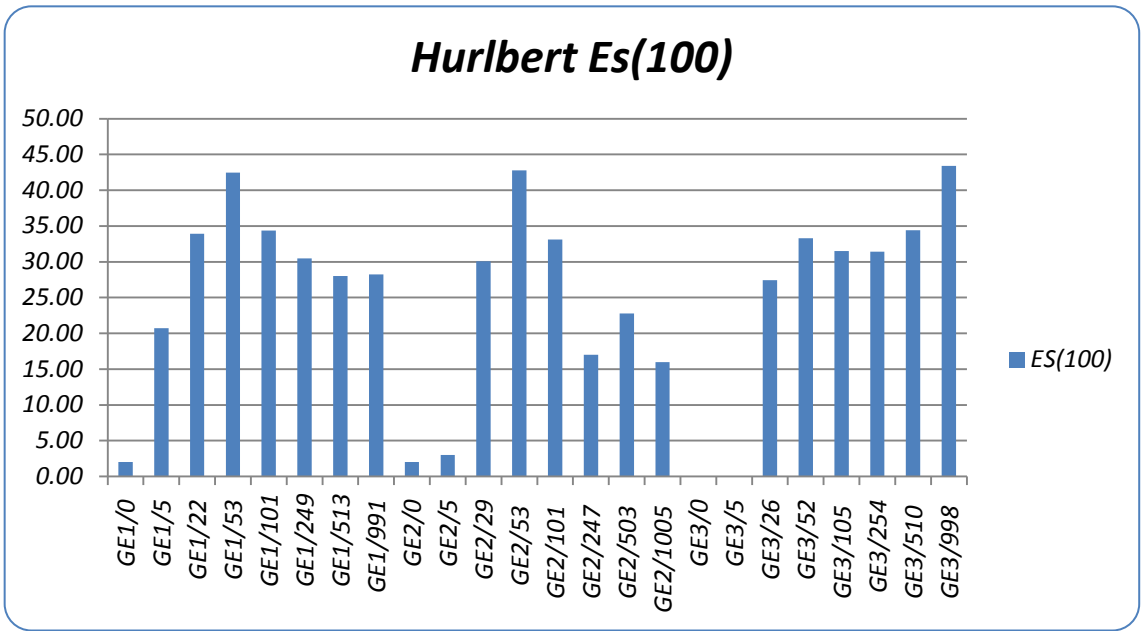


Figure 5.3.8-9 Evenness (J) for each station along the transects of Ghana East, GE1, GE2 and GE3. The size of the circles illustrates the relative the relative evenness at each station.



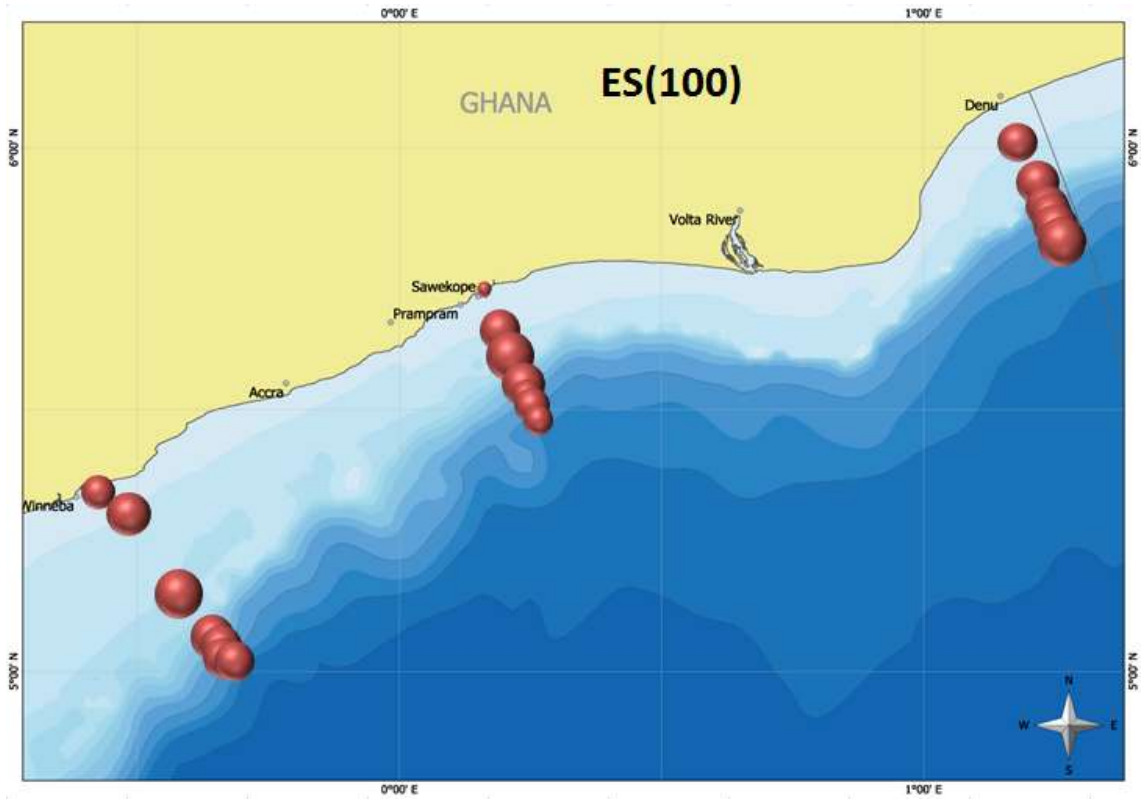


Figure 5.3.8-9 Es (100) for each station along the transects of Ghana East, GE1, GE2 and GE3. The size of the circles illustrates the relative the relative evenness at each station.

Table 5.3.3 Distribution of taxa in geometric groups for stations along the transect GE1 2011.

GE1/0				
Class	Family-Species	N	%	Cum %
Isopoda	Excirolana sp.	39	97,5	97,5
Mysida	Mysida	1	2,5	100,0

GE1/5				
Class	Family-Species	N	%	Cum %
Polychaeta	Orbiniidae	52	23,2	23,2
Ophiuroidea	Amphioplus archeri	32	14,3	37,5
Polychaeta	Ampharetidae	22	9,8	47,3
Polychaeta	Lumbrineridae	18	8,0	55,4
Polychaeta	Oweniidae	17	7,6	62,9
Amphipoda	Urothoidae	12	5,4	68,3
Polychaeta	Nephtyidae	12	5,4	73,7
Polychaeta	Cirratulidae	10	4,5	78,1
Polychaeta	Maldanidae	8	3,6	81,7
Amphipoda	Ampeliscidae	6	2,7	84,4
Bivalvia	Bivalvia juv.	6	2,7	87,1

GE1/22				
Class	Family-Species	N	%	Cum %
Amphipoda	Ampeliscidae	93	14,4	14,4
Bivalvia	Veneridae	59	9,1	23,6
Polychaeta	Terebellidae	46	7,1	30,7
Polychaeta	Eunicidae	36	5,6	36,3
Anomura	Anomura	33	5,1	41,4
Polychaeta	Lumbrineridae	29	4,5	45,9
Polychaeta	Ampharetidae	29	4,5	50,4
Bivalvia	Donax sp.	24	3,7	54,1
Polychaeta	Maldanidae	23	3,6	57,7
Polychaeta	Glyceridae	22	3,4	61,1

GE1/53				
Class	Family-Species	N	%	Cum %
Amphipoda	Ampeliscidae	22	16,4	16,4
Polychaeta	Eunicidae	10	7,5	23,9
Polychaeta	Maldanidae	8	6,0	29,9
Bivalvia	Veneridae	6	4,5	34,3
Polychaeta	Syllidae	5	3,7	38,1
Nemertea		5	3,7	41,8
Bivalvia	Donacidae	4	3,0	44,8
Polychaeta	Glyceridae	4	3,0	47,8
Polychaeta	Amphinomidae	4	3,0	50,7
Polychaeta	Terebellidae	4	3,0	53,7

GE1/101				
Class	Family-Species	N	%	Cum %
Bivalvia	Nuculana	22	18,6	18,6
Polychaeta	Amphinomidae	11	9,3	28,0
Polychaeta	Lumbrineridae	8	6,8	34,7
Bivalvia	Nuculanidae	7	5,9	40,7
Amphipoda	Ampeliscidae	5	4,2	44,9
Bivalvia	Veneridae	5	4,2	49,2
Polychaeta	Phyllodocidae	5	4,2	53,4
Polychaeta	Onuphidae	5	4,2	57,6
Polychaeta	Paraonidae	4	3,4	61,0
Polychaeta	Ampharetidae	4	3,4	64,4

GE1/249				
Class	Family-Species	N	%	Cum %
Amphipoda	Ampeliscidae	37	15,4	15,4
Sipuncula		37	15,4	30,8
Bivalvia	Nuculanidae	16	6,7	37,5
Bivalvia	Donacidae	15	6,3	43,8
Polychaeta	Cirratulidae	13	5,4	49,2
Polychaeta	Polychaeta	13	5,4	54,6
Polychaeta	Cossuridae	12	5,0	59,6
Polychaeta	Terebellidae	11	4,6	64,2
Polychaeta	Lumbrineridae	10	4,2	68,3
Bivalvia	Veneridae	9	3,8	72,1

GE1/513				
Class	Family-Species	N	%	Cum %
Sipuncula		20	22,0	22,0
Polychaeta	Onuphidae	10	11,0	33,0
Tanaidacea	Apseudidae sp. 3	6	6,6	39,6
Polychaeta	Spionidae	6	6,6	46,2
Bivalvia	Veneridae	5	5,5	51,6
Polychaeta	Maldanidae	4	4,4	56,0
Polychaeta	Polychaeta	4	4,4	60,4
Ophiuroidea	Amphiura atlantidea	4	4,4	64,8
Brachyura	Galatheidae sp. 1	3	3,3	68,1
Astacidea	Astacidea	3	3,3	71,4
Polychaeta	Magelona	3	3,3	74,7
Polychaeta	Flabelligeridae	3	3,3	78,0

GE1/991				
Class	Family-Species	N	%	Cum %
Polychaeta	Maldanidae	31	18,1	18,1
Polychaeta	Cirratulidae	27	15,8	33,9
Bivalvia	Veneridae	19	11,1	45,0
Polychaeta	Spionidae	10	5,8	50,9
Polychaeta	Polychaeta	10	5,8	56,7
Bivalvia	Veneroidea	8	4,7	61,4
Ostracoda	Podocopa sp. 1	7	4,1	65,5
Tanaidacea	Apseudes sp.	5	2,9	68,4
Polychaeta	Paraonidae	5	2,9	71,3
Bivalvia	Nuculana	4	2,3	73,7
Bivalvia	Cuspidariidae	4	2,3	76,0
Polychaeta	Glyceridae	4	2,3	78,4
Polychaeta	Lumbrineridae	4	2,3	80,7

Table 5.3.4 Distribution of taxa in geometric groups for stations along the transect GE2 2011.

GE2/0				
Class	Family-Species	N	%	Cum %
Isopoda	Excirolana sp.	3	75,0	75,0
Polychaeta	Orbiniidae	1	25,0	100,0

GE2/5				
Class	Family-Species	N	%	Cum %
Ophiuroidea	Amphioplus archeri	2	50,0	50,0
Bivalvia	Cardiocardita lacunosa	1	25,0	75,0
Polychaeta	Polynoidae	1	25,0	100,0

GE2/29				
Class	Family-Species	N	%	Cum %
Bivalvia	Veneridae	129	28,0	28,0
Polychaeta	Spionidae	37	8,0	36,0
Polychaeta	Oweniidae	30	6,5	42,5
Bivalvia	Nucula	27	5,9	48,4
Polychaeta	Lumbrineridae	26	5,6	54,0
Polychaeta	Eunicidae	21	4,6	58,6
Amphipoda	Ampeliscidae	20	4,3	62,9
Bivalvia	Donacidae	19	4,1	67,0
Polychaeta	Glyceridae	14	3,0	70,1
Polychaeta	Terebellidae	10	2,2	72,2

GE2/53				
Class	Family-Species	N	%	Cum %
Bivalvia	Veneridae	57	12,6	12,6
Polychaeta	Onuphidae	48	10,6	23,1
Amphipoda	Ampeliscidae	41	9,0	32,2
Ophiuroidea	Amphipholis nudipora	19	4,2	36,3
Polychaeta	Magelona	18	4,0	40,3
Bivalvia	Donacidae	16	3,5	43,8
Polychaeta	Terebellidae	15	3,3	47,1
Polychaeta	Polynoidae	12	2,6	49,8
Polychaeta	Cirratulidae	12	2,6	52,4
Polychaeta	Syllidae	11	2,4	54,8
Polychaeta	Maldanidae	11	2,4	57,3

GE2/101				
Class	Family-Species	N	%	Cum %
Bivalvia	Nuculana commutata	35	13,8	13,8
Bivalvia	Nuculanidae	22	8,7	22,4
Polychaeta	Onuphidae	18	7,1	29,5
Amphipoda	Ampeliscidae	15	5,9	35,4
Polychaeta	Eunicidae	14	5,5	40,9
Polychaeta	Maldanidae	14	5,5	46,5
Polychaeta	Lumbrineridae	12	4,7	51,2
Polychaeta	Terebellidae	10	3,9	55,1
Brachyura	Brachyura sp. 10	8	3,1	58,3
Polychaeta	Ampharetidae	8	3,1	61,4

GE2/247				
Class	Family-Species	N	%	Cum %
Polychaeta	Nereididae	13	23,6	23,6
Polychaeta	Spionidae	8	14,5	38,2
Polychaeta	Polychaeta	7	12,7	50,9
Polychaeta	Glyceridae	4	7,3	58,2
Ophiuroidea	Ophiophragmus acutispina	4	7,3	65,5
Polychaeta	Eunicidae	3	5,5	70,9
Polychaeta	Polynoidae	2	3,6	74,5
Polychaeta	Onuphidae	2	3,6	78,2
Polychaeta	Ampharetidae	2	3,6	81,8
Holothuroidea	Synaptidae	2	3,6	85,5
Ophiuroidea	Amphiura chiajei	2	3,6	89,1

GE2/503				
Class	Family-Species	N	%	Cum %
Polychaeta	Maldanidae	25	24,3	24,3
Sipuncula		18	17,5	41,7
Bivalvia	Nuculana	11	10,7	52,4
Polychaeta	Cirratulidae	7	6,8	59,2
Polychaeta	Lumbrineridae	6	5,8	65,0
Polychaeta	Magelona	5	4,9	69,9
Bivalvia	Veneridae	4	3,9	73,8
Bivalvia	Nuculanidae	3	2,9	76,7
Polychaeta	Glyceridae	3	2,9	79,6
Polychaeta	Nereididae	3	2,9	82,5

GE2/1005				
Class	Family-Species	N	%	Cum %
Polychaeta	Maldanidae	8	33,3	33,3
Amphipoda	Amphipoda indet.	2	8,3	41,7
Cumacea	Cumacea sp. 2	1	4,2	45,8
Ostracoda	Podocopa sp. 2	1	4,2	50,0
Ostracoda	Myodocopa sp. 7	1	4,2	54,2
Isopoda	Quantanthura sp.	1	4,2	58,3
Amphipoda	Phoxocephalidae	1	4,2	62,5
Bivalvia	Veneridae	1	4,2	66,7
Bivalvia	Donacidae	1	4,2	70,8
Bivalvia	Bathyarca pectunculoides	1	4,2	75,0

Table 5.3.5 Distribution of taxa in geometric groups for stations along the transect GE3 2011.

GE3/26				
Class	Family-Species	N	%	Cum %
Bivalvia	Veneridae	871	29,6	29,6
Amphipoda	Ampeliscidae	697	23,7	53,3
Polychaeta	Eunicidae	214	7,3	60,6
Polychaeta	Syllidae	138	4,7	65,2
Polychaeta	Lumbrineridae	113	3,8	69,1
Amphipoda	Gammaridea sp. 1	73	2,5	71,6
Bivalvia	Timoclea	51	1,7	73,3
Gastropoda	Rissoidae	41	1,4	74,7
Tanaidacea	Pseudoloeptochelia sp.	36	1,2	75,9
Polychaeta	Cirratulidae	35	1,2	77,1

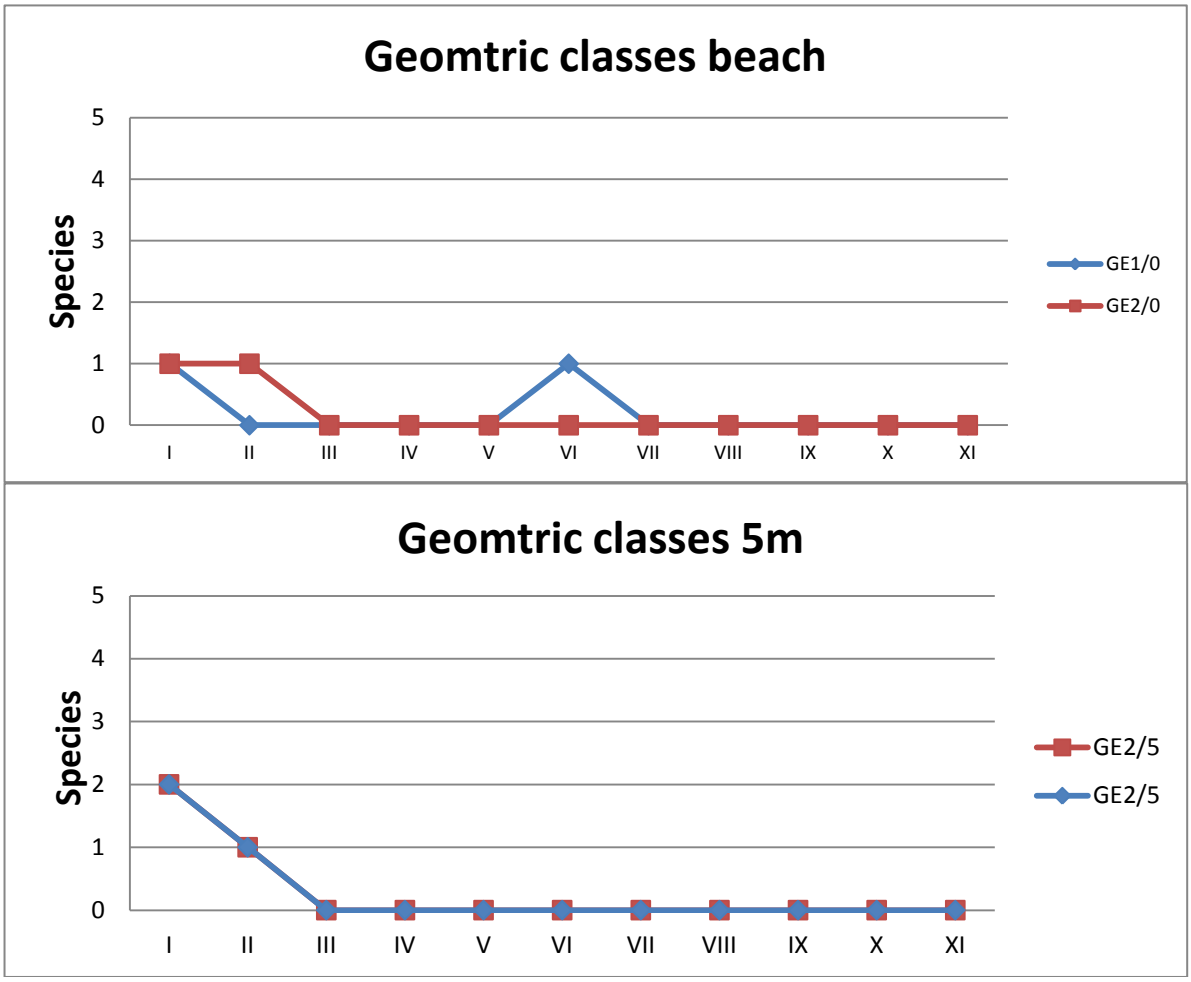
GE3/52				
Class	Family-Species	N	%	Cum %
Amphipoda	Ampeliscidae	29	16,6	16,6
Polychaeta	Onuphidae	21	12,0	28,6
Polychaeta	Eunicidae	17	9,7	38,3
Polychaeta	Maldanidae	14	8,0	46,3
Ophiuroidea	Ophiura grubei	12	6,9	53,1
Ophiuroidea	Ophiopsila guineensis	8	4,6	57,7
Polychaeta	Flabelligeridae	7	4,0	61,7
Ophiuroidea	Amphipholis nudipora	5	2,9	64,6
Polychaeta	Polynoidae	4	2,3	66,9
Polychaeta	Lumbrineridae	4	2,3	69,1
Polychaeta	Terebellidae	4	2,3	71,4
Ophiuroidea	Ophiophragmus acutispina	4	2,3	73,7

GE3/105				
Class	Family-Species	N	%	Cum %
Polychaeta	Onuphidae	145	35,6	35,6
Amphipoda	Ampeliscidae	20	4,9	40,5
Bivalvia	Nuculana	20	4,9	45,5
Polychaeta	Lumbrineridae	20	4,9	50,4
Polychaeta	Ampharetidae	15	3,7	54,1
Bivalvia	Nuculanidae	14	3,4	57,5
Polychaeta	Eunicidae	12	2,9	60,4
Brachyura	Brachyura sp. 10	10	2,5	62,9
Polychaeta	Terebellidae	10	2,5	65,4
Sipuncula		10	2,5	67,8

