

**SURVEYS OF THE DEMERSAL FISH RESOURCES OF THE OUTER  
SHELF AND SLOPE OFF GHANA**

**30 April - 07 May 2010**

**Institute of Marine Research  
Norway**

**Marine Fisheries Research Division  
Ghana**

Bergen November 2010



## 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 œuvre 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 reports “Dr. Fridtjof Nansen”**

**SURVEYS OF THE DEMERSAL FISH RESOURCES OF THE OUTER  
SHELF AND SLOPE OFF GHANA**

**30 April - 07 May 2010**

by

**Jens-Otto Krakstad and Oddgeir Alvheim**

Institute of Marine Research  
P.O. Box 1870 Nordnes  
N-5817 Bergen, Norway

**Richmond Quartey**

Marine Fisheries Research Division  
P.O. Box BT-62  
Tema, Ghana

and

**Tomio Iwamoto**

California Academy of Sciences,  
California, USA

**Institute of Marine Research  
Bergen, 2010**

## TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION.....	4
1.1.    Objectives.....	4
1.2.    Participation.....	4
1.3.    Narrative.....	4
1.4.    Survey effort.....	5
CHAPTER 2 METHODS.....	6
2.1.    Meteorological and hydrographical sampling.....	6
2.2.    Biological sampling.....	7
CHAPTER 3 OCEANOGRAPHIC CONDITIONS.....	8
3.1.    Along shelf distribution of environmental parameters.....	8
CHAPTER 4 RESULTS FROM THE TRAWL SURVEY.....	10
4.1.    Catch rates.....	10
4.2.    Biodiversity.....	13
4.3.    Consideration for commercial trawling.....	19
Annex I	Records of fishing stations
Annex II	Length distributions of main species
Annex III	Swept-area biomass estimates
Annex IV	Instruments and fishing gear used

## **CHAPTER 1      INTRODUCTION**

---

The survey was organised by IMR and FAO under the project CCP/INT/003/NOR: International cooperation with the Nansen Programme: Fisheries Management and Marine Environment. This project is the continuation of a series of projects and agreements between NORAD, IMR and FAO involving surveys with the research vessel “Dr. Fridtjof Nansen”. The objectives of the survey had been agreed upon during discussions between the cruise leader and Marine Fisheries Research Division, and the Environmental Protection Agency (EPA) in Ghana. The survey is the first to investigate the deepwater fish resources of Ghana on the slope between 100-1000 m depth.

### **1.1. Objectives**

The main objectives of the survey were:

- to describe the distribution, composition and estimate the abundance of the main demersal species on the outer shelf and slope from 100 – 1000 m depth by a swept-area trawl programme
- to collect zooplankton samples for distribution and abundance estimation
- to map the general hydrographic regime along the survey transect
- to provide on-the-job training to local participants in relation to the main survey routines

### **1.2. Participation**

The participants in the survey came from:

Marine Fisheries Research Division, Tema, Ghana:

Richmond Quartey (team leader), Eunice Anum-Ofoli, Edmund Nii-Anme, Jones Tetteh, Serwa Abogaye and Damoah Kwame

University of Ghana:

Solomon Owiredu Amoah and Ignatius Kweku Williams

California Academy of Sciences, USA:

Tomio Iwamoto

Institute of Marine Research, Bergen, Norway:

Jens-Otto Krakstad (cruise leader), Oddgeir Alvheim, Tore Mørk and Thor Egil Johansson

### 1.3. Narrative

The vessel left Tema (Ghana) in the morning of the 30<sup>th</sup> April and steamed eastwards to the Ghanaian border with Togo where the survey started the same day. The outer shelf and slope of Ghana was surveyed between 100 m – 1000 m depth by parallel course tracks about 15 NM (nautical miles) apart. Semi-random swept-area hauls were carried out on the shelf and slope within the depth zones <100 m, 100 - 300 m, 300 - 600 m and 600 - 1000 m in all areas with suitable trawling grounds. Continuous acoustic registrations were done throughout the survey.