GE3/254				
Class	Family-Species	N	%	Cum %
Sipuncula		20	10,4	10,4
Polychaeta	Onuphidae	19	9,9	20,3
Polychaeta	Maldanidae	16	8,3	28,6
Polychaeta	Nereididae	15	7,8	36,5
Polychaeta	Paraonidae	13	6,8	43,2
Ophiuroidea	Ophiophragmus acutispina	12	6,3	49,5
Polychaeta	Ampharetidae	8	4,2	53,6
Polychaeta	Glyceridae	7	3,6	57,3
Polychaeta	Lumbrineridae	7	3,6	60,9
Polychaeta	Polychaeta	7	3,6	64,6

GE3/510				
Class	Family-Species	N	%	Cum %
Polychaeta	Maldanidae	26	17,7	17,7
Tanaidacea	Apseudidae sp. 1	15	10,2	27,9
Bivalvia	Nuculidae	12	8,2	36,1
Bivalvia	Nuculanidae	11	7,5	43,5
Polychaeta	Polychaeta	11	7,5	51,0
Isopoda	Quantanthura sp.	9	6,1	57,1
Polychaeta	Magelona	7	4,8	61,9
Polychaeta	Cirratulidae	7	4,8	66,7
Polychaeta	Nereididae	3	2,0	68,7
Polychaeta	Spionidae	3	2,0	70,7

GE3/998				
Class	Family-Species	N	%	Cum %
Polychaeta	Onuphidae	15	10,5	10,5
Polychaeta	Maldanidae	15	10,5	21,0
Polychaeta	Capitellidae	13	9,1	30,1
Polychaeta	Polychaeta	10	7,0	37,1
Isopoda	Quantanthura sp.	7	4,9	42,0
Polychaeta	Spionidae	6	4,2	46,2
Polychaeta	Nereididae	5	3,5	49,7
Amphipoda	Amphipoda indet.	4	2,8	52,4
Polychaeta	Eunicidae	4	2,8	55,2
Polychaeta	Cirratulidae	4	2,8	58,0


Geomtric classes beach
Species
5
4
3
2
1
0
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
GE1/0
GE2/0
Geomtric classes 5m
Species
5
4
3
2
1
0
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
GE2/5
GE2/5

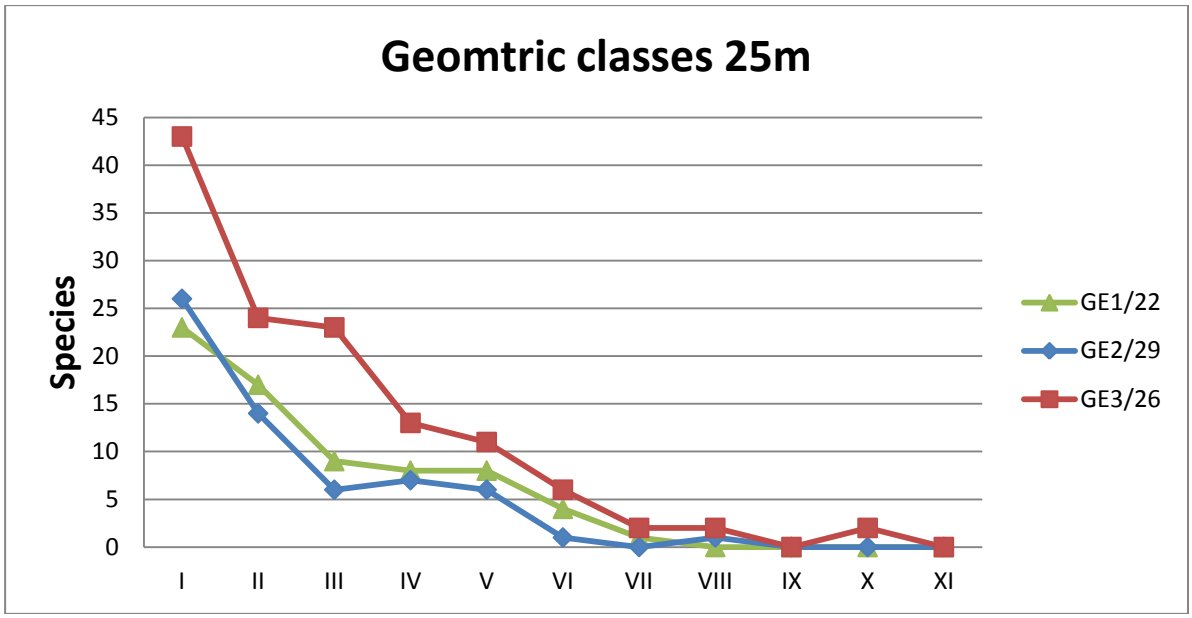
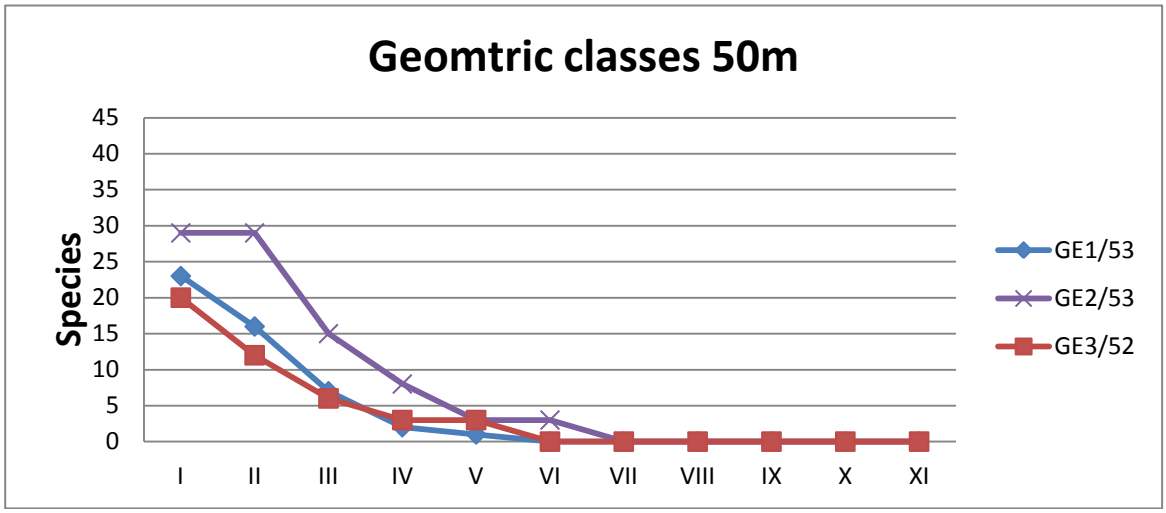


Figure 5.3.13-16 Number of taxa in geometrical classes along depths from shorline to 25 meters.



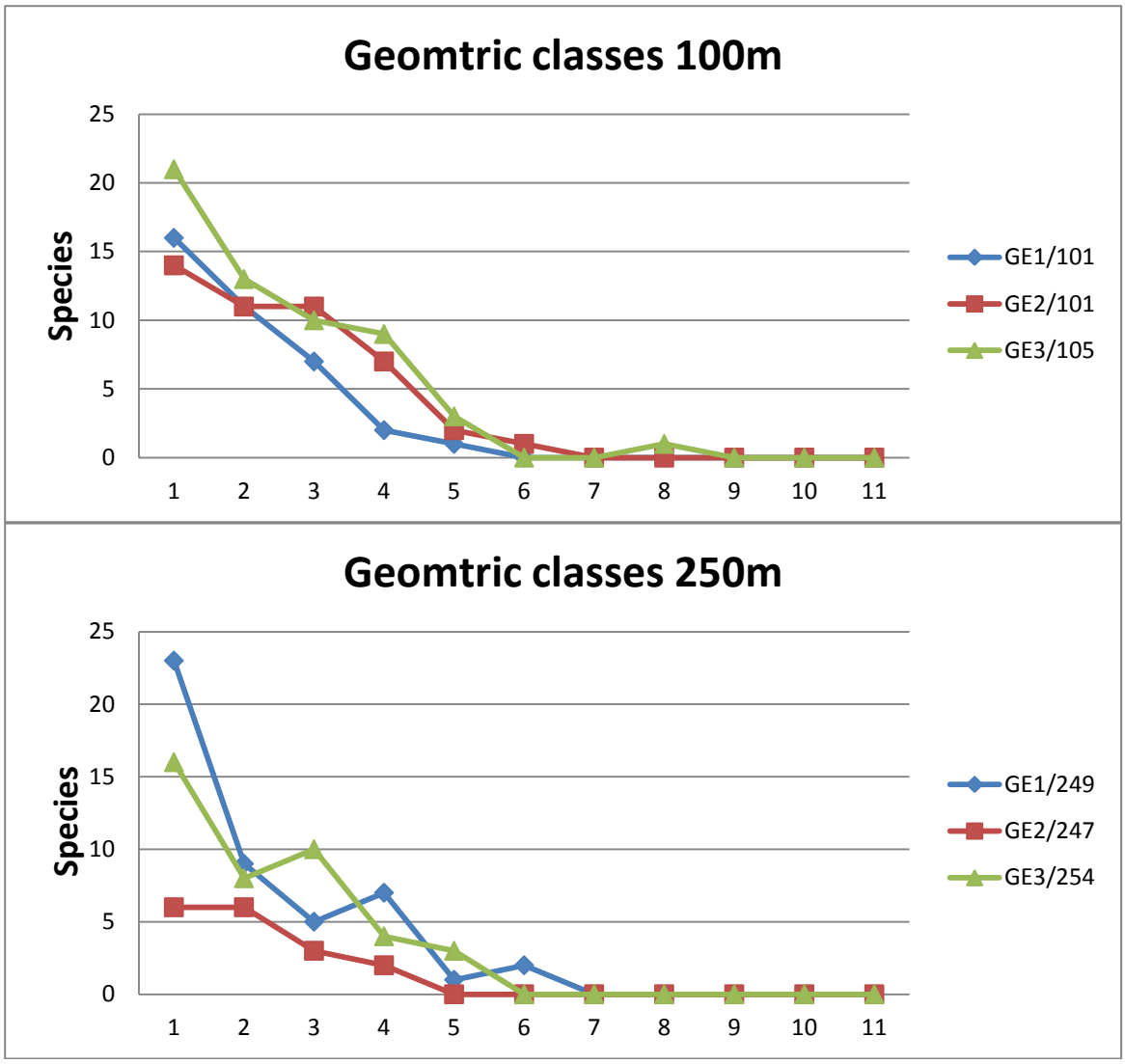


Figure 5.3.17-19 Number of taxa in geometrical classes along depths from 50 to 250 meters.

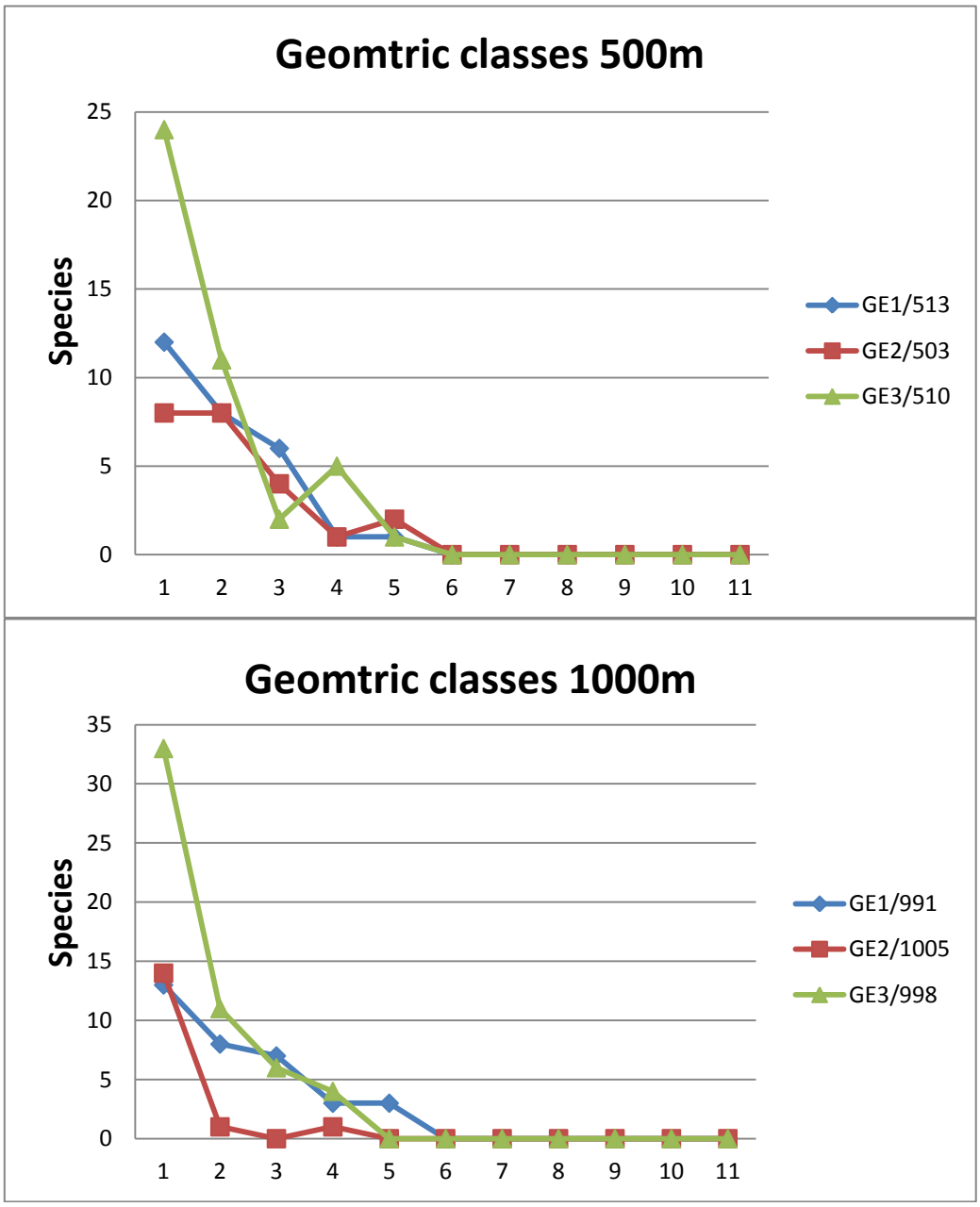


Figure 5.3.20-21 Number of taxa in geometrical classes along depths from 500 to 1000 meters.

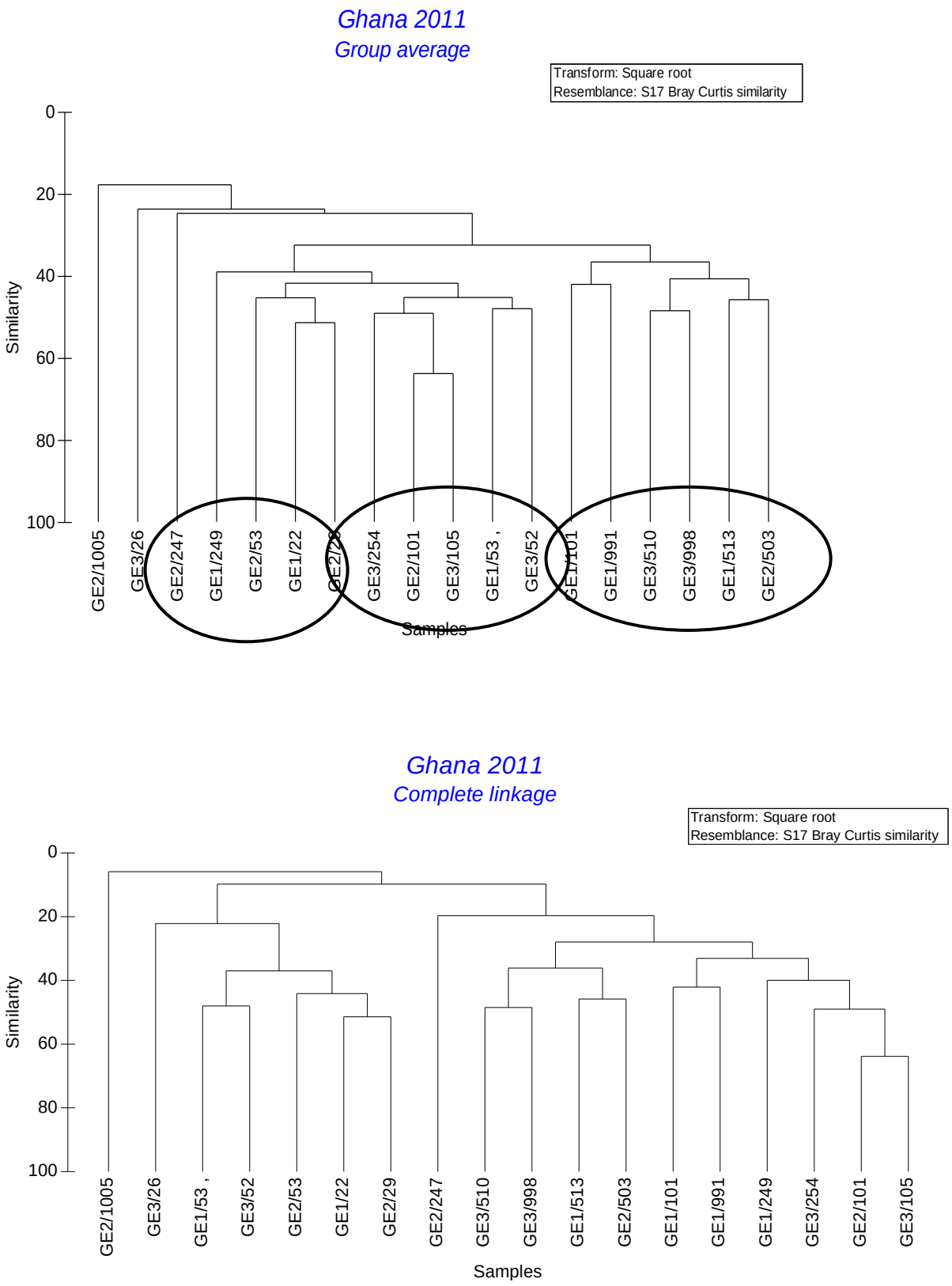


Figure 5.2.22 Dendrograms showing the similarity between fauna from sampling stations along the transects of Ghana East, GE1, GE2 and GE3. The dataset was root transformed.

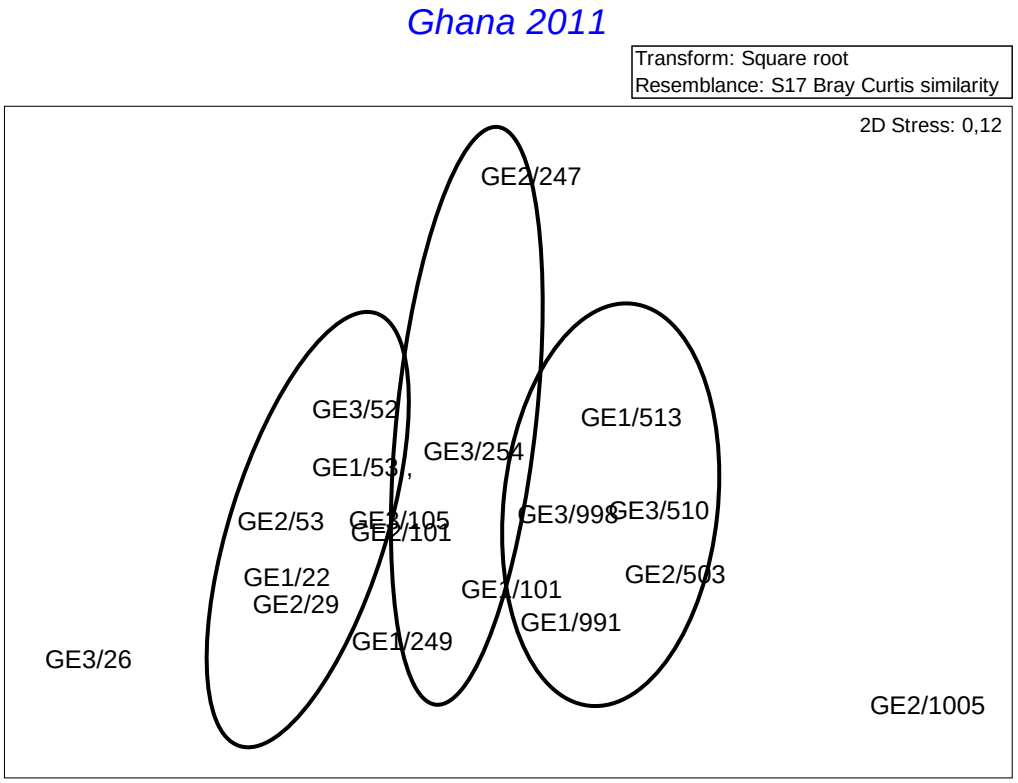


Figure 5.3.23 A two-dimensional plot of the MDS analyses of the transects of Ghana East, GE1, GE2 and GE3. The dataset was standardised and fourth root transformed.

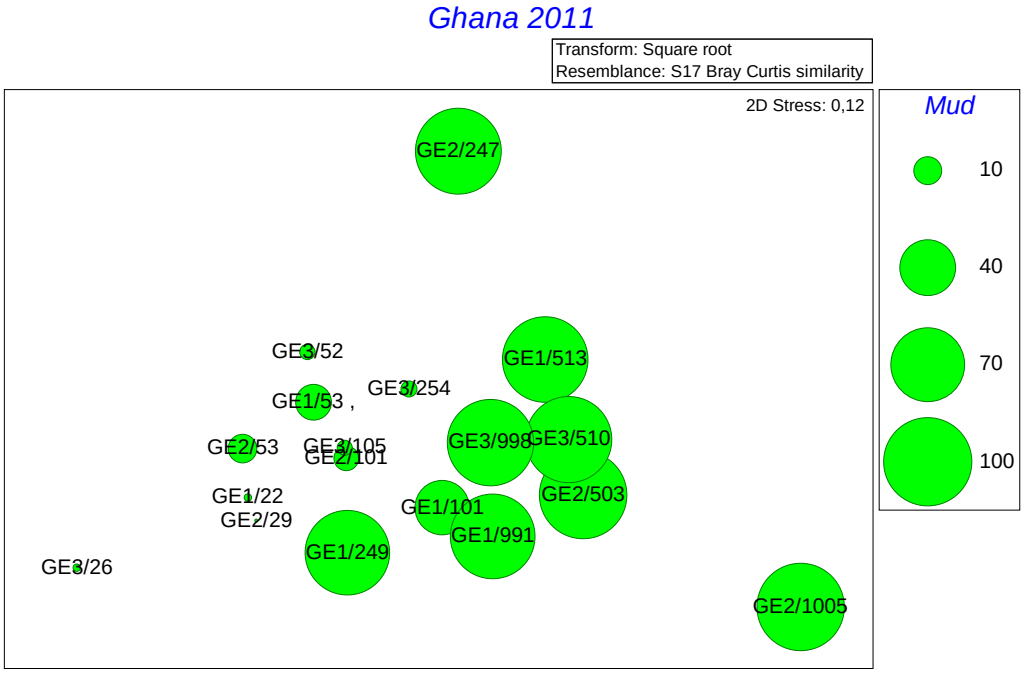


Figure 5.3.24 PCA analyses of the abiotic parameters along the transects of Ghana East, GE1, GE2 and GE3.The x-axis explains 32.3 % of the variation in faunal distribution, while 22.9 % is explained by the y-axis.

6. SUMMARY

The sampling in 2011 consisted of three transects of 8 stations ranging from 0 m (shoreline) to around 1000 m depth. The first transect was located in the central parts of the Ghana coast, while the second and third to the east of the Volta River delta.
The investigation included sediment sampling for analysis of grain size, chemical content and benthic fauna. The sampling was executed according to the OSPAR guidelines for sediment monitoring in offshore oil production areas. The sediment sampling was carried out by a scientific crew from Ghana under the supervision of technicians from the IMR

CTD profiles were deployed at along the three sediment sampling transects. The determined parameters include temperature, conductivity, dissolved oxygen and fluorescence. The investigation also included multibeam seabed mapping and mapping of the currents using the ADCP. The multibeam survey covered an area between Winneba and the border to Togo.

During the survey, local scientists were trained in the sampling methodology and equipment operation.

The temperature distribution exhibits conditions characteristic to late spring, prior to the onset of the upwelling season. The thermocline was depressed to a 30 m depth. The data suggest a downwelling. At the offshore end, the vertical structure of the water column exhibits a salinity maximum, $S > 36$ and a drop in oxygen concentration < 3 ml l^{-1}, located just below the thermocline.

The deepest areas of the transects contained mostly fine grained sediments, while coarser sand and gravel was found in the shallow parts of the transects. The total organic matter of the sediment corresponded mostly with were the fine grained material was found in the deeper parts of the area.

PCB-levels were not detected in the material. For other parameters only low walues were found for PAH NPD's and THC. The analysis of metals show generally low values associated with background levels with no risk of biological impact. Most of the metals showed increasing concentrations with depth and reduced grain size.
The detection limit for the chemical analyses of pesticides were too high to detect any elevated values in the 2010 material and therefore not included in the 2011 analysis.
The bottom fauna show no signs of disturbance by human activity ecsept for the GE3/26 that shows signs of what we suspect to be organic enrichment. Shallow areas were generally rich in both species and individuals, while fewer species and individuals were detected in the deepest sampling sites.

Altogether, the results suggests a benthic environment of good condition. The survey data will be the third contribution to the environmental baseline and finishes the coverage of the Ghana coast.

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8. LIST OF ABBREVIATIONS

Ba	Barium
Cd	Cadmium
CDCF	Centre for development cooperation in fisheries.
Cu	Copper
CTD	Conductivity, Temperature and Density
DGPS	Differential Global Positioning System
ES_{100}	Expected number of species in a 100 specimens sample
Fe	Iron
GC/FID	Gas chromatography with flame ionization detector
GC/MS	Gas chromatography with mass selective detector
GPS	Global Positioning System
H'	Shannon-Wiener diversity
Hg	Mercury
IMR	Institute of Marine Research
J	Pielou's measure of evenness
MDS	Multidimensional scaling
NPD	Naphthalene, Phenathrene/Anthracene, Dibenzothiophene and their C_1-C_3 homologues
NS	Norwegian Standard
PAH	Polycyclic Aromatic Hydrocarbons, including NPDs and 3-6 ring aromatics
Pb	Lead
SAM	Section of applied environmental research
THC	Total Hydrocarbon Content
TOM	Total Organic Material
UCC	University of Cape Coast
Zn	Zinc

9. APPENDIX

Content of the Appendix
Akkreditations dokument Eurofins
Map of sampling stations in 2009, 2010 and 2011.
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- Sampling Journal
- Species list
- Table of geometrical groups

Dendrograms in Primer
Chemistry
- Metals
- Hydrocarbons
- PCB
- NDP's
- PAH's
- Sediment characteristics

CTD stations
Trawl stations

SAMPLING JOURNAL Sign. in: Page nr: 1 of 24

Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m)
		Longitude	Latitude	22 m
GE-1/22	20.04.11	-0,5214	5,3048	Positioning control

Weather: Sunny	Wind: Calm	Wave height (m):
Time Start: 09:58	Time Finish: 13:30	Duration: 3 hr 32 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes) Short arm.		

Type of bottom sediment: Sandy with shell fragments.			
Color: 7,5 YR 4/3	Odor:		
Observation of animals: Crab, shrimp	No. rejected samples:		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	11	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		No
2	14	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	s		No
3	14	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	s		No

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	10	1			Sa	
5	14	5			Sa	
6	10	1			Sa	
7	11	10			Sa	
8	14	7			Sa	

SAMPLING JOURNAL Sign. in: Page nr: 2 of 24

Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 53
		Longitude	Latitude	
GE-1/53	20/4-11	-0,4254	5,1522	Positioning control

Weather: Sunny	Wind:	Wave height (m):
Time Start: 14:30	Time Finish: 20:00	Duration: 5 hr 30min
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Sand			
Color: 5 Y 4/1 Dark grey	Odor:		
Observation of animals:	No. rejected samples: 1		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	16	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		
2	13	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1		L	+	
3	12	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1		L	+	

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	5	4			L	+
5	12	3			L	+
6	8	5			L	+
7	12	3			L	+
8	10	3			L	+

Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 101m
		Longitude	Latitude	
GE-1/101	20/4-11	-0,3589	5,0691	Positioning control

Weather: Dark	Wind: Breeze	Wave height (m):
Time Start: 20:10/08:20	Time Finish: 21:11 /10:35	Duration: 4 hr
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Sand and silt			
Color: 5Y, 4/2 Olive gray	Odor:		
Observation of animals: Polychaets	No. rejected samples:		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	5	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		
2	5	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S		
3	7	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	Full	6			Sa	
5	5	4			Sa	
6	7	6		1 of 6 is preserved in alcohol	Sa	
7	6	2			Sa	
8	11	2			Sa	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 249m
		Longitude	Latitude	
GE-1/249	21/4-11	-0,3428	5,0530	Positioning control

Weather: Sunny	Wind: Calm	Wave height (m):
Time Start: 13:19	Time Finish: 21:25	Duration: 8 hr 6 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Sandy / silt with shell fragments			
Color: 5Y, 4/2 Olive grey	Odor:		
Observation of animals: Polychaeta	No. rejected samples:		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	9	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		
2	10	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S		
3	8	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	Full	6			L	+
5	Full	5			L	+
6	Full	5		Large echinoidea in ethanol in a bucket.	L	+
7	11	2			S	
8	9	3		Lost the grab due to cable breakage.	S	

SAMPLING JOURNAL Sign. in: Page nr: 5 of 24

Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 515m
		Longitude	Latitude	
GE-1/515	22/4-11	-0,3397	5.0297	Positioning control

Weather: Sunny	Wind: Calm	Wave height (m):
Time Start: 06:10	Time Finish: 18:00	Duration: 9 hr 50min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Clay.			
Color: 10 Y 3/2, Very dark grayish olive.	Odor:		
Observation of animals: Brittle star, gastropods, sea urchin.	No. rejected samples: 6		
Observation of oil, waste etc:	Empty: 4	Stone:	Open: 2

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	6	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		
2	4	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S		
3	5	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	Full	2		2 of 2 preserved in ethanol	L	+
5	6	2			L	+
6	Full	2		2 of 2 preserved in ethanol	L	+
7	Full	2			L	+
8	Full	2		2 of 2 preserved in ethanol	L	+

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 991m
		Longitude	Latitude	
GE-1/991	22/4-11	-0,3177	5,0230	Positioning control

Weather: Partly clouded	Wind: Small breeze	Wave height (m): 0,5 m
Time Start: 19:15/06:15	Time Finish:	Duration:
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Clay			
Color: 10 Y 3/2 Very dark grayish olive	Odor:		
Observation of animals: Polychaeta and ophiuroidea.	No. rejected samples: 2		
Observation of oil, waste etc:	Empty:	Stone:	Open: 2

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	3	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S	+	
2	3,5	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S	+	
3	4	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S	+	

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	15	1		Volume to small.	S	+
5	Full	1			L	
6	Full	3			L	
7	Full	2		2/2 preserved in ethanol.	L	
8	Full	1			L	
9	Full	1		Sample taken as a replacement for sample 4	S	+

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 29m
		Longitude	Latitude	
GE-2/29	25/4-11	0,1964	5,6607	Positioning control

Weather:	Wind:	Wave height (m):
Time Start: 17:48	Time Finish: 21:13	Duration:
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Fine sand and some corals.			
Color: 10YR 4/3 Brown	Odor:		
Observation of animals:	No. rejected samples:1		
Observation of oil, waste etc:	Empty:1	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	5,5	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	L	Y	N
2	6	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	L	Y	N
3	9,5	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	L	Y	N

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	10,5	5			L	Y
5	7,5	1			L	Y
6	9	6			L	Y
7	6	7		One on ethanol	L	Y
8	10,5	10			L	Y

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 53m
		Longitude	Latitude	
GE-2/53	25/4-11	0,2170	5,6097	Positioning control

Weather: sunny	Wind:	Wave height (m):
Time Start: 14:32	Time Finish: 17:00	Duration: 2 hr. 28 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Fine mineral and shell sand			
Color: 5Y 4/2 olive grey	Odor:		
Observation of animals:	No. rejected samples:0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	6	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		
2	7,5	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S		
3	6	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	5	4		One on ethanol	S	
5	5,5	3		One on ethanol	S	
6	4,5	3		One on ethanol	S	
7	5,5	3		One on ethanol	S	
8	5	3		One on ethanol	S	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 101m
		Longitude	Latitude	
GE-2/101	25/4-11	0,2411	5,5570	Positioning control

Weather: Sunny	Wind: Calm	Wave height (m):
Time Start: 10:50	Time Finish: 14:31	Duration: 3 hr 41 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Sandy mud with shell fragments.			
Color: 10Y, ¾ Dark olive	Odor:		
Observation of animals:	No. rejected samples: 0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	7	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		
2	6	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S		
3	6	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	11	3			S	
5	Full	3			S	
6	5	2			S	
7	7	2			S	
8	6	4		1 of 4 is on ethanol.	S	

SAMPLING JOURNAL Sign. in: Page nr: 10 of 24

Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 247m
		Longitude	Latitude	
GE-2/247	25/4-11	0,2497	5,5350	Positioning control

Weather: Bright & sunny	Wind: Cool breeze	Wave height (m):
Time Start: 06:10	Time Finish: 10:30	Duration: 4 hr 20min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Clay with shell fragments			
Color: 10Y 4/2 Dark grayish olive	Odor:		
Observation of animals: Polychaets and ophiurides	No. rejected samples:0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	8	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		
2	6	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S		
3	6	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	8	2		2/2 preserved in ethanol	S	
5	Full	1			S	
6	Full	1			S	
7	Full	1			S	
8	4	1			S	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 503 m
		Longitude	Latitude	
GE-2/503	24/4-11	0,2583	5,5145	Positioning control

Weather: Sunny	Wind: Breeze	Wave height (m):
Time Start: 15:04	Time Finish: 22:49	Duration: 7 hr 45 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Clay			
Color: 5Y, 4/1 Dark grey	Odor:		
Observation of animals:	No. rejected samples:4		
Observation of oil, waste etc:	Empty:2	Stone:	Open:2

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	2	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		
2	2	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S		
3	3	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	2	1			S	
5	Full	1			L	
6	5	1			L	
7	Full	1			L	
8	Full	3		Small bottle on ethanol.	L	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 1005m
		Longitude	Latitude	
GE-2/1005	24/4-11	0.2706	5,4868	Positioning control

Weather: Sunny	Wind: Cool breeze	Wave height (m):
Time Start: 06:15	Time Finish: 14:23	Duration: 8 hr 8 min. .
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Clay			
Color: 10 Y 3/2 Very dark grayish olive.	Odor:		
Observation of animals: Polychaetes	No. rejected samples:2		
Observation of oil, waste etc:	Empty:	Stone:	Open:2

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	full	1	1	1	1	1	1	1	1	1	1		1	1	1	0-2	1	1	S		Y
2	Full	1	1	1	1	1	1	1	1	1	1		1	1	1	2-4	1	1	S		Y
3	2,5	1	1	1	1	1	1	1	1	1	1		1	1	1	4-6	1	1	S		Y

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	Full	1			L	
5	Full	1			L	
6	Full	1			L	
7	Full	1			S	+
8	Full	1			S	+

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 26m
		Longitude	Latitude	
GE-3/26	7/5-11	1,1980	6.0220	Positioning control

Weather: Sunny	Wind: Calm	Wave height (m):
Time Start: 06:24	Time Finish:	Duration:
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Sand			
Color: 5Y 4/2 Olive grey	Odor:		
Observation of animals:	No. rejected samples:0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	18	1		1		1		1		1			1	1	1	0-2	1		L		
2	14,8	1		1		1		1		1			1	1	1	2-4	1		L		
3	12	1		1		1		1		1			1	1	1	4-6	1		L		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	12	13		Used for chemistry, replaced with sample 9.	L	
5	11	8			L	
6	12	7			L	
7	15	9			L	
8	15,6	6			L	
9	10,9	6			L	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 52m
		Longitude	Latitude	
GE-3/52	7/5-11	1,2359	5,9439	Positioning control

Weather: Sunny	Wind: Calm	Wave height (m):
Time Start: 10:40	Time Finish: 12:20	Duration: 1 hr. 40 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Sand			
Color: 2,5Y 4/2 Dark grayish brown.	Odor:		
Observation of animals:	No. rejected samples:0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	7	1		1		1		1		1			1	1	1	0-2	1		D		
2	5,5	1		1		1		1		1			1	1	1	2-4	1		D		
3	6	1		1		1		1		1			1	1	1	4-6	1		D		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	Full	4			L	
5	7	3 (4)		1 extra tube on ethanol	Duo	
6	5,5	3			Duo	
7	6	3			Duo	
8	7	3			Duo	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 105 m
		Longitude	Latitude	
GE-3/105	7/5-11	1,2552	5,8974	Positioning control

Weather: Clear	Wind: moderate	Wave height (m):
Time Start: 12:57	Time Finish: 15:15	Duration: 2 hr 18 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Silt			
Color: 5YR 4/2 Olive grey	Odor:		
Observation of animals:	No. rejected samples: 0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	5	1		1		1		1		1			1	1	1	0-2	1		D		
2	6	1		1		1		1		1			1	1	1	2-4	1		D		
3	6	1		1		1		1		1			1	1	1	4-6	1		D		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	7	2			D	
5	6,5	2			D	
6	6,5	3			D	
7	8	3		1 on ethanol	D	
8	6				D	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 254m
		Longitude	Latitude	
GE-3/254	7/5-11	1,2616	5,8833	Positioning control

Weather: Clear	Wind: Moderate	Wave height (m):
Time Start: 15:42	Time Finish:	Duration:
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Silt and clay			
Color: 5Y 4/1 Dark grey	Odor:		
Observation of animals:	No. rejected samples:		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	12	1		1		1		1		1			1	1	1	0-2	1		D		
2	13	1		1		1		1		1			1	1	1	2-4	1		D		
3	10	1		1		1		1		1			1	1	1	4-6	1		D		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	9	2			Duo	
5	7	2			Duo	
6	9	2			Duo	
7	7	2			Duo	
8	10	1			Duo	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 510m
		Longitude	Latitude	
GE-3/510	7/5-11	1,2719	5,8608	Positioning control

Weather:	Wind: calm	Wave height (m):
Time Start: 18:30	Time Finish: 22:10	Duration: 3 hr 40 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Clay			
Color: 5Y 4/1 Dark grey	Odor:		
Observation of animals:	No. rejected samples:2		
Observation of oil, waste etc:	Empty:2	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	7	1		1		1		1		1			1	1	1	0-2	1		D		
2	4	1		1		1		1		1			1	1	1	2-4	1		D		
3	3	1		1		1		1		1			1	1	1	4-6	1		D		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	7	2			Duo	
5	4	1			Duo	
6	3	1			Duo	
7	4,5	1		Wall not inserted	Duo	
8	3,5	1		Wall not inserted	Duo	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 998m
		Longitude	Latitude	
GE-3/998	7/5-11	1,2844	5,8294	Positioning control

Weather:	Wind:	Wave height (m):
Time Start: 23:03	Time Finish:	Duration:
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Soft clay			
Color: 5Y 4/1 Dark grey	Odor:		
Observation of animals:	No. rejected samples: 2		
Observation of oil, waste etc:	Empty: 2	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	5	1		1		1		1		1			1	1	1	0-2	1		D		
2	3	1		1		1		1		1			1	1	1	2-4	1		D		
3	1,5	1		1		1		1		1			1	1	1	4-6	1		D		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	3	1			Duo	
5	4	1			Duo	
6	1,5	1			Duo	
7	4,5	1			Duo	
8	1,5	2	1	0,5 mm fraction in one bottle.	Duo	

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 0m
		Longitude	Latitude	
GE-1/0	28/4-11	00º34'814 W	05º20'888 N	Positioning control: Garmin 76 csx

Weather: Sunny	Wind: fresh breeze	Wave height (m):
Time Start: 11:00	Time Finish: 16:43	Duration: 5 hr 43 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Sand			
Color: 2,5 Y 6/2 Light brownish grey	Odor:		
Observation of animals:	No. rejected samples: 0		
Observation of oil, waste etc: Lots of litter and old fish nets.	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1		1		1		1		1		1			1	1	1	0-2	1		B		
2		1		1		1		1		1			1	1	1	2-4	1		B		
3		1		1		1		1		1			1	1	1	4-6	1		B		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	4*Full	1			HG	+
5	4*Full	1			HG	+
6	4*Full	1			HG	+
7	4*Full	1			HG	+
8	4*Full	1			HG	+

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 5 m
		Longitude	Latitude	
GE-1/6	28/4-11	500 m west of	GE-1/0	Positioning control

Weather:	Wind:	Wave height (m):
Time Start: 15:02	Time Finish: 16:43	Duration:
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Fine compact sand			
Color: 10Y-5GY 3/2 Very dark grayish olive	Odor:		
Observation of animals: Ophiuridea	No. rejected samples: 0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	5	1		1		1		1		1		From beach	1	1	1	0-5	1		B		
2	5	1		1		1		1		1		From beach	1	1	1				B		
3	5	1		1		1		1		1		From beach	1	1	1				B		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	4,5	1			HG	+
5	3,5	1			HG	+
6	3,5	1			HG	+
7						
8						

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m) 0
		Longitude	Latitude	
GE-2/0	29/4-11	00º09'948 E	05º44'036 N	Positioning control

Weather: Sunny	Wind: Breeze	Wave height (m):
Time Start: 11:30	Time Finish: 12:56	Duration: 1 hr 26 min
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Sand and shellsand rocky shore			
Color: 10 YR 8/2 Very pale brown	Odor:		
Observation of animals:	No. rejected samples: 0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1		1		1		1		1		1		From beach	1	1	1	0-2	1		B		
2		1		1		1		1		1		From beach	1	1	1	2-4	1		B		
3		1		1		1		1		1		From beach	1	1	1	4-6	1		B		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	4* Full	1			HG	+
5	4* Full	1			HG	+
6	4* Full	1			HG	+
7	4* Full	2			HG	+
8	4* Full	1			HG	+

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.: Denu	Date:	Position		Depth (m) 0m Shoreline
		Longitude	Latitude	
GE-3/0	29/4-11	01º09`724 E	06º05`729 N	Positioning control

Weather: Overcast	Wind: Breeze	Wave height (m):
Time Start: 16:15/08:20	Time Finish: 18:06/11:50	Duration: 1 hr 51 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: sand/shellsand			
Color: 10Y 8/2 Very pale brown	Odor:		
Observation of animals:	No. rejected samples: 0		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1		1		1		1		1		1			1	1	1	0-2	1		B		
2		1		1		1		1		1			1	1	1	2-4	1		B		
3		1		1		1		1		1			1	1	1	4-6	1		B		

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	4* Full	3			HG	+
5	4* Full	6			HG	+
6	4* Full	3			HG	+
7	4* Full	1			HG	+
8	4* Full	2			HG	+

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.: Denu	Date:	Position		Depth (m) 5m
		Longitude	Latitude	
GE-3/5	30/4-11			Positioning control

Weather: overcast	Wind: breeze	Wave height (m):
Time Start: 08:20	Time Finish: 11:50	Duration: 3 hr 30 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Fine sand			
Color: 5Y 3/2 Dark olive grey	Odor:		
Observation of animals:	No. rejected samples:		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	5	1		1		1		1		1						0-5	1		HG	+	
2	5	1		1		1		1		1									HG	+	
3	5	1		1		1		1		1									HG	+	

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4				Lost due to rough sea.	HG	+
5					HG	+
6					HG	+
7						
8						

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m)
		Longitude	Latitude	
GE-2/5	30/4-11	*00º11'018 E	*05º44'402 N	Positioning control * Beach position.