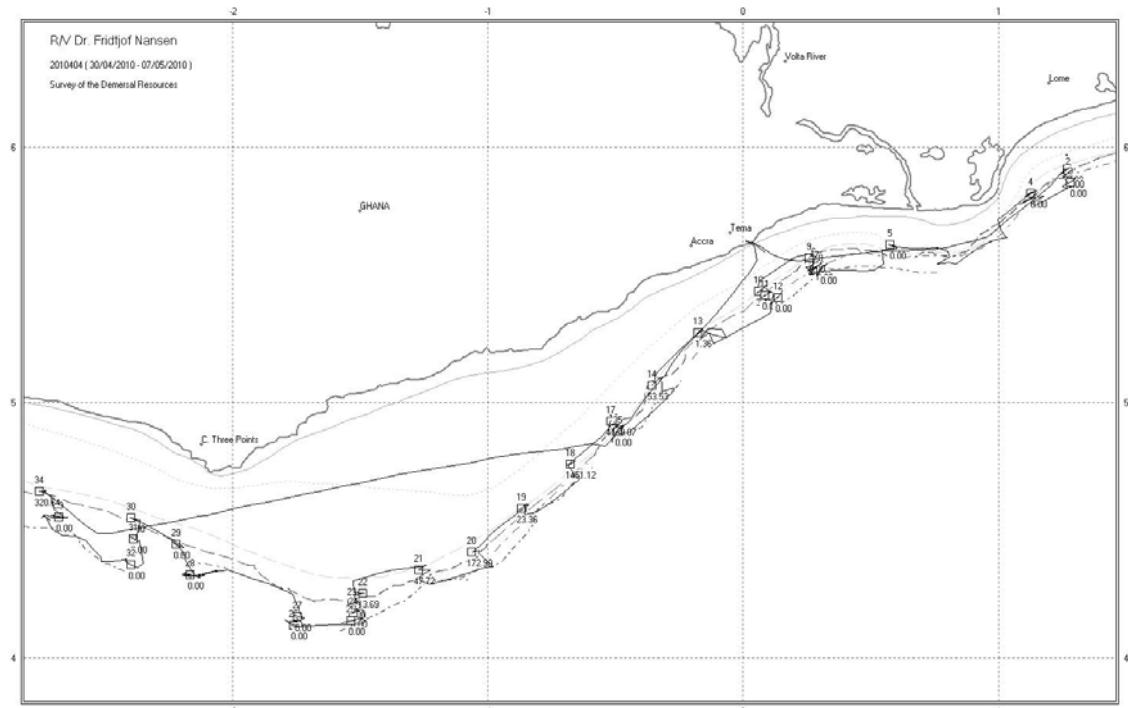
CTD-stations were taken at the bottom trawl stations. In addition, CTD's from surface down to the bottom was taken at 100 m depth and 1000 m depth at every 30 NM along the transects. The main part of the survey was completed in the evening of 6<sup>th</sup> May and the vessel arrived in Tema in the morning of the 7<sup>th</sup> May. Minor problems were experienced with the deepwater trawling because of a drum axel broke and caused an interruption to the trawling operation for some 10h during the last day of the survey. Problems were also experienced with the CTD that had a circuit failure. The failure was fixed onboard within 24 h. As a consequence some trawls do not have an accompanying CTD station.

### 1.4. Survey effort

The cruise tracks with trawl, hydrographic and plankton stations are shown in Figure 1.1. Table 1.1 summarises the survey effort in each sector.

**Table 1.1** Number of bottom trawl (BT) stations, plankton (P), hydrographic (CTD) stations and distance surveyed (NM).

Regions	Date	BT Stations	Plankton stations	CTD Station	Distance travelled
Ghana	30/04 - 07/05-2010	35	11	39	907



**Figure 1.1** Course track with fishing stations Depth contours at 20 m, 50 m, 100 m, 200 m and 500 m are indicated.

## CHAPTER 2 METHODS

---

### 2.1. Meteorological and hydrographical sampling

#### *Temperature, salinity and oxygen*

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 usually taken down to a few metres above the bottom, but not deeper than 1500 m.

The SBE 21 Seacat thermosalinograph was running routinely during the survey, obtaining samples of sea surface salinity and relative temperature (5 m depth) every 10 seconds. An attached in-line Turner Design SCUFA Fluorometer continuously measured Chlorophyll A levels [RFU] at 5 m below the sea surface while underway during the entire cruise.

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

A vessel-mounted Acoustic Doppler Current Profiler (VMADCP) from RD Instruments logged the current profiles continuously, and was set to ping synchronously with the echo sounders. The frequency of the VMADCP is 150 kHz, and data were averaged and stored in 4 m vertical bins in shallow water to approximately 400 m bottom depth and 8 m bins deeper than this.

#### *Zooplankton*

The sampling was conducted by means of HYDROBIOS Multinet with 5 nets at the monitoring lines. The nets (180 µm) were remotely opened from the bridge of the vessel. The depth intervals covered in 2010 were: 200-100 m, 100 -75 m, 75-50 m, 50-25 m and from 25 m to the surface. In the case of stations shallower than 25 m, the sample was taken from the bottom and up to the surface. A SCANMAR depth sensor gave real-time information of the depth and a flow meter inside the net was used to estimate the sampling volume. The samples were preserved in 4% formalin to be taken to the University of Ghana for further analysis.