Weather: Overcast	Wind: Light air	Wave height (m):
Time Start: 15:16	Time Finish: 16:40	Duration: 1 hr 24 min.
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment: Fine sand			
Color: 10Y-5GY 3/2 Very dark grayish olive	Odor:		
Observation of animals:	No. rejected samples:		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1	5	1		1		1		1		1						0-5	1		HG	+	
2	5	1		1		1		1		1									HG	+	
3	5	1		1		1		1		1									HG	+	

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4	2	1			HG	+
5	2	1			HG	+
6	3,5	1			HG	+
7						
8						

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Vessel: RV Dr. Fritjof Nansen	Area: Ghana east	Project code: 80 52 53	Survey nr: 2011404 Ghana east

Grab station nr.:	Date:	Position		Depth (m)
		Longitude	Latitude	
GH				Positioning control

Weather:	Wind:	Wave height (m):
Time Start:	Time Finish:	Duration:
Sample equipment used (name, bite area, weight): 0,1m^2 Van Veen Grab and 1mm sieve (round holes)		

Type of bottom sediment:			
Color:	Odor:		
Observation of animals:	No. rejected samples:		
Observation of oil, waste etc:	Empty:	Stone:	Open:

Sample nr.	Volume (cm)	THC Nor / GH		Metals Nor / GH		PCB Nor/ GH		Pesticides Nor/GH		Toc Nor/GH		Remarks :	DNA Nor			granulometry geo.			G. nr	Ex. w	Br. Surf
													0-2	2-4	4-6	Sek.	Nor	Gh			
1		1		1		1		1		1			1	1	1	0-2	1				
2		1		1		1		1		1			1	1	1	2-4	1				
3		1		1		1		1		1			1	1	1	4-6	1				

Sample nr	Vol. (cm)	No bottles bio. 1mm	No bottles bio. 0,5mm	Remarks:	Grabnr.	Extra weights
4						
5						
6						
7						
8						

Species List

The lowest identification level	GE1/0 28.04.2011					GE1/5 28.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia										
Pycnogonida										
Pycnogonida										
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1										
Leuconidae sp. 2										
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										
Bodotriidae sp. 1										
Bodotriidae sp. 2										
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.										
Cumacea sp. 1										
Cumacea sp. 2										
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6										
Cumacea sp. 7										
Cumacea sp. 8										
Cumacea sp. 9										
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.										
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1										
Apseudidae sp. 2										
Apseudidae sp. 3										
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE1/0 28.04.2011					GE1/5 28.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10										
Brachyura sp. 11										
Brachyura sp. 12										
Brachyura sp. 13										
Brachyura sp. 14										
Brachyura sp. 15										
Brachyura sp. 16										
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22										
Brachyura sp. 23										
Brachyura sp. 24										
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1										
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE1/0 28.04.2011					GE1/5 28.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda										
Asellota										
Quantanthura sp.										
Notanthura sp.						1	1	3		
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2										
Anthuridae sp. 3										
Anthuridae sp. 4										
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.										
Arcturina triangularis										
Excirolana sp.	8	8	14	8	1					
Cirolana sp. 1										
Cirolana sp. 2										
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida	1									
Ampeliscidae						2	3	1		
Gammaridea sp. 1										
Gammaridea sp. 2										
Synopiidae										
Leucothoidae										
Lysianassidae										
Liljeborgiidae										
Pardaliscidae										
Oedicerotidae							1			
Phoxocephalidae										
Sebidae										
Urothoidae						8	3	1		
Corophiidea										
Corophiidae s.s.										
Caprellidae										
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.										
Euphausiacea										
Euphausiacea										
Astacidea										
Astacidea										

The lowest identification level	GE1/0 28.04.2011					GE1/5 28.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura										
Crustacea										
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae										
Marginellidae										
Eulimidae										
Eulima sp.										
Triphoridae										
Rissoidae										
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae										
Buccinidae										
Gastropoda juv.										
Caudofoveata										
Bivalvia										
Pharidae										
Sinupharus								1		
Veneridae										
Clausinella punctigera										
Dosinia lupinus afra										
Pitar sp.										
Timoclea										
Timoclea ovata										
Donacidae										
Donax sp.										
Tellinidae										
Corbulidae										
Corbula sulcata										
Corbula										
Nuculidae										
Nucula										
Nuculanidae										
Ledella										
Nuculana						1				
Nuculana commutata										
Cardiidae										
Lyrocardium										
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										
Arcidae										
Bathyarca pectunculoides										

The lowest identification level	GE1/0 28.04.2011					GE1/5 28.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae										
Cardiocardita sp.							1			
Cardiocardita lacunosa										
Solenidae							1			
Crassatellidae										
Crassinella sp.										
Limidae										
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										
Bivalvia juv.						3		3		
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae										
Nephtyidae						5		7		
Glyceridae										
Goniadidae										
Aphroditidae										
Polynoidae										
Sigalionidae										
Chrysopetalidae										
Nereididae										
Syllidae										
Amphinomidae							3			
Eunicidae										
Onuphidae						1	2			
Lumbrineridae						4	6	8		
Dorvilleidae										
Oweniidae						6	6	5		
Orbiniidae						18	17	17		
Spionidae										
Chaetopteridae										
Magelona							1			
Cirratulidae						1	5	4		
Paraonidae						1				
Cossuridae						1				
Flabelligeridae								1		
Opheliidae										
Sternaspis										
Capitellidae							1			
Maldanidae						4	2	2		
Terebellidae								1		
Trichobranchidae										

The lowest identification level	GE1/0 28.04.2011					GE1/5 28.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae										
Serpulidae										
Siboglinidae										
Trochochaetidae										
Poecilochaetus										
Polychaeta						1				
Nematoda										
Nemertea						1	1	2		
Sipuncula								1		
Priapulida										
Echiura							1			
Vermes (non det., worm like inv.)										
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.										
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae										
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri						13	9	10		
Amphioplus aurensis										
Amphioplus congensis										
Amphipholis nudipora										
Amphiura atlantica										
Amphiura atlantidea										
Amphiura chiajei										
Amphiura incana										
Amphiura sp.										
Amphiura ungulata										
Ophionephthys lowelli										
Ophiophragmus acutispina										
Ophiostigma abnorme										
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis										
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei										

The lowest identification level	GE1/22 20.04.2011					GE1/53 20.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia	1								1	1
Pycnogonida										
Pycnogonida	1									
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1										
Leuconidae sp. 2										
Leuconidae sp. 3	1									
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										
Bodotriidae sp. 1										
Bodotriidae sp. 2										
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.										
Cumacea sp. 1										
Cumacea sp. 2										
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6										
Cumacea sp. 7										
Cumacea sp. 8								1		
Cumacea sp. 9										
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.	2									
Metapseudidae sp.										
Pseudoloeptochelia sp.					1					
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2					2					
Apseudidae sp. 1										
Apseudidae sp. 2	1									
Apseudidae sp. 3										
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE1/22 20.04.2011					GE1/53 20.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2	8		1							
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10										
Brachyura sp. 11										
Brachyura sp. 12					1			1		
Brachyura sp. 13					1					
Brachyura sp. 14										
Brachyura sp. 15				1						
Brachyura sp. 16	2									
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22										
Brachyura sp. 23										
Brachyura sp. 24						1			1	
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2									1	
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1										
Thalassinidae sp. 2							1			
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE1/22 20.04.2011					GE1/53 20.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda										
Asellota										
Quantanthura sp.										
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1					2					
Anthuridae sp. 2										
Anthuridae sp. 3	1				2			1	1	
Anthuridae sp. 4										
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.				1						
Arcturina triangularis	1									
Excirolana sp.										
Cirolana sp. 1							2		1	
Cirolana sp. 2										
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2								1		
Mysida										
Mysida										
Ampeliscidae	33		1	4	55	6	1	5	5	5
Gammaridea sp. 1										
Gammaridea sp. 2										
Synopiidae										
Leucothoidae										
Lysianassidae	5								2	
Liljeborgiidae										
Pardaliscidae								1		
Oedicerotidae	6		1							
Phoxocephalidae										
Sebidae										
Urothoidae			1							
Corophiidea	2		6		2					1
Corophiidae s.s.										
Caprellidae					1					
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.	1									
Euphausiacea										
Euphausiacea										
Astacidea										
Astacidea										

The lowest identification level	GE1/22 20.04.2011					GE1/53 20.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura	2		29		2			1		
Crustacea										
Gastropoda										
Acmidae										
Skeneidae				1						
Cypraeidae					2					
Naticidae										
Marginellidae										
Eulimidae										
Eulima sp.										
Triphoridae										
Rissoidae										
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae										
Buccinidae										
Gastropoda juv.										
Caudofoveata										
Bivalvia										
Pharidae	2				1					
Sinupharus										
Veneridae	22		19	10	8	3	1	1	1	
Clausinella punctigera									1	
Dosinia lupinus afra										
Pitar sp.										
Timoclea										
Timoclea ovata										
Donacidae						3			1	
Donax sp.	24									
Tellinidae		1								
Corbulidae				1	2					
Corbula sulcata					1					
Corbula							1			
Nuculidae										
Nucula					2					
Nuculanidae							3			
Ledella										
Nuculana										
Nuculana commutata										
Cardiidae										
Lyrocardium								3		
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										
Arcidae										
Bathyarca pectunculoides										

The lowest identification level	GE1/22 20.04.2011					GE1/53 20.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae										
Cardiocardita sp.										
Cardiocardita lacunosa										
Solenidae										
Crassatellidae										
Crassinella sp.										
Limidae										
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										
Bivalvia juv.										
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae	4		1		1	2				
Nephtyidae	3	1	1		2			1		
Glyceridae	11	2	3		6	2	1			1
Goniadidae				2						
Aphroditidae										
Polynoidae	2		3	2	1		1	2		
Sigalionidae										
Chrysopetalidae										
Nereididae	1	1								
Syllidae					2	3	2			
Amphinomidae								3		1
Eunicidae		1		1	34	4		4		2
Onuphidae	10	1	2		3	2				
Lumbrineridae	13		5	4	7	1	1			1
Dorvilleidae										
Oweniidae		8	2				1			
Orbiniidae	11		3							
Spionidae	3	2	5	1	3			1		
Chaetopteridae										
Magelona			1					1		1
Cirratulidae	14		1		2					
Paraonidae	6		1	1						
Cossuridae	2									
Flabelligeridae					5	1		1		1
Opheliidae		1								
Sternaspis	6								1	
Capitellidae	15	2	1	2						
Maldanidae	16	1	1		5	3	1	4		
Terebellidae	30	3			13		1	3		
Trichobranchidae	1									

The lowest identification level	GE1/22 20.04.2011					GE1/53 20.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae	3				1			1		
Serpulidae										
Siboglinidae			1	1			1			
Trochochaetidae										
Poecilochaetus										
Polychaeta	1			1	8	2	1			
Nematoda										
Nemertea	7					2			3	
Sipuncula	1									
Priapulida									1	
Echiura										
Vermes (non det., worm like inv.)					3				1	
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.										
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae										
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri										
Amphioplus aurensis									1	
Amphioplus congensis								1		
Amphipholis nudipora							1			1
Amphiura atlantica				3						
Amphiura atlantidea										
Amphiura chiajei										
Amphiura incana										
Amphiura sp.										
Amphiura ungulata		1		3	2					
Ophionephthys lowelli									1	
Ophiophragmus acutispina				1	1					
Ophiostigma abnorme								1		
Ophiacantha sp.	1									
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis								1		
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei	1					1				1

The lowest identification level	GE1/101 20.04.2011					GE1/249 21.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia										
Pycnogonida										
Pycnogonida										
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1										
Leuconidae sp. 2										
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										
Bodotriidae sp. 1									1	
Bodotriidae sp. 2										
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.										
Cumacea sp. 1										
Cumacea sp. 2										
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6										
Cumacea sp. 7		1								
Cumacea sp. 8										
Cumacea sp. 9										
Cumacea sp. 10									1	
Cumacea sp. 11									1	
Cumacea sp. 12						2				
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.										
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1										
Apseudidae sp. 2										
Apseudidae sp. 3										
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE1/101 20.04.2011					GE1/249 21.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10										
Brachyura sp. 11										
Brachyura sp. 12										
Brachyura sp. 13										
Brachyura sp. 14										
Brachyura sp. 15										
Brachyura sp. 16										
Brachyura sp. 17					1					
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22		1								
Brachyura sp. 23							1			
Brachyura sp. 24										
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38						1			1	
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1	1									
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE1/101 20.04.2011					GE1/249 21.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda						3		1		
Asellota										
Quantanthura sp.					1					
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2										
Anthuridae sp. 3										
Anthuridae sp. 4										
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.										
Arcturina triangularis										
Excirolana sp.										
Cirolana sp. 1										
Cirolana sp. 2										
Gnathia sp. 1.						1				
Gnathia sp. 2.						1				
Gnathia sp. 3								1		
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida										
Ampeliscidae	1	1		1	2	12	6	7	10	2
Gammaridea sp. 1										
Gammaridea sp. 2										
Synopiidae										
Leucothoidae										
Lysianassidae				2	1				1	
Liljeborgiidae										
Pardaliscidae								1	1	
Oedicerotidae										
Phoxocephalidae										
Sebidae										
Urothoidae										
Corophiidea				1						1
Corophiidae s.s.										
Caprellidae										
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.							2		1	
Euphausiacea										
Euphausiacea										1
Astacidea										
Astacidea										

The lowest identification level	GE1/101 20.04.2011					GE1/249 21.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura										
Crustacea										
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae				1						
Marginellidae										
Eulimidae										
Eulima sp.										
Triphoridae										
Rissoidae										
Alvania sp.							1			
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae										
Buccinidae							1			
Gastropoda juv.										
Caudofoveata										
Bivalvia										
Pharidae										
Sinupharus										
Veneridae	2	1	2			2		7		
Clausinella punctigera										
Dosinia lupinus afra										
Pitar sp.										
Timoclea										
Timoclea ovata										
Donacidae				1			1	14		
Donax sp.										
Tellinidae										
Corbulidae										
Corbula sulcata										
Corbula										
Nuculidae										
Nucula										
Nuculanidae		1	6			10	2	4		
Ledella										
Nuculana	12			6	4					
Nuculana commutata										
Cardiidae						1				
Lyrocardium										
Europicardium caparti			1							
Cuspidariidae		1								
Cuspidaria										
Cardiomya costellata										
Arcidae		1								
Bathyarca pectunculoides										

The lowest identification level	GE1/101 20.04.2011					GE1/249 21.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae										
Cardiocardita sp.										
Cardiocardita lacunosa										
Solenidae										
Crassatellidae										
Crassinella sp.										
Limidae										
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										
Bivalvia juv.		3								
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda								1		
Polychaeta										
Phyllodocidae	2		1		2					
Nephtyidae										
Glyceridae				1			1		1	2
Goniadidae										
Aphroditidae										
Polynoidae	1			1				2		1
Sigalionidae										
Chrysopetalidae										
Nereididae										
Syllidae		2								1
Amphinomidae	1	1	6	1	2	2				
Eunicidae			1		1				1	
Onuphidae		2	1	2						
Lumbrineridae		2	1	3	2	2	3	2	2	1
Dorvilleidae										
Oweniidae								1		
Orbiniidae								1		
Spionidae		2		1			1		1	
Chaetopteridae										
Magelona						1	1	1	1	
Cirratulidae		1		1		4	5	2		2
Paraonidae	1	1		2		2		3		
Cossuridae						1	3	3	5	
Flabelligeridae					1					
Opheliidae				2						
Sternaspis										
Capitellidae		1	1							
Maldanidae	1				1					
Terebellidae							1	5	5	
Trichobranchidae										

The lowest identification level	GE1/101 20.04.2011					GE1/249 21.04.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae									1	
Serpulidae										
Siboglinidae										
Trochochaetidae										
Poecilochaetus										
Polychaeta		1			2	4	1	3	3	2
Nematoda										
Nemertea						1				
Sipuncula						11	5	14	7	
Priapulida										
Echiura		1								
Vermes (various, non det., worm like invertebrates)									1	
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.										
Brissopsis elongata										
Plagiobrissus africanus								1		
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae										
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri										
Amphioplus aurensis						1				
Amphioplus congensis						1			2	
Amphipholis nudipora										
Amphiura atlantica							2			
Amphiura atlantidea					1					
Amphiura chiajei										
Amphiura incana										
Amphiura sp.										
Amphiura ungulata										
Ophionephthys lowelli										
Ophiophragmus acutispina										
Ophiostigma abnorme										
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis										
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei				1						

The lowest identification level	GE1/513 22.04.2011					GE1/991 22.04.2011					
Sample	4	5	6	7	8	4	5	6	7	8	9
Hexacorallia											
Actiniaria											
Octocorallia											
Octocorallia											
Pycnogonida											
Pycnogonida											
Cumacea											
Nannastacidae sp. 1											
Nannastacidae sp. 2											
Nannastacidae sp. 3											
Cumella sp.											
Leuconidae sp. 1											
Leuconidae sp. 2											
Leuconidae sp. 3											
Leuconidae sp. 4											
Leuconidae sp. 5											
Leuconidae sp. 6											
Leuconidae sp. 7											
Ceratocumatiidae sp.											
Bodotriidae sp. 1											
Bodotriidae sp. 2											
Diastylidae sp. 1											
Diastylidae sp. 2											
Diastylidae sp. 3											
Diastylidae sp. 4											
Diastylidae sp. 5											
Diastylidae sp. 6											
Diastylidae sp. 7											
Makrokylindrus sp.											
Cumacea sp. 1											
Cumacea sp. 2											
Cumacea sp. 3											
Cumacea sp. 4											
Cumacea sp. 5											
Cumacea sp. 6											
Cumacea sp. 7											
Cumacea sp. 8											
Cumacea sp. 9											
Cumacea sp. 10											
Cumacea sp. 11											
Cumacea sp. 12											
Cumacea sp. 13											
Tanaidacea											
Apseudes sp.							5				
Kalliapseudes sp.											
Metapseudidae sp.											
Pseudoloeptochelia sp.											
Leptochelia sp.											
Calozodion sp. 1											
Calozodion sp. 2											
Apseudidae sp. 1											
Apseudidae sp. 2											
Apseudidae sp. 3	5	1							1		
Pakistanapseudes sp.											
Parapseudidae sp.											
Ostracoda											
Podocopa sp. 1							2	2	3		

The lowest identification level	GE1/513 22.04.2011					GE1/991 22.04.2011					
Sample	4	5	6	7	8	4	5	6	7	8	9
Podocopa sp. 2											3
Podocopa sp. 3											
Myodocopa sp. 1											
Myodocopa sp. 2											
Myodocopa sp. 3											
Myodocopa sp. 4											
Myodocopa sp. 5											
Myodocopa sp. 6											
Myodocopa sp. 7											
Brachyura											
Brachyura sp. 1											
Brachyura sp. 2											
Brachyura sp. 3											
Brachyura sp. 4											
Brachyura sp. 5											
Brachyura sp. 6											
Brachyura sp. 7											
Brachyura sp. 8											
Brachyura sp. 9											
Brachyura sp. 10											
Brachyura sp. 11											
Brachyura sp. 12											
Brachyura sp. 13											
Brachyura sp. 14											
Brachyura sp. 15											
Brachyura sp. 16											
Brachyura sp. 17											
Brachyura sp. 18											
Brachyura sp. 19											
Brachyura sp. 20											
Brachyura sp. 21											
Brachyura sp. 22											
Brachyura sp. 23											
Brachyura sp. 24											
Brachyura sp. 25											
Brachyura sp. 26											
Brachyura sp. 27											
Brachyura sp. 28											
Brachyura sp. 29											
Brachyura sp. 30											
Brachyura sp. 31											
Brachyura sp. 32											
Brachyura sp. 33											
Brachyura sp. 34											
Brachyura sp. 35											
Brachyura sp. 36											
Brachyura sp. 37											
Brachyura sp. 38											
Galatheidae sp. 1		1			2						
Galatheidae sp. 2											
Galatheidae sp. 3											
Galatheidae sp. 4											
Caridea											
Thalassinidae sp. 1											
Thalassinidae sp. 2											
Stomatopoda											
Eurysquilla sp.											