### 2.2. Biological sampling

#### *Sampling gear*

A Gisund Super bottom trawl with a headline height of about 4.5 m was used during the survey, the doors are of the Thyborøn' combi type. The distance between the front parts of the wings was about 21 m during deployment at a speed of 3 NM h-1. These settings have been the standard on all swept area surveys with R/V "Dr. Fridtjof Nansen". During all tows

deeper than 80 m, a 9 m long constraining rope was attached between the wires 120 m in front of the trawl doors. This kept a constant distance between the doors of about 50 m during the trawling. In shallow stations with depths of less than 80 m, the door-to-door distance varied more, depending on bottom type and currents. Data from the door and depth/trawl-height sensors were logged for all tows and are stored in files with CMG format, which makes it possible to study the trawl performance in more detail.

Trawl duration was standardized to 30 minutes. The trawling start time is controlled by using SCANMAR sensors to detect the landing of the trawl on the bottom, and the stop-time is defined as the time when the wires start to haul the net. In some cases the towing was interrupted before 30 minutes either due to poor bottom conditions or too high catches of fish indicated by the installed catch sensors. If the stations were not trusted to reflect the density of fish on the bottom they were recorded as invalid in the Nansis database.

#### *Catch sampling*

The trawl catches were sampled for species composition by weight and numbers. The deck sampling procedure is described in more detail by Strømme (1992). Length measurements (total length) were taken for target species. The length of each fish was recorded to the nearest 1 cm below. The mantle length was measured to the nearest 1 cm below for *Sepia* spp. Basic information recorded at each fishing stations, i.e. trawl hauls, is presented in Annex I. Pooled length frequency distributions, raised to catch per hour, of selected species are shown in Annex II. The swept-area estimates are presented in Annex III. A description of the fishing gears used, acoustic instruments and their standard settings is given in Annex IV.

## CHAPTER 3 OCEANOGRAPHIC CONDITIONS

---

### 3.1. Along shelf distribution of environmental parameters

CTD profiles were taken on all trawl stations along the survey transect. From these alongshore figures of temperature, salinity, oxygen and relative fluorescence were extracted at stations just off the shelf break at approximately 500 m bottom depth (Figure 3.1). Generally the profiles show great along shelf stability in the water masses with only minor variation from station to station. Cross shelf profiles of temperature, salinity, oxygen and relative fluorescence where taken on the previous environmental survey off Ghana, 2010403 together with current measurements from the same transects.

The temperature profile show maximum surface temperature on the central part of the shelf at 30 °C. A thermocline can be observed at 30-60 m depth where temperatures are dropping from about 28-21°C. The temperature at the bottom at 500 m depth was <8°C.

The salinity profile show lowest salinity in the surface waters (34.9). It was especially pronounced in the eastern end of the survey area where surface waters are affected by the Volta river plume (34.7). There was a strong salinity gradient in the upper 25 m with salinity increasing to a maximum of 35.9 between 30-130 m depth before decreasing gradually at deeper depths. Salinity at 500 m depth was around 34.7.

The oxygen profile show a oxygen maximum > 4.5 ml/l around 50 m depth and decreasing oxygen to a minimum of < 1.5 around 200 – 400 m depth.

The relative fluorescence profile show a surface values of fluorescence < 0.1 and a fluorescence maximum around 0.3 around 60 m depth and decreasing fluorescence to 100 m depth where from the values where < 0.1.