The lowest identification level	GE1/513 22.04.2011					GE1/991 22.04.2011					
Sample	4	5	6	7	8	4	5	6	7	8	9
Lysiosquillidae sp.											
Stomatopoda sp.											
Cirripedia											
Cirripedia sp.											
Isopoda											
Isopoda											
Asellota											
Quantanthura sp.		2									
Notanthura sp.											
Paranthura sp.											
Anthuridae sp. 1											
Anthuridae sp. 2											
Anthuridae sp. 3											
Anthuridae sp. 4											
Anthuridae sp 5				1							
Anthuridae gen. nov.											
Masanthura sp.											
Cyathura sp.											
Haliophasma sp.											
Eugerdella sp.											
Desmosomatidae sp.								1			
Macrostylis sp.											
Arcturinoides sp.											
Arcturina triangularis											
Excirolana sp.											
Cirolana sp. 1											
Cirolana sp. 2											
Gnathia sp. 1.											
Gnathia sp. 2.											
Gnathia sp. 3											
Janiridae sp. 1											
Janiridae sp. 2											
Mysida											
Mysida											
Ampeliscidae							2		1		
Gammaridea sp. 1											
Gammaridea sp. 2											
Synopiidae											
Leucothoidae											
Lysianassidae							1				
Liljeborgiidae											
Pardaliscidae											
Oedicerotidae											
Phoxocephalidae							1			1	
Sebidae											
Urothoidae											
Corophiidea											
Corophiidae s.s.											
Caprellidae											
Hyperiidea											
Iphimediidae											
Eriopisa group										1	
Amphipoda indet.											
Euphausiacea											
Euphausiacea											
Astacidea											
Astacidea		1			2						

The lowest identification level	GE1/513 22.04.2011					GE1/991 22.04.2011					
Sample	4	5	6	7	8	4	5	6	7	8	9
Anomura											
Anomura											
Crustacea		1				1					
Gastropoda											
Acmidae											
Skeneidae											
Cypraeidae											
Naticidae											
Marginellidae											
Eulimidae											
Eulima sp.											
Triphoridae											
Rissoidae											
Alvania sp.											
Capulidae											
Capulus ungaricus											
Trochidae											
Callistoma sp.											
Turridae											
Skeneidae											
Lucorhynchia lyrata											
Epitoniidae											
Columbellidae											
Cima minima											
Pyramidellidae											
Buccinidae											
Gastropoda juv.											
Caudofoveata											
Bivalvia											
Pharidae											
Sinupharus											
Veneridae		3	2			8		6			5
Clausinella punctigera											
Dosinia lupinus afra											
Pitar sp.											
Timoclea											
Timoclea ovata											
Donacidae											
Donax sp.											
Tellinidae			1								
Corbulidae											
Corbula sulcata											
Corbula											
Nuculidae	1				1						
Nucula							2				
Nuculanidae											2
Ledella							1				
Nuculana									4		
Nuculana commutata											
Cardiidae											
Lyrocardium											
Europicardium caparti											
Cuspidariidae											4
Cuspidaria							2				
Cardiomya costellata											
Arcidae											
Bathyarca pectunculoides											

The lowest identification level	GE1/513 22.04.2011					GE1/991 22.04.2011					
Sample	4	5	6	7	8	4	5	6	7	8	9
Veneroidea						8					
Carditidae											
Cardiocardita sp.											
Cardiocardita lacunosa											
Solenidae											
Crassatellidae											
Crassinella sp.											
Limidae											
Limaria											
Limatula											
Pectinidae											
Mytilidae											
Lucinidae											
Atrina sp.											
Semelidae											
Bivalvia juv.											
Polyplacophora											
Polyplacophora											
Scaphopoda											
Scaphopoda											
Polychaeta											
Phyllodocidae											
Nephtyidae	1										
Glyceridae			1	1			1	3			
Goniadidae											
Aphroditidae											
Polynoidae	1										
Sigalionidae											
Chrysopetalidae											
Nereididae											
Syllidae											
Amphinomidae											
Eunicidae											1
Onuphidae	2	2		4	2						1
Lumbrineridae								2	1		1
Dorvilleidae											
Oweniidae	1							1			
Orbiniidae				1				1			
Spionidae		3	3				3	5	2		
Chaetopteridae											
Magelona		1	2								
Cirratulidae		1			1	2	6	10	3		6
Paraonidae							1	2			2
Cossuridae											
Flabelligeridae		2		1					3		
Opheliidae											
Sternaspis											1
Capitellidae						1					2
Maldanidae		1	2	1		1	4	4	21	3	1
Terebellidae				1							
Trichobranchidae											

The lowest identification level	GE1/513 22.04.2011					GE1/991 22.04.2011					
Sample	4	5	6	7	8	4	5	6	7	8	9
Sabellidae											
Serpulidae											
Siboglinidae											2
Trochochaetidae											
Poecilochaetus											
Polychaeta	1	2	1			6	1	2			1
Nematoda							1				
Nemertea		1									
Sipuncula		2	12	6							
Priapulida											
Echiura											
Vermes (non det., worm like inv.)							1				
Asteroidea											
Pectinaster filholi											
Echinoidea											
Echinoidea juv.											
Brissopsis elongata	1										
Plagiobrissus africanus											
Cidaridae juv.											
Fibulariidae juv.											
Holothuroidea											
Holothuroidea											
Cucumariidae juv.											
Synallactidae juv.											
Synaptidae											
Ophiuroidea											
Ophiuroidea											
Amphilepis ingolfiana											
Amphioplus (Amphioplus) aciculatus											
Amphioplus archeri											
Amphioplus aurensis											
Amphioplus congensis											
Amphipholis nudipora											
Amphiura atlantica											
Amphiura atlantidea	3	1									
Amphiura chiajei			1								
Amphiura incana											
Amphiura sp.											
Amphiura ungulata											
Ophionephthys lowelli											
Ophiophragmus acutispina											
Ophiostigma abnorme											
Ophiacantha sp.											
Ophiactis lymani											
Ophiactis lűtkeni											
Ophiopsila guineensis											
Ophiolepis paucispina											
Ophiotrix congensis											
(Dictenophiura) carnea skoogi											
Ophiura grubei											

The lowest identification level	GE2/0 29.4.2011					GE2/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia										
Pycnogonida										
Pycnogonida										
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1										
Leuconidae sp. 2										
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										
Bodotriidae sp. 1										
Bodotriidae sp. 2										
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.										
Cumacea sp. 1										
Cumacea sp. 2										
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6										
Cumacea sp. 7										
Cumacea sp. 8										
Cumacea sp. 9										
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.										
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1										
Apseudidae sp. 2										
Apseudidae sp. 3										
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE2/0 29.4.2011					GE2/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10										
Brachyura sp. 11										
Brachyura sp. 12										
Brachyura sp. 13										
Brachyura sp. 14										
Brachyura sp. 15										
Brachyura sp. 16										
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22										
Brachyura sp. 23										
Brachyura sp. 24										
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1										
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE2/0 29.4.2011					GE2/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda										
Asellota										
Quantanthura sp.										
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2										
Anthuridae sp. 3										
Anthuridae sp. 4										
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.										
Arcturina triangularis										
Excirolana sp.		2			1					
Cirolana sp. 1										
Cirolana sp. 2										
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida										
Ampeliscidae										
Gammaridea sp. 1										
Gammaridea sp. 2										
Synopiidae										
Leucothoidae										
Lysianassidae										
Liljeborgiidae										
Pardaliscidae										
Oedicerotidae										
Phoxocephalidae										
Sebidae										
Urothoidae										
Corophiidea										
Corophiidae s.s.										
Caprellidae										
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.										
Euphausiacea										
Euphausiacea										
Astacidea										
Astacidea										

The lowest identification level	GE2/0 29.4.2011					GE2/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura										
Crustacea										
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae										
Marginellidae										
Eulimidae										
Eulima sp.										
Triphoridae										
Rissoidae										
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae										
Buccinidae										
Gastropoda juv.										
Caudofoveata										
Bivalvia										
Pharidae										
Sinupharus										
Veneridae										
Clausinella punctigera										
Dosinia lupinus afra										
Pitar sp.										
Timoclea										
Timoclea ovata										
Donacidae										
Donax sp.										
Tellinidae										
Corbulidae										
Corbula sulcata										
Corbula										
Nuculidae										
Nucula										
Nuculanidae										
Ledella										
Nuculana										
Nuculana commutata										
Cardiidae										
Lyrocardium										
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										
Arcidae										
Bathyarca pectunculoides										

The lowest identification level	GE2/0 29.4.2011					GE2/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae										
Cardiocardita sp.										
Cardiocardita lacunosa						1				
Solenidae										
Crassatellidae										
Crassinella sp.										
Limidae										
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										
Bivalvia juv.										
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae										
Nephtyidae										
Glyceridae										
Goniadidae										
Aphroditidae										
Polynoidae								1		
Sigalionidae										
Chrysopetalidae										
Nereididae										
Syllidae										
Amphinomidae										
Eunicidae										
Onuphidae										
Lumbrineridae										
Dorvilleidae										
Oweniidae										
Orbiniidae		1								
Spionidae										
Chaetopteridae										
Magelona										
Cirratulidae										
Paraonidae										
Cossuridae										
Flabelligeridae										
Opheliidae										
Sternaspis										
Capitellidae										
Maldanidae										
Terebellidae										
Trichobranchidae										

The lowest identification level	GE2/0 29.4.2011					GE2/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae										
Serpulidae										
Siboglinidae										
Trochochaetidae										
Poecilochaetus										
Polychaeta										
Nematoda										
Nemertea										
Sipuncula										
Priapulida										
Echiura										
Vermes (non det., worm like inv.)										
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.										
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae										
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri							1	1		
Amphioplus aurensis										
Amphioplus congensis										
Amphipholis nudipora										
Amphiura atlantica										
Amphiura atlantidea										
Amphiura chiajei										
Amphiura incana										
Amphiura sp.										
Amphiura ungulata										
Ophionephthys lowelli										
Ophiophragmus acutispina										
Ophiostigma abnorme										
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis										
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei										

The lowest identification level	GE2/29 25.4.2011					GE2/53 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia										
Pycnogonida										
Pycnogonida									1	
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1										
Leuconidae sp. 2										
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6							2			
Leuconidae sp. 7										
Ceratocumatiidae sp.										4
Bodotriidae sp. 1										4
Bodotriidae sp. 2										
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6									1	1
Diastylidae sp. 7						1				
Makrokylindrus sp.										
Cumacea sp. 1										
Cumacea sp. 2										
Cumacea sp. 3					2					
Cumacea sp. 4							1	1	1	1
Cumacea sp. 5									1	1
Cumacea sp. 6										
Cumacea sp. 7										
Cumacea sp. 8										
Cumacea sp. 9				1						
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.				2						
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1										
Apseudidae sp. 2										
Apseudidae sp. 3										
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE2/29 25.4.2011					GE2/53 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4					1					
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9				1						
Brachyura sp. 10										
Brachyura sp. 11										
Brachyura sp. 12				1						
Brachyura sp. 13										
Brachyura sp. 14									1	1
Brachyura sp. 15				1						
Brachyura sp. 16										
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22										
Brachyura sp. 23										
Brachyura sp. 24										
Brachyura sp. 25							1			
Brachyura sp. 26							1			
Brachyura sp. 27									1	
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										1
Brachyura sp. 31				2						
Brachyura sp. 32				1						
Brachyura sp. 33				1						
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3				8						
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1										
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE2/29 25.4.2011					GE2/53 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.								2		
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda				2	1					
Asellota										
Quantanthura sp.										
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2							1	3	1	
Anthuridae sp. 3										
Anthuridae sp. 4					1					
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.							1			
Cyathura sp.										
Haliophasma sp.								2		
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.			1							
Arcturina triangularis										
Excirolana sp.										
Cirolana sp. 1						1		1		
Cirolana sp. 2				1						
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida										
Ampeliscidae		1	3	9	7	9	9	8	7	8
Gammaridea sp. 1				1				2		
Gammaridea sp. 2				4						
Synopiidae										
Leucothoidae										
Lysianassidae			3				1	1		
Liljeborgiidae				1						
Pardaliscidae										
Oedicerotidae								1		
Phoxocephalidae		3			1					3
Sebidae							1			
Urothoidae		1								
Corophiidea				8			1		1	1
Corophiidae s.s.							1		1	
Caprellidae							1			
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.			1							
Euphausiacea										
Euphausiacea										
Astacidea										
Astacidea										

The lowest identification level	GE2/29 25.4.2011					GE2/53 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura							3			1
Crustacea										
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae								2		
Marginellidae	1									
Eulimidae										
Eulima sp.								3		
Triphoridae										
Rissoidae										
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae				1						
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae										
Buccinidae										
Gastropoda juv.										
Caudofoveata										
Bivalvia										
Pharidae						2				1
Sinupharus										
Veneridae	10	8	99	12		5	7	13	15	17
Clausinella punctigera										
Dosinia lupinus afra									1	
Pitar sp.										1
Timoclea										
Timoclea ovata										
Donacidae	3	3	13			1	2	4	5	4
Donax sp.										
Tellinidae										
Corbulidae			1					1		
Corbula sulcata										
Corbula						1				
Nuculidae										
Nucula	4	13	8	2						
Nuculanidae				1						
Ledella										
Nuculana						2			1	1
Nuculana commutata										
Cardiidae										
Lyrocardium										
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										1
Arcidae						1				
Bathyarca pectunculoides										

The lowest identification level	GE2/29 25.4.2011					GE2/53 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae	1									
Cardiocardita sp.										
Cardiocardita lacunosa										
Solenidae										
Crassatellidae			1							
Crassinella sp.										
Limidae			1							
Limaria						1			3	
Limatula							1			
Pectinidae								4		1
Mytilidae								1	1	1
Lucinidae								6		
Atrina sp.										1
Semelidae										
Bivalvia juv.										
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae						2	3			
Nephtyidae		1		1		2		1		
Glyceridae		1		9	4	1	2	2	1	1
Goniadidae										
Aphroditidae								1		
Polynoidae	1	2		4	2	1	2	6	3	
Sigalionidae										
Chrysopetalidae										
Nereididae				3					4	
Syllidae				8				5	3	3
Amphinomidae										
Eunicidae	2			15	4	4		2		2
Onuphidae	1			2	1	1	16	12	16	3
Lumbrineridae				25	1		6		3	1
Dorvilleidae										
Oweniidae		2	23		5					
Orbiniidae		1	1	2	2			1	1	
Spionidae		2	1	34		1	1	3	1	
Chaetopteridae										
Magelona	2	1	1			2	5		6	5
Cirratulidae	1			3		1		6	3	2
Paraonidae										1
Cossuridae										
Flabelligeridae				2		1	1	2		
Opheliidae				3			1			
Sternaspis									1	
Capitellidae					1				2	
Maldanidae				8		3	2	3	3	
Terebellidae	1			7	2	1	9		4	1
Trichobranchidae										

The lowest identification level	GE2/29 25.4.2011					GE2/53 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae								1		1
Serpulidae										
Siboglinidae										
Trochochaetidae										
Poecilochaetus										
Polychaeta	2				1				1	
Nematoda										
Nemertea					1				3	
Sipuncula									1	
Priapulida										
Echiura										
Vermes (non det., worm like inv.)		3								
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.						1		1	1	2
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.	1	1								
Holothuroidea										
Holothuroidea										
Cucumariidae juv.						2		1		
Synallactidae juv.								1		
Synaptidae							1			
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus								2		
Amphioplus archeri										
Amphioplus aurensis						1		1		
Amphioplus congensis								1	2	
Amphipholis nudipora						1	4	8	4	2
Amphiura atlantica										
Amphiura atlantidea										
Amphiura chiajei										
Amphiura incana									1	1
Amphiura sp.										
Amphiura ungulata		2	1							
Ophionephthys lowelli	1			1				1		
Ophiophragmus acutispina						1	1			
Ophiostigma abnorme									1	
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni				1			1			
Ophiopsila guineensis							1	6	1	
Ophiolepis paucispina				1						
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei						1			1	1

The lowest identification level	GE2/101 25.4.2011					GE2/247 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia		1		1						
Pycnogonida										
Pycnogonida										
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1										
Leuconidae sp. 2										
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										
Bodotriidae sp. 1										
Bodotriidae sp. 2										
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.										
Cumacea sp. 1										
Cumacea sp. 2										
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6										
Cumacea sp. 7										
Cumacea sp. 8										
Cumacea sp. 9										
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.										
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1										
Apseudidae sp. 2										
Apseudidae sp. 3										
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE2/101 25.4.2011					GE2/247 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10		2	3	1	2					
Brachyura sp. 11										
Brachyura sp. 12										
Brachyura sp. 13										
Brachyura sp. 14										
Brachyura sp. 15										
Brachyura sp. 16										
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21						1				
Brachyura sp. 22										
Brachyura sp. 23							1			
Brachyura sp. 24										
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34			1							
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1					4					
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE2/101 25.4.2011					GE2/247 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda										
Asellota										
Quantanthura sp.										
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2										
Anthuridae sp. 3		1	1							
Anthuridae sp. 4										
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.										
Arcturina triangularis										
Excirolana sp.										
Cirolana sp. 1						1				
Cirolana sp. 2										
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida										
Ampeliscidae	1	1	8	3	2				1	
Gammaridea sp. 1										
Gammaridea sp. 2										
Synopiidae										
Leucothoidae										
Lysianassidae			1	2						
Liljeborgiidae										
Pardaliscidae										
Oedicerotidae										
Phoxocephalidae										
Sebidae										
Urothoidae										
Corophiidea										
Corophiidae s.s.										
Caprellidae										
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.			1							
Euphausiacea										
Euphausiacea										
Astacidea										
Astacidea										

The lowest identification level	GE2/101 25.4.2011					GE2/247 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura										
Crustacea										
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae										
Marginellidae										
Eulimidae										
Eulima sp.										
Triphoridae										
Rissoidae										
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae										
Buccinidae										
Gastropoda juv.										
Caudofoveata										
Bivalvia										
Pharidae										
Sinupharus										
Veneridae					5					
Clausinella punctigera										
Dosinia lupinus afra										
Pitar sp.					1					
Timoclea										
Timoclea ovata										
Donacidae					6					
Donax sp.										
Tellinidae										
Corbulidae										
Corbula sulcata										
Corbula										
Nuculidae										
Nucula				1	1					
Nuculanidae		19		3						
Ledella										
Nuculana										
Nuculana commutata					35					
Cardiidae										
Lyrocardium										
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										
Arcidae										
Bathyarca pectunculoides										

The lowest identification level	GE2/101 25.4.2011					GE2/247 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae	1									
Cardiocardita sp.										
Cardiocardita lacunosa										
Solenidae										
Crassatellidae										
Crassinella sp.										
Limidae										
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										
Bivalvia juv.										
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae	1				1					
Nephtyidae		4	2	1						
Glyceridae	2		2		2		3			1
Goniadidae										
Aphroditidae										
Polynoidae			3	1		1	1			
Sigalionidae										
Chrysopetalidae										
Nereididae			1			5		2	4	2
Syllidae	3		2					1		
Amphinomidae				1						
Eunicidae	2	2	3	3	4			2	1	
Onuphidae		8	1	5	4		2			
Lumbrineridae		1	3	4	4					
Dorvilleidae										
Oweniidae										
Orbiniidae		1	1							
Spionidae	2	1		1	3		2		5	1
Chaetopteridae										
Magelona										
Cirratulidae	2		1	1	2					
Paraonidae	1	1	1		1					
Cossuridae										
Flabelligeridae		1								
Opheliidae										
Sternaspis										
Capitellidae			1							
Maldanidae	2	4	3		5					
Terebellidae	3	3	1	1	2					
Trichobranchidae										

The lowest identification level	GE2/101 25.4.2011					GE2/247 25.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae				1						
Serpulidae										
Siboglinidae										
Trochochaetidae										
Poecilochaetus				2						
Polychaeta			1				6		1	
Nematoda										
Nemertea	2			1						
Sipuncula		1		2						
Priapulida										
Echiura										
Vermes (non det., worm like inv.)										
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.					1					
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae						1				1
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana						1				
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri										
Amphioplus aurensis										
Amphioplus congensis					1					
Amphipholis nudipora		1	2							
Amphiura atlantica	2		1		1					
Amphiura atlantidea										
Amphiura chiajei								1		1
Amphiura incana										
Amphiura sp.										
Amphiura ungulata										
Ophionephthys lowelli										
Ophiophragmus acutispina					2	1		1	2	
Ophiostigma abnorme										
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis					1					
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei		1								