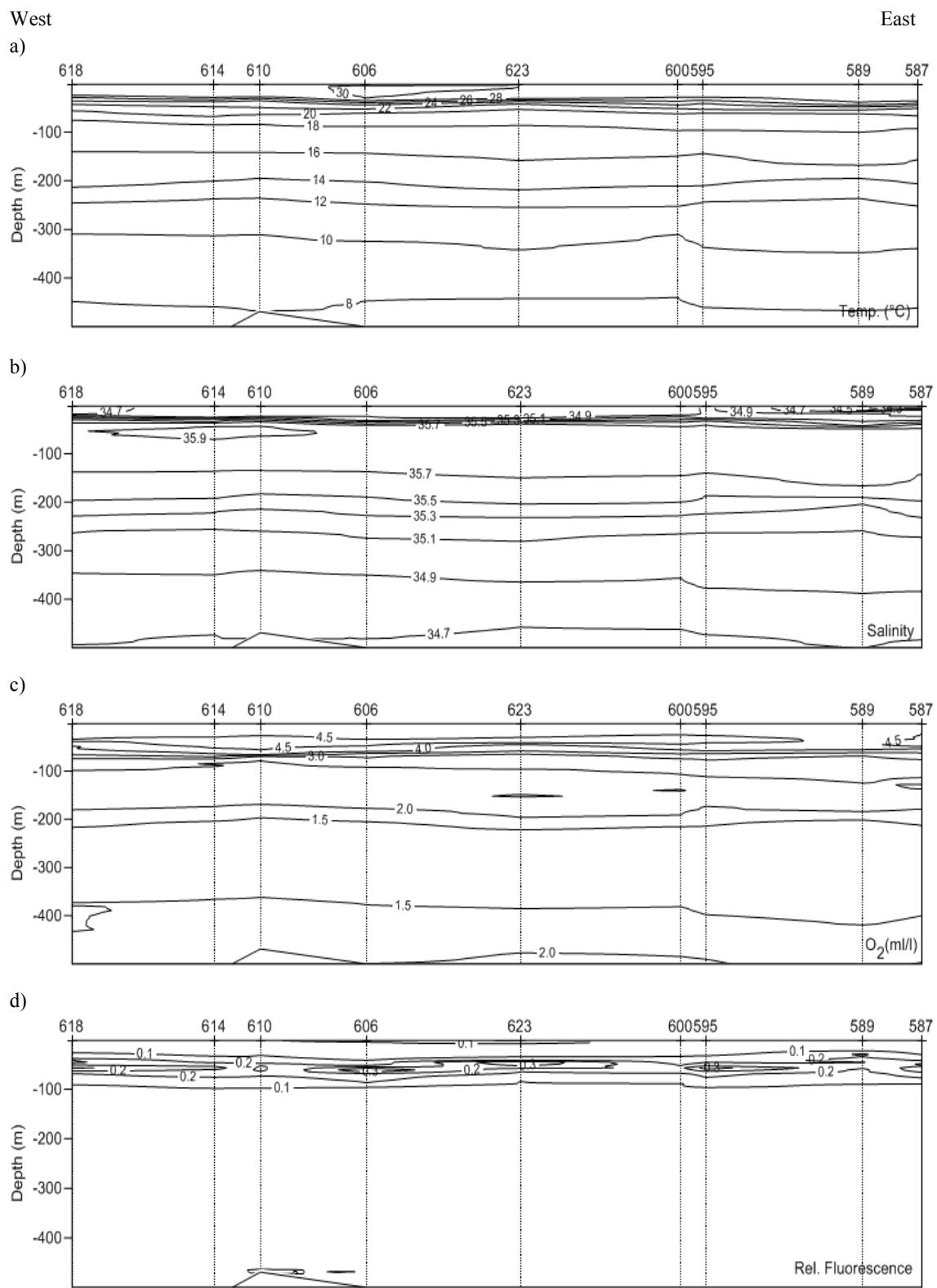


Figure 3.1 Along shelf distribution of environmental parameters along the shelf break. The temperature a), salinity b), oxygen c), relative fluorescence d)

## CHAPTER 4      RESULTS FROM THE TRAWL SURVEY

---

The composition of the fish fauna on the continental shelf and slope of the western Gulf of Guinea changes with depth (Williams 1968). This survey only focused on the outer shelf and deep water slope off Ghana and the catch-distribution analyses were therefore performed for four depth strata, outer shelf (< 100 m), upper slope (100-300 m) mid slope (300-600 m) and lower slope (>600 m). In the analyses the “Demersal” group includes commercially important families as Sciaenidae, Haemulidae (=Pomadasytidae), Serranidae, Sparidae and Lutjanidae, and especially in deeper waters the Merluccidae, Macrouridae and Moridae. The “Pelagic” group includes Engraulidae, Clupeidae, Carangidae, Scombridae, Sphyraenidae, Gempylidae and Trichiuridae (the latter family is actually mainly benthopelagic). For the analysis the “other” group includes all species not accounted for in the groups listed. Therefore, the content of “other” will change from table to table. The locations of the trawl stations are shown in Figure 1.1. Records of fishing stations and catches are presented in Annex I, and pooled length distributions (weighted by catch) of main species by area are shown in Annex II.