The lowest identification level	GE2/503 24.4.2011					GE2/1005 24.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia										
Pycnogonida										
Pycnogonida										
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1										
Leuconidae sp. 2					1					
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5					1					
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										
Bodotriidae sp. 1										
Bodotriidae sp. 2										
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.										
Cumacea sp. 1										
Cumacea sp. 2									1	
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6										
Cumacea sp. 7										
Cumacea sp. 8										
Cumacea sp. 9										
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.					1					
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.										
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1		1								
Apseudidae sp. 2										
Apseudidae sp. 3		1		1						
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE2/503 24.4.2011					GE2/1005 24.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2						1				
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7									1	
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10										
Brachyura sp. 11										
Brachyura sp. 12										
Brachyura sp. 13										
Brachyura sp. 14										
Brachyura sp. 15										
Brachyura sp. 16										
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22										
Brachyura sp. 23										
Brachyura sp. 24										
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1										
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE2/503 24.4.2011					GE2/1005 24.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda										
Asellota										
Quantanthura sp.		1				1				
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2										
Anthuridae sp. 3										
Anthuridae sp. 4										
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.										
Arcturina triangularis										
Excirolana sp.										
Cirolana sp. 1	1	1								
Cirolana sp. 2										
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida										
Ampeliscidae										
Gammaridea sp. 1										
Gammaridea sp. 2										
Synopiidae										
Leucothoidae										
Lysianassidae										
Liljeborgiidae										
Pardaliscidae										
Oedicerotidae	1									
Phoxocephalidae										1
Sebidae										
Urothoidae										
Corophiidea										
Corophiidae s.s.										
Caprellidae										
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.										2
Euphausiacea										
Euphausiacea										
Astacidea										
Astacidea										

The lowest identification level	GE2/503 24.4.2011					GE2/1005 24.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura										
Crustacea										
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae										
Marginellidae										
Eulimidae										
Eulima sp.										
Triphoridae										
Rissoidae										
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae										
Buccinidae										
Gastropoda juv.										
Caudofoveata										
Bivalvia										
Pharidae										
Sinupharus										
Veneridae		4							1	
Clausinella punctigera										
Dosinia lupinus afra										
Pitar sp.										
Timoclea										
Timoclea ovata										
Donacidae									1	
Donax sp.										
Tellinidae										
Corbulidae										
Corbula sulcata										
Corbula										
Nuculidae										
Nucula										
Nuculanidae		3								
Ledella										
Nuculana	3			5	3					
Nuculana commutata										
Cardiidae										
Lyrocardium										
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										
Arcidae										
Bathyarca pectunculoides								1		

The lowest identification level	GE2/503 24.4.2011					GE2/1005 24.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae										
Cardiocardita sp.										
Cardiocardita lacunosa										
Solenidae										
Crassatellidae										
Crassinella sp.										
Limidae										
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										1
Bivalvia juv.										
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae										
Nephtyidae			1							
Glyceridae	2				1					1
Goniadidae										
Aphroditidae										
Polynoidae										
Sigalionidae										
Chrysopetalidae										
Nereididae					3					
Syllidae										
Amphinomidae										
Eunicidae										
Onuphidae										
Lumbrineridae	1	1			4				1	
Dorvilleidae										
Oweniidae										
Orbiniidae							1			
Spionidae		1		1						
Chaetopteridae										
Magelona				3	2					
Cirratulidae	3	1		1	2	1				
Paraonidae			1		1					
Cossuridae										
Flabelligeridae										
Opheliidae										
Sternaspis										
Capitellidae										
Maldanidae	9	4	1	3	8		1		6	1
Terebellidae										
Trichobranchidae										

The lowest identification level	GE2/503 24.4.2011					GE2/1005 24.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae										
Serpulidae										
Siboglinidae										
Trochochaetidae										
Poecilochaetus										
Polychaeta					1			1		
Nematoda										
Nemertea										
Sipuncula	3	14	1							
Priapulida										
Echiura										
Vermes (non det., worm like inv.)										
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.										
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae										
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri										
Amphioplus aurensis										
Amphioplus congensis										
Amphipholis nudipora										
Amphiura atlantica										
Amphiura atlantidea	1				1					
Amphiura chiajei										
Amphiura incana										
Amphiura sp.										
Amphiura ungulata										
Ophionephthys lowelli										
Ophiophragmus acutispina										
Ophiostigma abnorme										
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis										
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei										

The lowest identification level	GE3/0 29.4.2011					GE3/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia										
Pycnogonida										
Pycnogonida										
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1										
Leuconidae sp. 2										
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										
Bodotriidae sp. 1										
Bodotriidae sp. 2										
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.										
Cumacea sp. 1										
Cumacea sp. 2										
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6										
Cumacea sp. 7										
Cumacea sp. 8										
Cumacea sp. 9										
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.										
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1										
Apseudidae sp. 2										
Apseudidae sp. 3										
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE3/0 29.4.2011					GE3/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10										
Brachyura sp. 11										
Brachyura sp. 12										
Brachyura sp. 13										
Brachyura sp. 14										
Brachyura sp. 15										
Brachyura sp. 16										
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22										
Brachyura sp. 23										
Brachyura sp. 24										
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1										
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE3/0 29.4.2011					GE3/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda										
Asellota										
Quantanthura sp.										
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2										
Anthuridae sp. 3										
Anthuridae sp. 4										
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.										
Arcturina triangularis										
Excirolana sp.										
Cirolana sp. 1										
Cirolana sp. 2										
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida										
Ampeliscidae										
Gammaridea sp. 1										
Gammaridea sp. 2										
Synopiidae										
Leucothoidae										
Lysianassidae										
Liljeborgiidae										
Pardaliscidae										
Oedicerotidae										
Phoxocephalidae										
Sebidae										
Urothoidae										
Corophiidea										
Corophiidae s.s.										
Caprellidae										
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.										
Euphausiacea										
Euphausiacea										
Astacidea										
Astacidea										

The lowest identification level	GE3/0 29.4.2011					GE3/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura										
Crustacea										
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae										
Marginellidae										
Eulimidae										
Eulima sp.										
Triphoridae										
Rissoidae										
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae										
Buccinidae										
Gastropoda juv.										
Caudofoveata										
Bivalvia										
Pharidae										
Sinupharus										
Veneridae										
Clausinella punctigera										
Dosinia lupinus afra										
Pitar sp.										
Timoclea										
Timoclea ovata										
Donacidae										
Donax sp.										
Tellinidae										
Corbulidae										
Corbula sulcata										
Corbula										
Nuculidae										
Nucula										
Nuculanidae										
Ledella										
Nuculana										
Nuculana commutata										
Cardiidae										
Lyrocardium										
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										
Arcidae										
Bathyarca pectunculoides										

The lowest identification level	GE3/0 29.4.2011					GE3/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae										
Cardiocardita sp.										
Cardiocardita lacunosa										
Solenidae										
Crassatellidae										
Crassinella sp.										
Limidae										
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										
Bivalvia juv.										
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae										
Nephtyidae										
Glyceridae										
Goniadidae										
Aphroditidae										
Polynoidae										
Sigalionidae										
Chrysopetalidae										
Nereididae										
Syllidae										
Amphinomidae										
Eunicidae										
Onuphidae										
Lumbrineridae										
Dorvilleidae										
Oweniidae										
Orbiniidae										
Spionidae										
Chaetopteridae										
Magelona										
Cirratulidae										
Paraonidae										
Cossuridae										
Flabelligeridae										
Opheliidae										
Sternaspis										
Capitellidae										
Maldanidae										
Terebellidae										
Trichobranchidae										

The lowest identification level	GE3/0 29.4.2011					GE3/5 30.4.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae										
Serpulidae										
Siboglinidae										
Trochochaetidae										
Poecilochaetus										
Polychaeta										
Nematoda										
Nemertea										
Sipuncula										
Priapulida										
Echiura										
Vermes (non det., worm like inv.)										
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.										
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae										
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri										
Amphioplus aurensis										
Amphioplus congensis										
Amphipholis nudipora										
Amphiura atlantica										
Amphiura atlantidea										
Amphiura chiajei										
Amphiura incana										
Amphiura sp.										
Amphiura ungulata										
Ophionephthys lowelli										
Ophiophragmus acutispina										
Ophiostigma abnorme										
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis										
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei										

The lowest identification level	GE3/26 7.5.2011						GE3/52 7.5.2011				
Sample	4	5	6	7	8	9	4	5	6	7	8
Hexacorallia											
Actiniaria											
Octocorallia											
Octocorallia				1							
Pycnogonida											
Pycnogonida											
Cumacea											
Nannastacidae sp. 1											
Nannastacidae sp. 2											
Nannastacidae sp. 3					1						
Cumella sp.											
Leuconidae sp. 1											
Leuconidae sp. 2											
Leuconidae sp. 3											
Leuconidae sp. 4											1
Leuconidae sp. 5											
Leuconidae sp. 6											
Leuconidae sp. 7						1					
Ceratocumatiidae sp.											
Bodotriidae sp. 1											
Bodotriidae sp. 2											
Diastylidae sp. 1											
Diastylidae sp. 2											
Diastylidae sp. 3											
Diastylidae sp. 4											
Diastylidae sp. 5								1			
Diastylidae sp. 6											
Diastylidae sp. 7											
Makrokylindrus sp.											
Cumacea sp. 1											
Cumacea sp. 2											
Cumacea sp. 3											
Cumacea sp. 4											
Cumacea sp. 5											
Cumacea sp. 6											
Cumacea sp. 7											
Cumacea sp. 8											
Cumacea sp. 9											
Cumacea sp. 10											
Cumacea sp. 11											
Cumacea sp. 12											
Cumacea sp. 13											
Tanaidacea											
Apseudes sp.											
Kalliapseudes sp.		1	11	12	4						
Metapseudidae sp.					1						
Pseudoloeptochelia sp.		4	1	20	11						
Leptochelia sp.		1									
Calozodion sp. 1		1	1								
Calozodion sp. 2		1	1		1						
Apseudidae sp. 1											
Apseudidae sp. 2											
Apseudidae sp. 3											
Pakistanapseudes sp.											
Parapseudidae sp.						3					
Ostracoda											
Podocopa sp. 1											

The lowest identification level	GE3/26 7.5.2011						GE3/52 7.5.2011				
Sample	4	5	6	7	8	9	4	5	6	7	8
Podocopa sp. 2											
Podocopa sp. 3											
Myodocopa sp. 1		2	2		1						
Myodocopa sp. 2											
Myodocopa sp. 3				4							
Myodocopa sp. 4						1					
Myodocopa sp. 5				1							
Myodocopa sp. 6				1							
Myodocopa sp. 7											
Brachyura											
Brachyura sp. 1											
Brachyura sp. 2		1									
Brachyura sp. 3		1		1							
Brachyura sp. 4		2	3								
Brachyura sp. 5		1									
Brachyura sp. 6		1									
Brachyura sp. 7		1		1							
Brachyura sp. 8		2									
Brachyura sp. 9		1									
Brachyura sp. 10											
Brachyura sp. 11											
Brachyura sp. 12											
Brachyura sp. 13											
Brachyura sp. 14											1
Brachyura sp. 15											
Brachyura sp. 16				2	1						
Brachyura sp. 17											
Brachyura sp. 18					7						
Brachyura sp. 19					1						
Brachyura sp. 20				8	2	4					
Brachyura sp. 21											
Brachyura sp. 22											
Brachyura sp. 23											
Brachyura sp. 24											
Brachyura sp. 25											
Brachyura sp. 26											
Brachyura sp. 27											
Brachyura sp. 28						6					
Brachyura sp. 29						1					
Brachyura sp. 30											
Brachyura sp. 31											
Brachyura sp. 32											
Brachyura sp. 33											
Brachyura sp. 34											
Brachyura sp. 35				1							
Brachyura sp. 36						1					
Brachyura sp. 37				1							
Brachyura sp. 38											
Galatheidae sp. 1											
Galatheidae sp. 2											
Galatheidae sp. 3											
Galatheidae sp. 4					1						
Caridea											
Thalassinidae sp. 1											
Thalassinidae sp. 2								1			
Stomatopoda											
Eurysquilla sp.											1

The lowest identification level	GE3/26 7.5.2011						GE3/52 7.5.2011				
Sample	4	5	6	7	8	9	4	5	6	7	8
Lysiosquillidae sp.											
Stomatopoda sp.											
Cirripedia											
Cirripedia sp.		22									
Isopoda											
Isopoda											
Asellota											
Quantanthura sp.											
Notanthura sp.											
Paranthura sp.		2	1		2	1					
Anthuridae sp. 1				5							
Anthuridae sp. 2				2							
Anthuridae sp. 3		4				1				1	
Anthuridae sp. 4											
Anthuridae sp 5			1								
Anthuridae gen. nov.	1										
Masanthura sp.											
Cyathura sp.		1				1					
Haliophasma sp.											
Eugerdella sp.											
Desmosomatidae sp.											
Macrostylis sp.											
Arcturinoides sp.			1			1					
Arcturina triangularis											
Excirolana sp.											
Cirolana sp. 1											
Cirolana sp. 2											
Gnathia sp. 1.											
Gnathia sp. 2.											
Gnathia sp. 3	1	5				4					
Janiridae sp. 1		1									
Janiridae sp. 2											
Mysida											
Mysida			1								
Ampeliscidae		25	100	148	299	125	1	10	5	9	4
Gammaridea sp. 1		29	1	13	19	11					
Gammaridea sp. 2			2	2		1					
Synopiidae		4		3	1						
Leucothoidae						1					
Lysianassidae											
Liljeborgiidae											
Pardaliscidae											
Oedicerotidae		2									
Phoxocephalidae											
Sebidae											
Urothoidae						1		2			
Corophiidea		2	3	8	19						
Corophiidae s.s.											
Caprellidae		5									
Hyperiidea											
Iphimediidae				3							
Eriopisa group											
Amphipoda indet.			1	1	2	2					
Euphausiacea											
Euphausiacea											
Astacidea											
Astacidea											

The lowest identification level	GE3/26 7.5.2011						GE3/52 7.5.2011				
Sample	4	5	6	7	8	9	4	5	6	7	8
Anomura											
Anomura					2						
Crustacea							1				
Gastropoda											
Acmidae					1						
Skeneidae											
Cypraeidae											
Naticidae											
Marginellidae						1					
Eulimidae											
Eulima sp.											
Triphoridae		7			9	1					
Rissoidae		19			17	5					
Alvania sp.											
Capulidae			1								
Capulus ungaricus		7									
Trochidae		7			2						
Callistoma sp.											
Turridae		9									
Skeneidae											
Lucorhynchia lyrata					2						
Epitoniidae					1						
Columbellidae					2						
Cima minima											
Pyramidellidae											
Buccinidae											
Gastropoda juv.											
Caudofoveata											
Bivalvia											
Pharidae											
Sinupharus											
Veneridae		30	18	465	320	38					
Clausinella punctigera											
Dosinia lupinus afra											
Pitar sp.			1		1	1		1	1		
Timoclea			51								
Timoclea ovata									1		
Donacidae		1		2	5	11					
Donax sp.											
Tellinidae					2		2				
Corbulidae				3	2						
Corbula sulcata											
Corbula							2				
Nuculidae					18						
Nucula		1	2								
Nuculanidae				12							
Ledella											
Nuculana											
Nuculana commutata											
Cardiidae					1						
Lyrocardium											
Europicardium caparti											
Cuspidariidae											
Cuspidaria											
Cardiomya costellata											
Arcidae				1							1
Bathyarca pectunculoides											

The lowest identification level	GE3/26 7.5.2011						GE3/52 7.5.2011				
Sample	4	5	6	7	8	9	4	5	6	7	8
Veneroidea											
Carditidae		4		7	14			1	1		
Cardiocardita sp.											
Cardiocardita lacunosa											
Solenidae											
Crassatellidae				1							
Crassinella sp.			1								
Limidae		1		4							
Limaria											
Limatula											
Pectinidae		1									
Mytilidae											
Lucinidae		1	5								
Atrina sp.											
Semelidae											
Bivalvia juv.											
Polyplacophora											
Polyplacophora		1			2						
Scaphopoda											
Scaphopoda											
Polychaeta											
Phyllodocidae		7	3	2		2					
Nephtyidae			2	2	2	1			1		1
Glyceridae		2	2	3	8	9			1	1	
Goniadidae											
Aphroditidae											
Polynoidae		2		1		1	2			2	
Sigalionidae											
Chrysopetalidae				3							
Nereididae		2	1	1	4	2				1	1
Syllidae		26	1	10	101					1	
Amphinomidae				1							
Eunicidae		47	47	76	4	40	2		3	7	5
Onuphidae				3	2	1	15			4	2
Lumbrineridae		22	16	17	41	17	3		1		
Dorvilleidae					1						
Oweniidae		3	1	9	1	3					1
Orbiniidae		3	2		3	4					
Spionidae		5	4	3	18						
Chaetopteridae											
Magelona						1					1
Cirratulidae		1	2	3	2	27	1				2
Paraonidae		3			2	3					
Cossuridae						1					
Flabelligeridae					2	2			1	4	2
Opheliidae		3	1	5		3	1				
Sternaspis											
Capitellidae			2	1						1	1
Maldanidae		6		20	3	3	4		2	6	2
Terebellidae		1	1	2	9	2	1			2	1
Trichobranchidae											

The lowest identification level	GE3/26 7.5.2011						GE3/52 7.5.2011				
Sample	4	5	6	7	8	9	4	5	6	7	8
Sabellidae			1								
Serpulidae		1									
Siboglinidae											
Trochochaetidae											
Poecilochaetus											
Polychaeta		7	1	3	1	9					1
Nematoda				2							
Nemertea			3	4							
Sipuncula		2		3	6	10					1
Priapulida								1			
Echiura											
Vermes (non det., worm like inv.)										3	
Asteroidea											
Pectinaster filholi											1
Echinoidea											
Echinoidea juv.											
Brissopsis elongata											
Plagiobrissus africanus											
Cidaridae juv.		5	1	1							
Fibulariidae juv.											
Holothuroidea											
Holothuroidea									1		
Cucumariidae juv.											
Synallactidae juv.											
Synaptidae											
Ophiuroidea											
Ophiuroidea											
Amphilepis ingolfiana											
Amphioplus (Amphioplus) aciculatus										2	
Amphioplus archeri											
Amphioplus aurensis								1			
Amphioplus congensis											
Amphipholis nudipora				1			2	2	1		
Amphiura atlantica											
Amphiura atlantidea											
Amphiura chiajei											
Amphiura incana											
Amphiura sp.											
Amphiura ungulata			1								
Ophionephthys lowelli											
Ophiophragmus acutispina						1		1	1	1	1
Ophiostigma abnorme		1									
Ophiacantha sp.											
Ophiactis lymani		8			1						
Ophiactis lűtkeni											
Ophiopsila guineensis							6			2	
Ophiolepis paucispina		2	2	1							
Ophiotrix congensis		1		1							
(Dictenophiura) carnea skoogi											
Ophiura grubei			2				1	4	1	3	3

The lowest identification level	GE3/105 7.5.2011					GE3/254 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria				1						
Octocorallia										
Octocorallia	1									
Pycnogonida										
Pycnogonida										
Cumacea										
Nannastacidae sp. 1										
Nannastacidae sp. 2										
Nannastacidae sp. 3										
Cumella sp.										1
Leuconidae sp. 1										
Leuconidae sp. 2										
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										1
Bodotriidae sp. 1										2
Bodotriidae sp. 2										
Diastylidae sp. 1		1								
Diastylidae sp. 2							1			
Diastylidae sp. 3										
Diastylidae sp. 4										
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.										
Cumacea sp. 1					1					
Cumacea sp. 2										
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6					1					
Cumacea sp. 7										
Cumacea sp. 8										
Cumacea sp. 9										
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13				1						
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.										
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1										
Apseudidae sp. 2										
Apseudidae sp. 3										
Pakistanapseudes sp.										
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE3/105 7.5.2011					GE3/254 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3										
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1								1		
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10	1	1	2	5	1					
Brachyura sp. 11			1							
Brachyura sp. 12										
Brachyura sp. 13										
Brachyura sp. 14		1								
Brachyura sp. 15										
Brachyura sp. 16	2									
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22										
Brachyura sp. 23										
Brachyura sp. 24										
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1										
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE3/105 7.5.2011					GE3/254 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.										
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda										
Asellota										
Quantanthura sp.										
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2										
Anthuridae sp. 3		2			3					
Anthuridae sp. 4										
Anthuridae sp 5										
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										
Desmosomatidae sp.										
Macrostylis sp.										
Arcturinoides sp.										
Arcturina triangularis										
Excirolana sp.				2						
Cirolana sp. 1	1		2		1		1			
Cirolana sp. 2										
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida			3							
Ampeliscidae		2	3	4	11	1				
Gammaridea sp. 1										
Gammaridea sp. 2										
Synopiidae										
Leucothoidae										
Lysianassidae	2	1		3	2					
Liljeborgiidae										
Pardaliscidae				1				1		1
Oedicerotidae					1		1			
Phoxocephalidae										
Sebidae										
Urothoidae										
Corophiidea										
Corophiidae s.s.										
Caprellidae										
Hyperiidea										
Iphimediidae										
Eriopisa group										
Amphipoda indet.					1	1				
Euphausiacea										
Euphausiacea										
Astacidea										
Astacidea										

The lowest identification level	GE3/105 7.5.2011					GE3/254 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura										
Crustacea					1					
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae										
Marginellidae										
Eulimidae					2					
Eulima sp.										
Triphoridae										
Rissoidae										
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.										
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima							2	1		1
Pyramidellidae										
Buccinidae										
Gastropoda juv.										
Caudofoveata	1									
Bivalvia										
Pharidae										
Sinupharus										
Veneridae	1		2							
Clausinella punctigera										
Dosinia lupinus afra										
Pitar sp.										
Timoclea										
Timoclea ovata										
Donacidae										
Donax sp.										
Tellinidae			2							
Corbulidae										
Corbula sulcata										
Corbula										
Nuculidae										
Nucula	1									
Nuculanidae			10		4			1		
Ledella										
Nuculana	6	14								2
Nuculana commutata										
Cardiidae										
Lyrocardium										
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										
Arcidae										
Bathyarca pectunculoides										

The lowest identification level	GE3/105 7.5.2011					GE3/254 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae										
Cardiocardita sp.										
Cardiocardita lacunosa										
Solenidae										
Crassatellidae					1					
Crassinella sp.										
Limidae										
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										
Bivalvia juv.						1	1			
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae								1		
Nephtyidae	2	3		1		1	3		1	
Glyceridae				1		2	2		1	2
Goniadidae										
Aphroditidae										
Polynoidae	2		1	4		1		2	1	1
Sigalionidae										
Chrysopetalidae										
Nereididae			1			7	2	2	2	2
Syllidae		2		1	1					
Amphinomidae										
Eunicidae		5		3	4	1	1	3		
Onuphidae	31	66	35	6	7	6		1		12
Lumbrineridae	5	3	4	4	4	1	1	4	1	
Dorvilleidae										
Oweniidae				1		1	2			
Orbiniidae		1		1						
Spionidae	3	1	2	2	1	4		1		1
Chaetopteridae										
Magelona										
Cirratulidae		1	1	3	2	1	2			1
Paraonidae	1		1		3	5	2	1		5
Cossuridae								1		
Flabelligeridae		1		1		1				
Opheliidae				1						
Sternaspis										
Capitellidae	1		1			1				
Maldanidae	1	2			4	5	2	6	3	
Terebellidae	1	1	2	1	5					1
Trichobranchidae						1				

The lowest identification level	GE3/105 7.5.2011					GE3/254 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae										
Serpulidae										
Siboglinidae			1			1				1
Trochochaetidae										
Poecilochaetus										
Polychaeta	1	2		2		1	1	1	2	2
Nematoda										
Nemertea	1								2	
Sipuncula	1	2		7		11	1	2	2	4
Priapulida										
Echiura										
Vermes (non det., worm like inv.)						1		1		
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.										
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae						1				
Ophiuroidea										
Ophiuroidea		1	1							
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri										
Amphioplus aurensis										
Amphioplus congensis										
Amphipholis nudipora	1	1		2	1					
Amphiura atlantica	4	2	1	1	1					
Amphiura atlantidea										
Amphiura chiajei						2	1	1	1	1
Amphiura incana										
Amphiura sp.										
Amphiura ungulata										
Ophionephthys lowelli										
Ophiophragmus acutispina			2					5	4	3
Ophiostigma abnorme										
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis	1			2						
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi										
Ophiura grubei	2									

The lowest identification level	GE3/510 7.5.2011					GE3/998 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Hexacorallia										
Actiniaria										
Octocorallia										
Octocorallia										
Pycnogonida										
Pycnogonida										
Cumacea										
Nannastacidae sp. 1										1
Nannastacidae sp. 2						1				
Nannastacidae sp. 3										
Cumella sp.										
Leuconidae sp. 1									1	
Leuconidae sp. 2				1						
Leuconidae sp. 3										
Leuconidae sp. 4										
Leuconidae sp. 5										
Leuconidae sp. 6										
Leuconidae sp. 7										
Ceratocumatiidae sp.										
Bodotriidae sp. 1										
Bodotriidae sp. 2							1			
Diastylidae sp. 1										
Diastylidae sp. 2										
Diastylidae sp. 3	1									
Diastylidae sp. 4	1									
Diastylidae sp. 5										
Diastylidae sp. 6										
Diastylidae sp. 7										
Makrokylindrus sp.			1							
Cumacea sp. 1										
Cumacea sp. 2										
Cumacea sp. 3										
Cumacea sp. 4										
Cumacea sp. 5										
Cumacea sp. 6										
Cumacea sp. 7										
Cumacea sp. 8										
Cumacea sp. 9										
Cumacea sp. 10										
Cumacea sp. 11										
Cumacea sp. 12										
Cumacea sp. 13										
Tanaidacea										
Apseudes sp.										
Kalliapseudes sp.										
Metapseudidae sp.										
Pseudoloeptochelia sp.										
Leptochelia sp.										
Calozodion sp. 1										
Calozodion sp. 2										
Apseudidae sp. 1	5	4	1	5				1		
Apseudidae sp. 2										
Apseudidae sp. 3										
Pakistanapseudes sp.				2						
Parapseudidae sp.										
Ostracoda										
Podocopa sp. 1										

The lowest identification level	GE3/510 7.5.2011					GE3/998 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Podocopa sp. 2										
Podocopa sp. 3									1	
Myodocopa sp. 1										
Myodocopa sp. 2										
Myodocopa sp. 3										
Myodocopa sp. 4										
Myodocopa sp. 5										
Myodocopa sp. 6										
Myodocopa sp. 7										
Brachyura										
Brachyura sp. 1										
Brachyura sp. 2										
Brachyura sp. 3										
Brachyura sp. 4										
Brachyura sp. 5										
Brachyura sp. 6										
Brachyura sp. 7										
Brachyura sp. 8										
Brachyura sp. 9										
Brachyura sp. 10										
Brachyura sp. 11										
Brachyura sp. 12										
Brachyura sp. 13										
Brachyura sp. 14										
Brachyura sp. 15										
Brachyura sp. 16										
Brachyura sp. 17										
Brachyura sp. 18										
Brachyura sp. 19										
Brachyura sp. 20										
Brachyura sp. 21										
Brachyura sp. 22										
Brachyura sp. 23										
Brachyura sp. 24										
Brachyura sp. 25										
Brachyura sp. 26										
Brachyura sp. 27										
Brachyura sp. 28										
Brachyura sp. 29										
Brachyura sp. 30										
Brachyura sp. 31										
Brachyura sp. 32										
Brachyura sp. 33										
Brachyura sp. 34										
Brachyura sp. 35										
Brachyura sp. 36										
Brachyura sp. 37										
Brachyura sp. 38										
Galatheidae sp. 1										
Galatheidae sp. 2										
Galatheidae sp. 3										
Galatheidae sp. 4										
Caridea										
Thalassinidae sp. 1										
Thalassinidae sp. 2										
Stomatopoda										
Eurysquilla sp.										

The lowest identification level	GE3/510 7.5.2011					GE3/998 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Lysiosquillidae sp.									1	
Stomatopoda sp.										
Cirripedia										
Cirripedia sp.										
Isopoda										
Isopoda										
Asellota										1
Quantanthura sp.		1	6		2	2	1	4		
Notanthura sp.										
Paranthura sp.										
Anthuridae sp. 1										
Anthuridae sp. 2										
Anthuridae sp. 3										
Anthuridae sp. 4										
Anthuridae sp 5										1
Anthuridae gen. nov.										
Masanthura sp.										
Cyathura sp.										
Haliophasma sp.										
Eugerdella sp.										1
Desmosomatidae sp.										1
Macrostylis sp.										1
Arcturinoides sp.										
Arcturina triangularis										
Excirolana sp.										
Cirolana sp. 1	1		1							
Cirolana sp. 2										
Gnathia sp. 1.										
Gnathia sp. 2.										
Gnathia sp. 3										
Janiridae sp. 1										
Janiridae sp. 2										
Mysida										
Mysida		1							1	
Ampeliscidae										
Gammaridea sp. 1			1							
Gammaridea sp. 2										
Synopiidae		1		1					1	1
Leucothoidae										
Lysianassidae										
Liljeborgiidae										
Pardaliscidae										
Oedicerotidae										
Phoxocephalidae										1
Sebidae										
Urothoidae										
Corophiidea										1
Corophiidae s.s.										
Caprellidae	1									
Hyperiidea								1		
Iphimediidae										
Eriopisa group										
Amphipoda indet.				1		1		1		2
Euphausiacea										
Euphausiacea	2									
Astacidea										
Astacidea										

The lowest identification level	GE3/510 7.5.2011					GE3/998 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Anomura										
Anomura										
Crustacea		1						1		
Gastropoda										
Acmidae										
Skeneidae										
Cypraeidae										
Naticidae										
Marginellidae										
Eulimidae										
Eulima sp.										
Triphoridae										
Rissoidae								1		
Alvania sp.										
Capulidae										
Capulus ungaricus										
Trochidae										
Callistoma sp.		1								
Turridae										
Skeneidae										
Lucorhynchia lyrata										
Epitoniidae										
Columbellidae										
Cima minima										
Pyramidellidae									1	
Buccinidae										
Gastropoda juv.		1								
Caudofoveata			1							
Bivalvia										
Pharidae										
Sinupharus										
Veneridae									3	
Clausinella punctigera										
Dosinia lupinus afra										
Pitar sp.										
Timoclea										
Timoclea ovata										
Donacidae										
Donax sp.										
Tellinidae										
Corbulidae										
Corbula sulcata										
Corbula										
Nuculidae				12						2
Nucula										
Nuculanidae		3		8					3	
Ledella										
Nuculana	2							1		
Nuculana commutata										
Cardiidae										
Lyrocardium										
Europicardium caparti										
Cuspidariidae										
Cuspidaria										
Cardiomya costellata										
Arcidae										
Bathyarca pectunculoides										

The lowest identification level	GE3/510 7.5.2011					GE3/998 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Veneroidea										
Carditidae										
Cardiocardita sp.										
Cardiocardita lacunosa										
Solenidae										
Crassatellidae										
Crassinella sp.										
Limidae							1			
Limaria										
Limatula										
Pectinidae										
Mytilidae										
Lucinidae										
Atrina sp.										
Semelidae										
Bivalvia juv.		1								
Polyplacophora										
Polyplacophora										
Scaphopoda										
Scaphopoda										
Polychaeta										
Phyllodocidae		1								
Nephtyidae		1					1			
Glyceridae				1				2		
Goniadidae			1							
Aphroditidae										
Polynoidae										
Sigalionidae										1
Chrysopetalidae										
Nereididae		1	1	1				2	1	2
Syllidae								1	1	
Amphinomidae										3
Eunicidae				2						4
Onuphidae										15
Lumbrineridae	1									1
Dorvilleidae										
Oweniidae		1								2
Orbiniidae		2								3
Spionidae	1	1		1		2			2	2
Chaetopteridae								1		
Magelona	1	1	2	3						2
Cirratulidae			3	2	2				3	1
Paraonidae			1							1
Cossuridae										3
Flabelligeridae			1		2					
Opheliidae				1						
Sternaspis										1
Capitellidae	1	1					1	2		10
Maldanidae	4	3	6	3	10			4	3	8
Terebellidae										1
Trichobranchidae										1

The lowest identification level	GE3/510 7.5.2011					GE3/998 7.5.2011				
Sample	4	5	6	7	8	4	5	6	7	8
Sabellidae										
Serpulidae										
Siboglinidae										
Trochochaetidae			1							
Poecilochaetus										
Polychaeta	4	3	4					1	1	8
Nematoda										
Nemertea										
Sipuncula			1							
Priapulida										
Echiura										
Vermes (non det., worm like inv.)										1
Asteroidea										
Pectinaster filholi										
Echinoidea										
Echinoidea juv.										
Brissopsis elongata										
Plagiobrissus africanus										
Cidaridae juv.										
Fibulariidae juv.										
Holothuroidea										
Holothuroidea										
Cucumariidae juv.										
Synallactidae juv.										
Synaptidae										
Ophiuroidea										
Ophiuroidea										
Amphilepis ingolfiana										
Amphioplus (Amphioplus) aciculatus										
Amphioplus archeri										
Amphioplus aurensis										
Amphioplus congensis										
Amphipholis nudipora										
Amphiura atlantica										
Amphiura atlantidea										
Amphiura chiajei				1						
Amphiura incana										
Amphiura sp.									1	
Amphiura ungulata										
Ophionephthys lowelli										
Ophiophragmus acutispina										
Ophiostigma abnorme										
Ophiacantha sp.										
Ophiactis lymani										
Ophiactis lűtkeni										
Ophiopsila guineensis										
Ophiolepis paucispina										
Ophiotrix congensis										
(Dictenophiura) carnea skoogi								1		
Ophiura grubei										

Chemical data

PAH 16 OLF

Station	Sample	PAH 16 Acenaphthene (mg/kg dry matter)	PAH 16 Acenaphthylene (mg/kg dry matter)	PAH 16 Anthracene (mg/kg dry matter)	PAH 16 Benzo(a)anthracene (mg/kg dry matter)
GE1/0	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/101	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/22	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/249	1	<0,0005	<0,0005	<0,0005	0,00067
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/515	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/53	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/6	1	<0,0005	<0,0005	<0,0005	0,0014
	2	<0,0005	<0,0005	<0,0005	0,0018
	3	<0,0005	<0,0005	<0,0005	0,0025
GE1/991	1	<0,0005	0,00051	<0,0005	0,0006
	2	<0,0005	0,00056	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/0	1	<0,0005	<0,0005	<0,0005	0,001
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/1005	1	<0,0005	0,00073	<0,0005	0,00077
	2	<0,0005	0,00067	<0,0005	0,00061
	3	<0,0005	0,00082	<0,0005	0,00094
GE2/101	1	<0,0005	<0,0005	<0,0005	0,0013
	2	<0,0005	<0,0005	<0,0005	0,00098
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/247	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/29	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/5	1	<0,0005	<0,0005	<0,0005	0,00063
	2	<0,0005	<0,0005	<0,0005	0,005
	3	<0,0005	<0,0005	<0,0005	0,0013
GE2/503	1	<0,0005	<0,0005	<0,0005	0,0021
	2	<0,0005	<0,0005	0,00063	0,0017
	3	<0,0005	<0,0005	0,00075	0,004
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	0,00051
GE3/0	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005

PAH 16 OLF

Station	Sample	PAH 16 Benzo(a)pyrene (mg/kg dry matter)	PAH 16 Benzo(ghi)perylene (mg/kg dry matter)	PAH 16 Benzo[b+j+k]fluoranthene (mg/kg dry matter)	PAH 16 Chrysene (mg/kg dry matter)
GE1/0	1	0,00054	0,00057	0,00076	<0,0005
	2	0,00062	0,00059	0,00072	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/101	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	0,00074	<0,0005
	3	<0,0005	<0,0005	0,00069	0,00051
GE1/22	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
1 GE1/249	1	<0,0005	0,00071	0,0014	0,0011
	2	<0,0005	<0,0005	0,00059	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/515	1	<0,0005	<0,0005	0,00054	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/53	1	<0,0005	0,00061	0,00098	<0,0005
	2	<0,0005	<0,0005	0,00095	<0,0005
	3	<0,0005	0,00061	0,0011	0,0005
GE1/6	1	0,0011	0,0011	0,0015	0,0012
	2	0,0015	0,0014	0,0021	0,0015
	3	0,0019	0,0017	0,0026	0,0022
GE1/991	1	<0,0005	0,00065	0,0014	0,0012
	2	<0,0005	<0,0005	0,0013	0,00087
	3	<0,0005	<0,0005	0,0011	0,00082
GE2/0	1	0,00074	0,00075	0,0012	0,00096
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/1005	1	<0,0005	<0,0005	0,0015	0,00097
	2	0,00053	<0,0005	0,0015	0,00082
	3	<0,0005	0,00094	0,002	0,0013
GE2/101	1	0,00072	0,00068	0,0016	0,0012
	2	0,00096	0,0011	0,0018	0,0012
	3	<0,0005	0,00055	0,0011	0,00057
GE2/247	1	<0,0005	<0,0005	0,00075	<0,0005
	2	<0,0005	<0,0005	0,00087	0,00053
	3	<0,0005	<0,0005	0,00078	<0,0005
GE2/29	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/5	1	0,00054	0,00056	0,00083	0,0006
	2	0,0025	0,0021	0,0042	0,0038
	3	0,00078	0,00069	0,0015	0,001
GE2/503	1	0,0011	0,0012	0,0037	0,0023
	2	0,0011	0,0012	0,0031	0,0018
	3	0,0013	0,002	0,0045	0,0035
GE2/53	1	<0,0005	<0,0005	0,00069	<0,0005
	2	<0,0005	<0,0005	0,00094	<0,0005
	3	<0,0005	0,00067	0,0011	0,00059
GE3/0	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005

PAH 16 OLF continued

Station	Sample	PAH 16 Dibenzo(a,h)anthracene (mg/kg dry matter)	PAH 16 Fluoranthene (mg/kg dry matter)	PAH 16 Fluorene (mg/kg dry matter)	PAH 16 Indeno(1,2,3-cd)pyrene (mg/kg dry matter)
GE1/0	1	<0,0005	0,00059	<0,0005	<0,0005
	2	<0,0005	0,00073	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/101	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	0,00075	<0,0005	<0,0005
	3	<0,0005	0,00059	<0,0005	<0,0005
GE1/22	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
1 GE1/249	1	<0,0005	0,00078	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/515	1	<0,0005	0,0011	<0,0005	<0,0005
	2	<0,0005	0,00077	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE1/53	1	<0,0005	0,00074	<0,0005	<0,0005
	2	<0,0005	0,00083	<0,0005	<0,0005
	3	<0,0005	0,00089	<0,0005	<0,0005
GE1/6	1	<0,0005	0,002	<0,0005	<0,0005
	2	<0,0005	0,003	<0,0005	<0,0005
	3	<0,0005	0,0043	<0,0005	0,0006
GE1/991	1	<0,0005	0,0023	<0,0005	<0,0005
	2	<0,0005	0,0018	<0,0005	<0,0005
	3	<0,0005	0,0018	<0,0005	<0,0005
GE2/0	1	<0,0005	0,0012	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/1005	1	<0,0005	0,0021	<0,0005	<0,0005
	2	<0,0005	0,0023	<0,0005	<0,0005
	3	<0,0005	0,0033	<0,0005	<0,0005
GE2/101	1	<0,0005	0,0021	<0,0005	<0,0005
	2	<0,0005	0,0017	<0,0005	0,00051
	3	<0,0005	0,00086	<0,0005	<0,0005
GE2/247	1	<0,0005	0,0012	<0,0005	<0,0005
	2	<0,0005	0,0012	<0,0005	<0,0005
	3	<0,0005	0,0013	<0,0005	<0,0005
GE2/29	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE2/5	1	<0,0005	0,00071	<0,0005	<0,0005
	2	<0,0005	0,0056	<0,0005	0,0019
	3	<0,0005	0,0011	<0,0005	0,00061
GE2/503	1	<0,0005	0,0045	<0,0005	0,00079
	2	<0,0005	0,0047	<0,0005	0,00052
	3	<0,0005	0,0076	<0,0005	0,00082
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	0,00056	<0,0005	<0,0005
	3	<0,0005	0,00074	<0,0005	<0,0005
GE3/0	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005

PAH 16 OLF continued

Station	Sample	PAH 16 Naphtalene (mg/kg dry matter)	PAH 16 Phenanthrene (mg/kg dry matter)	PAH 16 Pyrene (mg/kg dry matter)	PAH 16 EPA (sum) (mg/kg dry matter)
GE1/0	1	<0,0005	<0,0005	0,00058	<0,01
	2	<0,0005	<0,0005	0,00063	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/101	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	0,00076	<0,01
	3	<0,0005	<0,0005	0,00063	<0,01
GE1/22	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
1 GE1/249	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,00059	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/515	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,00095	<0,01
	3	<0,0005	<0,0005	<0,0005	nd
GE1/53	1	<0,0005	<0,0005	0,00059	<0,01
	2	<0,0005	<0,0005	0,00072	<0,01
	3	<0,0005	<0,0005	0,00071	<0,01
GE1/6	1	<0,0005	<0,0005	0,0017	<0,01
	2	<0,0005	<0,0005	0,0028	0,014
	3	<0,0005	<0,0005	0,0033	0,019
GE1/991	1	0,0018	<0,0005	0,0021	0,011
	2	0,0017	<0,0005	0,0017	<0,01
	3	0,0013	<0,0005	0,002	<0,01
GE2/0	1	<0,0005	<0,0005	0,001	<0,01
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE2/1005	1	0,0021	<0,0005	0,0021	0,01
	2	0,0021	<0,0005	0,0021	0,011
	3	0,0026	<0,0005	0,003	0,015
GE2/101	1	<0,0005	<0,0005	0,0019	<0,01
	2	<0,0005	<0,0005	0,0019	0,01
	3	<0,0005	<0,0005	0,00097	<0,01
GE2/247	1	<0,0005	<0,0005	0,0013	<0,01
	2	<0,0005	<0,0005	0,0017	<0,01
	3	<0,0005	<0,0005	0,0017	<0,01
GE2/29	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE2/5	1	<0,0005	<0,0005	0,00058	<0,01
	2	<0,0005	0,0018	0,0046	0,031
	3	<0,0005	<0,0005	0,00098	<0,01
GE2/503	1	0,0016	0,0011	0,004	0,022
	2	0,00084	0,00085	0,0041	0,02
	3	0,0013	0,0012	0,0061	0,033
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,01
	2	<0,0005	<0,0005	0,00068	<0,01
	3	<0,0005	<0,0005	0,00089	<0,01
GE3/0	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd

PAH 16 OLF continued

Station	Sample	PAH 16 Acenaphthene (mg/kg dry matter)	PAH 16 Acenaphthylene (mg/kg dry matter)	PAH 16 Anthracene (mg/kg dry matter)	PAH 16 Benzo(a)anthracene (mg/kg dry matter)
GE3/105	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	0,00077
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	0,0016
GE3/510	1	<0,0005	<0,0005	<0,0005	0,00081
	2	<0,0005	<0,0005	<0,0005	0,00055
	3	<0,0005	<0,0005	<0,0005	0,00088
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	<0,0005	0,0013	<0,0005	0,00089
	2	<0,0005	0,00097	<0,0005	0,0011
	3	<0,0005	0,001	0,00059	0,0018

PAH 16 OLF continued

Station	Sample	PAH 16 Benzo(a)pyrene (mg/kg dry matter)	PAH 16 Benzo(ghi)perylene (mg/kg dry matter)	PAH 16 Benzo[b+j+k]fluoranthene (mg/kg dry matter)	PAH 16 Chrysene (mg/kg dry matter)
GE3/105	1	<0,0005	<0,0005	0,00081	0,00053
	2	<0,0005	<0,0005	0,0013	0,001
	3	<0,0005	<0,0005	0,00077	<0,0005
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	0,0009	0,00066
	3	<0,0005	<0,0005	0,00075	<0,0005
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	<0,0005	<0,0005	0,00057	<0,0005
	2	<0,0005	<0,0005	0,00058	<0,0005
	3	0,0012	0,001	0,0018	0,0013
GE3/510	1	0,0005	0,00072	0,0018	0,0012
	2	<0,0005	0,00071	0,0015	0,00079
	3	0,00053	0,00071	0,0018	0,0012
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	0,00053	0,00095	0,0022	0,0014
	2	0,0007	0,001	0,0025	0,0017
	3	0,00095	0,001	0,0026	0,0021

PAH 16 OLF continued

Station	Sample	PAH 16 Dibenzo(a,h)anthracene (mg/kg dry matter)	PAH 16 Fluoranthene (mg/kg dry matter)	PAH 16 Fluorene (mg/kg dry matter)	PAH 16 Indeno(1,2,3-cd)pyrene (mg/kg dry matter)
GE3/105	1	<0,0005	0,00082	<0,0005	<0,0005
	2	<0,0005	0,0012	<0,0005	<0,0005
	3	<0,0005	0,00066	<0,0005	<0,0005
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	0,0009	<0,0005	<0,0005
	3	<0,0005	0,00074	<0,0005	<0,0005
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	0,0018	<0,0005	0,0006
GE3/510	1	<0,0005	0,003	<0,0005	<0,0005
	2	<0,0005	0,0021	<0,0005	<0,0005
	3	<0,0005	0,0031	<0,0005	<0,0005
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	<0,0005	0,0035	<0,0005	<0,0005
	2	<0,0005	0,0036	<0,0005	<0,0005
	3	<0,0005	0,0043	<0,0005	<0,0005

PAH 16 OLF continued

Station	Sample	PAH 16 Naphtalene (mg/kg dry matter)	PAH 16 Phenanthrene (mg/kg dry matter)	PAH 16 Pyrene (mg/kg dry matter)	PAH 16 EPA (sum) (mg/kg dry matter)
GE3/105	1	<0,0005	<0,0005	0,0008	<0,01
	2	<0,0005	<0,0005	0,0015	<0,01
	3	<0,0005	<0,0005	0,00075	<0,01
GE3/254	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	0,0015	<0,01
	3	<0,0005	<0,0005	0,0011	<0,01
GE3/26	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,01
	2	<0,0005	<0,0005	<0,0005	<0,01
	3	<0,0005	<0,0005	0,0016	0,011
GE3/510	1	0,0013	<0,0005	0,003	0,012
	2	0,0011	<0,0005	0,0023	<0,01
	3	0,00096	<0,0005	0,0033	0,013
GE3/52	1	<0,0005	<0,0005	<0,0005	nd
	2	<0,0005	<0,0005	<0,0005	nd
	3	<0,0005	<0,0005	<0,0005	nd
GE3/998	1	0,0037	0,0008	0,0031	0,018
	2	0,0031	0,00064	0,0029	0,018
	3	0,0033	0,0013	0,0034	0,022

PCB's.

Station	Sample	(Sum) PCB (7) (mg/kg dw)	PCB 101 (mg/kg dw)	PCB 118 (mg/kg dw)	PCB 138 (mg/kg dw)	PCB 153 (mg/kg dw)	PCB 180 (mg/kg dw)	PCB 28 (mg/kg dw)	PCB 52 (mg/kg dw)
GE1/0	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/101	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/22	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/249	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/515	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/53	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/6	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/991	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/0	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/1005	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/101	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/247	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/29	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/5	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/503	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005

PCB's

Station	Sample	(Sum) PCB (7) (mg/kg dw)	PCB 101 (mg/kg dw)	PCB 118 (mg/kg dw)	PCB 138 (mg/kg dw)	PCB 153 (mg/kg dw)	PCB 180 (mg/kg dw)	PCB 28 (mg/kg dw)	PCB 52 (mg/kg dw)
GE3/254	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/26	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/510	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/52	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	nd	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005

THC Appendix

Station	Sample	THC (C12 - C35) (mg/kg dry matter)	Station	sample	THC (C12 - C35) (mg/kg dry matter)
GE1/0	1	<1	GE2/29	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE1/101	1	<1	GE2/5	1	1,2
	2	<1		2	5,1
	3	<1		3	2,1
GE1/22	1	<1	GE2/503	1	28
	2	<1		2	3,6
	3	<1		3	34
GE1/249	1	7	GE2/53	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE1/515	1	1,5	GE3/0	1	<1
	2	2,6		2	<1
	3	<1		3	<1
GE1/53	1	<1	GE3/105	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE1/6	1	<1	GE3/254	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE1/991	1	3,2	GE3/26	1	<1
	2	1,4		2	<1
	3	1,2		3	<1
GE2/0	1	<1	GE3/5	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE2/1005	1	<1	GE3/510	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE2/101	1	<1	GE3/52	1	<1
	2	<1		2	<1
	3	<1		3	<1
GE2/247	1	<1	GE3/998	1	<1
	2	<1		2	<1
	3	<1		3	<1

NPD's Appendix.

Station	Sample	NPD-forbindelser Dibenzothiophene (mg/kg dw)	Dibenzothiophene C1 (mg/kg dw)	Dibenzothiophene C2 (mg/kg dw)	Dibenzothiophene C3 (mg/kg dw)	Naphtalene C1 (mg/kg dw)	Naphtalene C2 (mg/kg dw)
GE1/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/101	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/22	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
1							
GE1/249	1	<0,0005	0,00076	0,0029	0,0034	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/515	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/53	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/6	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE1/991	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/1005	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/101	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/247	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/29	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/5	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/503	1	<0,0005	<0,0005	0,0014	0,0011	0,0013	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/0	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/105	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	0,0026	0,0021	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005

NDP's continued

Station	Sample	Naphtalene C3 (mg/kg dw)	Phenanthrene C1 (mg/kg dw)	Phenanthrene C2 (mg/kg dw)	Phenanthrene C3 (mg/kg dw)	sum analysis (mg/kg dw)	Sum of NPDs (mg/kg dw)
GE1/0	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE1/101	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE1/22	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
1							
GE1/249	1	<0,0005	0,00066	0,009	0,0085	0,025	0,025
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE1/515	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE1/53	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE1/6	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	0,00098	0,00085	0,002	<0,01(<0.005)
GE1/991	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE2/0	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE2/1005	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE2/101	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE2/247	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE2/29	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE2/5	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	0,00062	0,0012	0,002	<0,01(<0.005)
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE2/503	1	<0,0005	0,00092	0,0048	0,0033	0,013	0,013
	2	<0,0005	<0,0005	0,0042	0,0012	0,005	<0,01
	3	<0,0005	<0,0005	<0,0005	0,0021	0,002	<0,01(<0.005)
GE2/53	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE3/0	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE3/105	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	0,0011	0,0044	0,010	0,01
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd

NDP's continued

Station	Sample	NPD-forbindelser Dibenzothiophene (mg/kg dw)	Dibenzothiophene C1 (mg/kg dw)	Dibenzothiophene C2 (mg/kg dw)	Dibenzothiophene C3 (mg/kg dw)	Naphtalene C1 (mg/kg dw)	Naphtalene C2 (mg/kg dw)
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	0,0035	0,0011	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/510	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
GE3/998	1	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	2	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005
	3	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005

NDP's continued

Station	Sample	Naphtalene C3 (mg/kg dw)	Phenanthrene C1 (mg/kg dw)	Phenanthrene C2 (mg/kg dw)	Phenanthrene C3 (mg/kg dw)	sum analysis (mg/kg dw)	Sum of NPDs (mg/kg dw)
GE3/254	1	<0,0005	<0,0005	<0,0005	<0,0005	0	
	2	<0,0005	<0,0005	0,0027	0,00051	0,008	<0,01 (0,008)
	3	<0,0005	<0,0005	0,00053	<0,0005	0,001	<0,01(<0.005)
GE3/26	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE3/5	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE3/510	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE3/52	1	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
GE3/998	1	<0,0005	<0,0005	0,0009	<0,0005	0,001	<0,01(<0.005)
	2	<0,0005	<0,0005	<0,0005	<0,0005	0,000	nd
	3	<0,0005	<0,0005	0,0017	<0,0005	0,002	<0,01(<0.005)

Ghana 2011 metals.

Station	Sample	Arsen (As) (mg/kg) (dw)	Barium (Ba) (mg/kg) (dw)	Lead (Pb) (mg/kg) (dw)	Copper (Cu) (mg/kg) (dw)	Chromium (Cr) (mg/kg) (dw)	Mercury (Hg) (mg/kg) (dw)	Nickel (Ni) (mg/kg) (dw)	Zink (Zn) (mg/kg) (dw)	Cadmium (Cd) (mg/kg) (dw)
GE1/0	1	12	2,1	5,5	3	12	<0,001	2,3	20	<0,01
	2	8,8	1,9	3,6	2,4	8,5	<0,001	1,5	14	<0,01
	3	8,8	1,7	3,6	3,9	8,5	<0,001	1,7	13	<0,01
GE1/101	1	6,2	12	4	3,4	33	0,013	11	34	0,07
	2	6,1	12	4	3,5	34	0,013	11	36	0,077
	3	4,4	11	3,4	3,6	31	0,013	11	33	0,078
GE1/22	1	26	2,7	2,5	0,61	18	0,003	1,7	9,1	0,029
	2	22	4	2,8	0,89	18	0,004	1,9	12	0,12
	3	26	3,1	2,7	1	18	0,004	1,8	20	0,046
GE1/249	1	5,5	11	3,5	3,2	37	0,013	9,6	40	0,091
	2	5,2	11	3,9	3,2	38	0,012	9,7	43	0,097
	3	4,9	9,2	3,1	2,7	33	0,011	8,5	36	0,1
GE1/515	1	4,4	40	5,7	8,1	36	0,022	18	40	0,13
	2	4,7	40	5,9	8,1	36	0,021	18	39	0,11
	3	5,3	34	5,1	7	30	0,021	15	33	0,096
GE1/53	1	24	10	4,4	2,2	28	0,009	6,2	23	0,094
	2	19	11	4,8	2,4	32	0,01	7,6	24	0,085
	3	18	12	4,5	2,7	32	0,011	8,1	25	0,08
GE1/6	1	6,1	4,7	5,2	3,4	26	0,003	3,7	30	0,013
	2	6,6	5,9	5,4	3,9	25	0,004	3,9	26	0,014
	3	6,7	5,1	4,9	3,5	25	0,003	3,6	26	0,013
GE1/991	1	7,1	90	7,3	7,8	38	0,031	17	43	0,1
	2	7	100	7,8	9	42	0,029	19	46	0,095
	3	6,6	100	7,6	9,1	41	0,03	19	47	0,11
GE2/0	1	2	2,1	1,1	0,66	3,2	<0,001	0,64	3,6	<0,01
	2	1,8	1,9	1	0,77	2,1	0,002	0,62	2,5	<0,01
	3	2,3	2	1	0,83	2,5	0,002	0,59	4	<0,01
GE2/1005	1	5,6	91,0	8,3	13,0	47,0	0,0	26,0	50,0	0,2
	2	4,8	92	7,4	11	42	0,028	22	43	0,11
	3	5,6	100	9,8	14	51	0,028	28	54	0,16
GE2/101	1	24	12	8,8	4,2	37	0,016	12	35	0,058
	2	24	13	9,4	4,6	39	0,017	13	36	0,059
	3	38	12	12	3,9	44	0,017	14	41	0,059
GE2/247	1	5,2	20	7,7	8,9	41	0,021	18	40	0,1
	2	5,5	19	7,3	8,4	39	0,021	17	38	0,078
	3	6,1	19	7	8	40	0,019	17	39	0,073

Ghana 2011 metals continued.

Station	Sample	Arsen (As) (mg/kg) (dw)	Barium (Ba) (mg/kg) (dw)	Lead (Pb) (mg/kg) (dw)	Copper (Cu) (mg/kg) (dw)	Chromium (Cr) (mg/kg) (dw)	Mercury (Hg) (mg/kg) (dw)	Nickel (Ni) (mg/kg) (dw)	Zink (Zn) (mg/kg) (dw)	Cadmium (Cd) (mg/kg) (dw)
GE2/29	1	9,3	2,2	1,4	0,33	4,9	0,001	0,74	3,7	0,03
	2	14	3,3	1,8	0,4	6,7	0,004	0,94	4	0,043
	3	16	3,2	2,2	1	8,6	0,002	1,2	6,1	0,032
GE2/5	1	4,2	53	4,8	0,82	14	0,003	2,4	23	0,01
	2	4,7	20	3,3	1,3	12	0,004	2,5	21	<0,01
	3	5,2	21	2,9	1,3	12	0,006	2,7	22	0,011
GE2/503	1	7,4	47	8,1	11	46	0,022	23	46	0,12
	2	7,2	49	8,1	11	47	0,023	23	45	0,12
	3	14	57	9,1	12	48	0,024	24	48	0,14
GE2/53	1	10	8,8	5,3	1,8	26	0,008	7,5	27	0,039
	2	9,1	9,2	5,3	2,1	27	0,01	7,9	27	0,043
	3	9,9	8,5	5	2,2	24	0,008	7,1	26	0,049
GE3/0	1	2,1	0,94	0,87	1,6	8,7	<0,001	1,9	5,6	<0,01
	2	1,6	0,9	1,1	1,2	9,3	<0,001	2,1	4,9	<0,01
	3	2	0,9	0,85	0,88	8,9	<0,001	1,8	3,8	<0,01
GE3/105	1	12	16	6,4	5,3	31	0,016	12	34	0,17
	2	12	16	6,8	5,7	34	0,026	14	37	0,17
	3	8	11	5,3	3,6	21	0,009	8,1	29	0,12
GE3/254	1	21	18	9,8	6,8	60	0,018	16	57	0,13
	2	19	16	10	6,1	72	0,017	16	65	0,099
	3	15	19	9,5	7,6	65	0,015	18	60	0,11
GE3/26	1	4,7	3,4	1,8	1,2	16	0,002	3,5	11	0,06
	2	4,3	3	1,8	1,19	15,1	0,002	3,2	9,9	0,06
	3	3,5	3,5	1,6	1,4	15	0,002	3,3	11	0,061
GE3/5	1	7,6	3,9	2,3	0,71	11	0,001	2,7	12	<0,01
	2	8	4	2,6	0,86	11	0,001	3	12	<0,01
	3	7,9	3,4	2,5	0,83	11	0,001	2,7	12	<0,01
GE3/510	1	19	50	11	11	46	0,037	23	48	0,23
	2	11	41	9,6	12	45	0,027	23	48	0,17
	3	8,2	44	10	11	46	0,031	23	50	0,2
GE3/52	1	6,5	11	4,1	4,3	26	0,009	9,9	25	0,18
	2	8,4	16	6,7	6,2	38	0,012	15	41	0,27
	3	5,3	16	6,1	6,3	36	0,013	15	38	0,23
GE3/998	1	8,4	75	10	12	43	0,033	22	50	0,15
	2	9	84	12	14	48	0,035	25	54	0,19
	3	8,1	77	10	12	43	0,032	23	49	0,17

CTD stations

DATE	TIME	LON	LAT	DEPTH	STATION	TRANSECT
20.04.2011	09:22:01	-0.5323	5.2989	22	HD388	GE 1
20.04.2011	15:41:19	-0.4259	5.1523	52	HD389	GE 1
20.04.2011	20:16:46	-0.3576	5.0700	31	HD390	GE 1
20.04.2011	22:24:27	-0.3103	5.0158	1154	HD391	GE 1
20.04.2011	23:11:43	-0.3168	5.0230	995	HD392	GE 1
20.04.2011	23:56:05	-0.3239	5.0306	831	HD393	GE 1
21.04.2011	00:33:51	-0.3281	5.0363	659	HD394	GE 1
21.04.2011	01:07:53	-0.3319	5.0403	490	HD395	GE 1
21.04.2011	01:37:25	-0.3356	5.0448	364	HD396	GE 1
21.04.2011	02:03:04	-0.3412	5.0513	287	HD397	GE 1
21.04.2011	02:26:03	-0.3442	5.0550	182	HD398	GE 1
21.04.2011	02:42:16	-0.3471	5.0586	114	HD399	GE 1
21.04.2011	03:00:51	-0.3565	5.0695	101	HD400	GE 1
21.04.2011	03:21:08	-0.3681	5.0857	79	HD401	GE 1
21.04.2011	03:44:16	-0.3876	5.1095	62	HD402	GE 1
21.04.2011	04:05:44	-0.4081	5.1344	56	HD403	GE 1
21.04.2011	04:28:51	-0.4245	5.1558	52	HD404	GE 1
21.04.2011	04:56:53	-0.4526	5.1950	42	HD405	GE 1
21.04.2011	05:30:06	-0.4926	5.2503	34	HD406	GE 1
21.04.2011	05:59:49	-0.5279	5.3020	23	HD407	GE 1
21.04.2011	12:46:41	-0.3429	5.0530	249	HD408	GE 1
22.04.2011	05:42:36	-0.3310	5.0403	514	HD409	GE 1
22.04.2011	18:06:56	-0.3166	5.0219	1024	HD410	GE 1
23.04.2011	16:54:49	-0.3355	5.0429	393	HD411	GE 1
23.04.2011	17:14:32	-0.3340	5.0427	410	HD412	GE 1
25.04.2011	00:04:09	0.1941	5.6653	25	HD413	GE 2
25.04.2011	00:23:07	0.1991	5.6513	35	HD414	GE 2
25.04.2011	00:35:28	0.2053	5.6366	42	HD415	GE 2
25.04.2011	00:47:11	0.2111	5.6233	48	HD416	GE 2
25.04.2011	01:00:10	0.2169	5.6099	53	HD417	GE 2
25.04.2011	01:12:41	0.2229	5.5961	61	HD418	GE 2
25.04.2011	01:27:19	0.2307	5.5785	72	HD419	GE 2
25.04.2011	01:43:16	0.2402	5.5567	100	HD420	GE 2
25.04.2011	01:56:55	0.2462	5.5426	178	HD421	GE 2
25.04.2011	02:16:14	0.2508	5.5327	265	HD422	GE 2
25.04.2011	02:34:56	0.2558	5.5200	389	HD423	GE 2
25.04.2011	02:57:07	0.2614	5.5073	643	HD424	GE 2
25.04.2011	03:26:42	0.2659	5.4977	851	HD425	GE 2
25.04.2011	04:02:17	0.2703	5.4874	1004	HD426	GE 2
07.05.2011	06:00:21	1.1983	6.0229	26	HD427	GE 3
07.05.2011	10:32:35	1.2361	5.9446	52	HD428	GE 3
07.05.2011	12:57:14	1.2552	5.8974	105	HD429	GE 3
07.05.2011	15:29:00	1.2616	5.8836	252	HD430	GE 3
07.05.2011	18:17:17	1.2716	5.8609	505	HD431	GE 3
07.05.2011	22:23:25	1.2848	5.8303	1003	HD432	GE 3

Demersal trawling positions.

DATE	TIME	LON	LAT	DEPTH	CODE	EVENT
21.04.2011	11:42:18	-0.3570	5.0704	100	BT1	Out
21.04.2011	12:12:58	-0.3727	5.0498	106	BT1	In
23.04.2011	21:29:18	-0.4079	5.3589	27	BT2	Out
23.04.2011	22:00:06	-0.4315	5.3467	26	BT2	In
26.04.2011	08:12:47	0.2842	5.6754	27	BT3	Out
26.04.2011	08:44:17	0.2566	5.6700	31	BT3	In
08.05.2011	08:32:58	1.0858	5.9418	32	BT4	Out
08.05.2011	09:07:26	1.1117	5.9623	33	BT4	In