### 4.1. Catch rates

A total of 35 swept-area trawl hauls were made in Ghana. Of these 7 trawls were conducted on the outer shelf, 12 on the upper slope, 8 on the mid slope, and 8 on the lower slope. The catch data are presented as catch/h per depth region. No trawling was conducted on the inner shelf and no swept area biomass estimates are available from this survey. The catch rates declined with depth (Table 4.1). The catch rates within each depth region was 1622 kg/h on the outer shelf, 1093 kg/h on the upper slope, 612 kg/h on the mid slope and 813 kg/h on the lower slope. As expected also the valuable demersal species declined rapidly with depth while the non commercial species in the “other” group increased. In general, the average catch rates were highest in the western part of Ghana as has also been observed on the surveys on the shelf.

The most abundant species group on the outer shelf was the pelagic group with average catch rates of 759 kg/h. However the variance was high and the large average catch was mainly due to a large catch on one station. The pelagic group contributed 47% to the overall catch in this depth region. Within this group it was *Trachurus trecae* that was the most important species. Commercially important demersal species where the second most important group with 38 % and average catch rates of 615 kg/h. *Boops boops* and *Dentex congensis* were the most dominant species. Cephalopods, sharks and shrimps were not important in the catches in this depth region. The group of other species contributed 12% and 200 kg/h to the overall catch.

On the upper slope the “other” group was the most abundant. This group contributed 67% of the total catch with catch rates of 731 kg/h. Figure 5.1 show the most abundant species within

this depth region. Both the demersal and the pelagic group contributed with 15% of the total catch. The average catch rate was 164 and 169 kg/h respectively. Sharks, cephalopods and shrimps contributed 1.6%, 0.9% and 0.2% of the catch.

The most abundant group on the mid slope continued to be the group of “other” species with average catches of 444 kg/h and 73% of the overall catch. Shrimps were the second most important group with average catches of 101 kg/h and 17%. The most abundant species in this group was *Nematocarcinus africanus*, a non commercial small shrimp. Sharks had average catch rates of 34 kg/h, 5.5% of total. Pelagic species had average catch rates of 22 kg/h and 3.5% of the overall catch. Cephalopods had mean catch rate of 7 kg/h and 1.2% while demersal species contributed with 0.9% of the overall catch with average catch rates of 5 kg/h.

The group of “other” species continued to dominate on the lower slope with 87% of the overall catch and average catch rates of 708 kg/h. Sharks contributed with 70 kg/h and 8.5% of the overall catch while the demersal group contributed with 21 kg/h and 2.6%. Shrimps and Cephalopods were not important

**Table 4.1** Catch rates (kg/h) by main groups in swept-area bottom-trawl hauls on the a) outer shelf (< 100 m), b) upper slope (100-300 m), c) mid slope (300-600 m) and d) lower slope (>600 m)

a)

Station	Gear depth	Cephalopods	Demersal	Pelagic	Sharks	Shrimps	Other	Total
1	94.5	62.7	472.6	0	8.7	0	171	715
4	77	114.2	315.5	14.7	0	0	135.3	579.8
5	45.5	3.4	43.2	17.4	0	0.4	275.2	339.5
10	86	22.7	519.3	23.4	2.4	0	33.8	601.6
13	89.5	21.1	44.8	1.4	0	0	21.7	88.9
17	98.5	65.5	2624.8	5086.2	7.4	0	128.7	7912.6
20	99	29.1	281.1	172.9	0	0	635.6	1118.7
Mean	84.3	45.5	614.5	759.4	2.6	0.1	200.2	1622.3
St dev	18.8	37.8	905.7	1908.9	3.8	0.1	210.1	2792
%	-	2.8	37.9	46.8	0.2	0.0	12.3	100.0

b)

Station	Gear depth	Cephalopods	Demersal	Pelagic	Sharks	Shrimps	Other	Total
2	204.5	6.9	91	0	27	3.7	304.1	432.7
9	102.5	3.4	103.5	17.8	0	0	21.7	146.4
11	221.5	14.6	235.7	0	21.8	0	3016.8	3289
14	102	1.4	78	84.7	10.2	0.5	559.9	734.7
16	264	0.5	28.7	0	25.6	1.4	535.6	591.9
18	102.5	19.6	501	1466.9	9.8	0	250.4	2247.7
19	113	11.7	210.2	23.4	4.8	0	19.7	269.8
21	107	11.1	447.4	47.7	15.9	0	153.1	675.3
22	132.5	0	135.4	23.5	19.5	0	692.5	870.9
23	287.5	13	16.7	0	55.6	18.9	1983.9	2088.1
30	204.5	34.3	4.1	0	15.6	0	1127.2	1181.2
34	118.5	1.5	116.2	360.8	0	0	107	585.5
Mean	163.3	9.8	164	168.7	17.2	2	731	1092.8
St dev	68.9	10	161.3	421.2	15.2	5.4	912.9	954.6
%	-	0.9	15.0	15.4	1.6	0.2	66.9	100.0

c)

Station	Gear depth	Cephalopods	Demersal	Pelagic	Sharks	Shrimps	Other	Total
3	553	10.6	7.3	3.4	8.9	7.2	106.8	144.2
6	314.5	2.1	0.4	6.2	32.1	5.4	2101.3	2147.5
15	544	1.3	2.8	6.3	5.4	5.7	258.7	280.2
24	451	1.7	10.5	84.9	1	164	175.2	437.2
27	533	0	0	29.5	181.1	443	130.9	784.6
29	339	13	15	0	9	6.9	552.5	596.5
31	517	27.3	2	24.6	30.1	171.7	84.5	340.2
35	556.5	1.1	5.3	17.3	0.7	2.1	141.4	168
Mean	476	7.2	5.4	21.5	33.5	100.8	443.9	612.3
St dev	98.2	9.5	5.3	27.7	60.9	156.6	686.3	656.6
%	-	1.2	0.9	3.5	5.5	16.5	72.5	100.0

d)

Station	Gear depth	Cephalopods	Demersal	Pelagic	Sharks	Shrimps	Other	Total
7	608	0	73.2	8.2	10.1	2.7	882.5	976.8
8	908.5	0.2	3.4	0.7	0.9	17.6	67.3	90.2
12	602	0.3	13.3	6.5	246.4	18.4	541.1	826.1
25	719	0	33.7	1	224.3	6.2	145.2	410.4
26	822	1.6	1.2	2	17	2.3	42.3	66.5
28	735.5	1.9	10.7	0.9	44.7	20.7	698.4	777.2
32	863.5	1.5	7.8	0.8	0	5.6	2213	2228.8
33	753.5	2.8	26.7	0.6	10.1	10.6	1073.7	1124.4
Mean	751.5	1	21.2	2.6	69.2	10.5	707.9	812.5
St dev	111.1	1	23.8	3	103.7	7.4	719.9	694
%	-	0.1	2.6	0.3	8.5	1.3	87.1	100.0

## 4.2. Biodiversity

The fish fauna of the outer shelf and slope of Ghana are poorly known and have been little collected, although several major initiatives in the past have focused on investigating the marine fauna of the broad area encompassing the Gulf of Guinea. Examples of past investigations trawling in Ghanaian waters include the Danish Expedition to the Coasts of Tropical West Africa, which made numerous demersal hauls off Ghana with small trawls or dredges but mostly in shallow shelf waters. The *Galathea* passed through the country on its round-the-world expedition, but occupied only a few stations off Ghana. In 1964 and 1965, the R/V *Pillsbury* conducted two cruises to the Gulf of Guinea (*Studies in Tropical Oceanography, Miami*, no. 4, parts 1 and 2), the first in 1964 began in Lagos and ended in Monrovia (the second cruise explored the eastern part of the Gulf). During that 1964 cruise, the vessel made a series of 22 stations off Ghana, 15 of which were on the bottom using mostly a 2-m otter trawl, but also a Blake [beam] trawl (3 stations), and a 12.5-m otter trawl (3 stations). The three Blake trawl stations were deployed at depths from 1353 to 3129 m; all but one of the other trawls were fished at depths between 20 and 64 m; the one exception was in 110 m using a 12.5-m trawl. Ships participating in the Guinean Trawling Survey in the mid-1960s made collections (again mostly in shelf waters) that have been reported in widely disparate journals. The former Soviet ship *Zveda Kryma* has also made deepwater collections off Ghana, but a comprehensive list of the species collected by that vessel are not available.

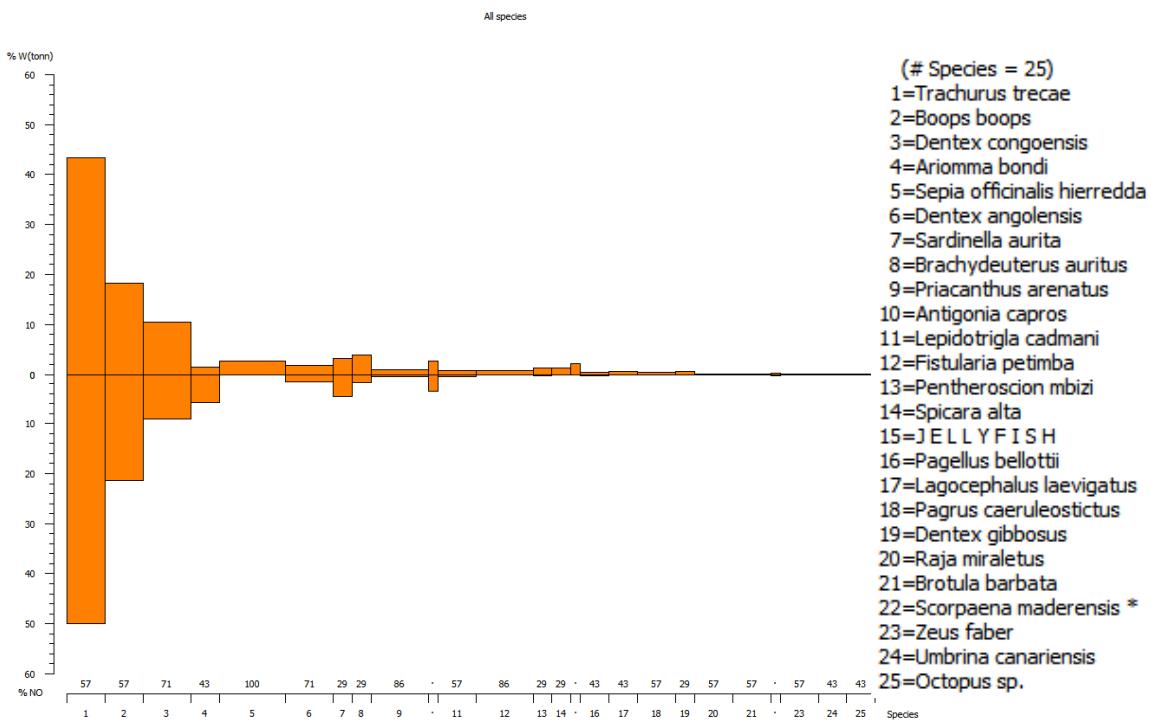
The paucity of past deep-water trawl collections made off Ghana make it likely that a large percentage of the slope fishes taken during the current *Nansen* survey represent species that have not previously been recorded in these waters. Because there is no current list of marine fish species of Ghana, confirming such records becomes a laborious task that will require searches of the primary literature. It is for that reason that we cannot now provide a list of the new records. With some confidence, however, we can say that certain groups collected during the survey likely contain species that have not been previously recorded, including the grenadiers (Macrouridae, Bathygadidae), deepsea anglerfishes (Ceratiidae, Diceratiidae), Congrid eels, tripod fishes (Bathypterois 3 spp.), cusk eels (Ophidiidae), slickheads (Alepocephalidae), soles (Soleidae), and snake mackerels (Gempylidae).

Figure 4.1 a-d reports the most common species in each depth region depicted using an Index of Relative Importance (IRI combining the relative numeric abundance (N), the average size (W) and the commonness (F) of a species,  $IRI = (%N + \%W) * \%F$ .

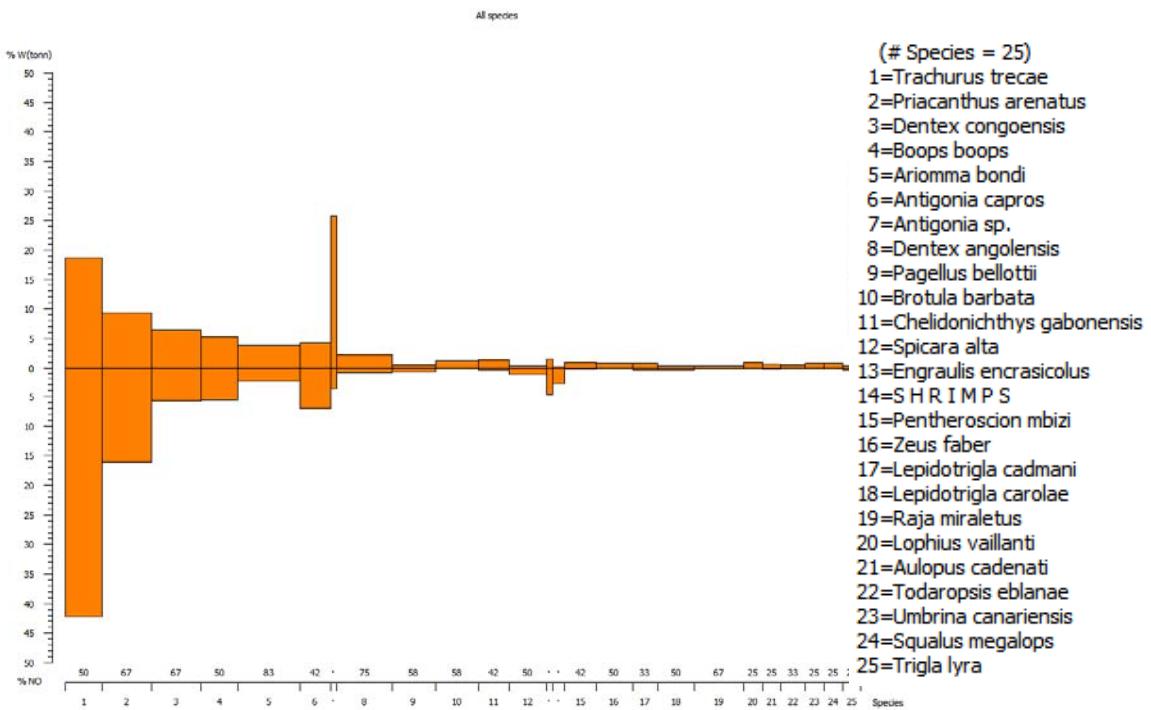
The pelagic *Trachurus trecae* was the most common single species both on the outer shelf and the upper slope; however the catch rate decreased rapidly below 100 m depth. *Priacanthus arenatus* became the second most important species on the upper slope. It was frequently caught but only in very low numbers also on the outer shelf. The species composition changed considerably when moving to deeper waters. At the mid slope the three most common species, *Synagrops bellus*, *Chlorophthalmus atlanticus* and *Nematocarcinus africanus* was not found among the 25 most common species in the depth regions above.

At the lower slope *Yarella blackfordi*, *Stereomastis* sp. and *Aristeus varidens* were the three most common species. All three species has a distribution also in the mid slope but with lower concentrations.

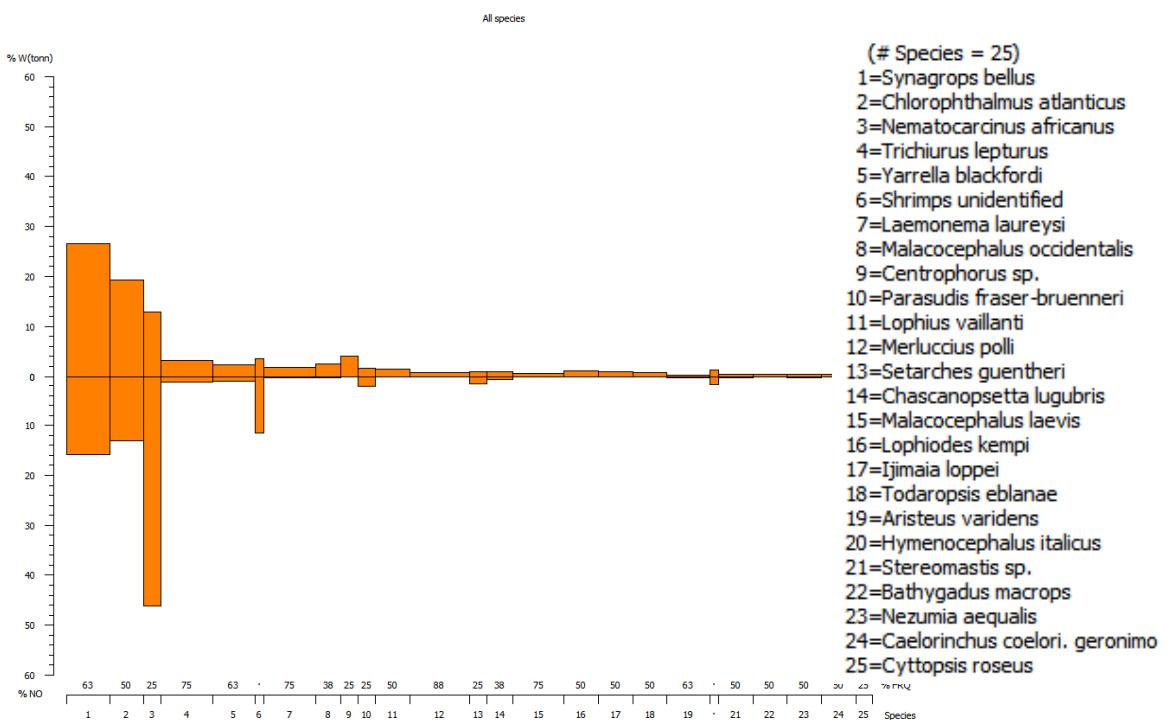
#### Outer shelf



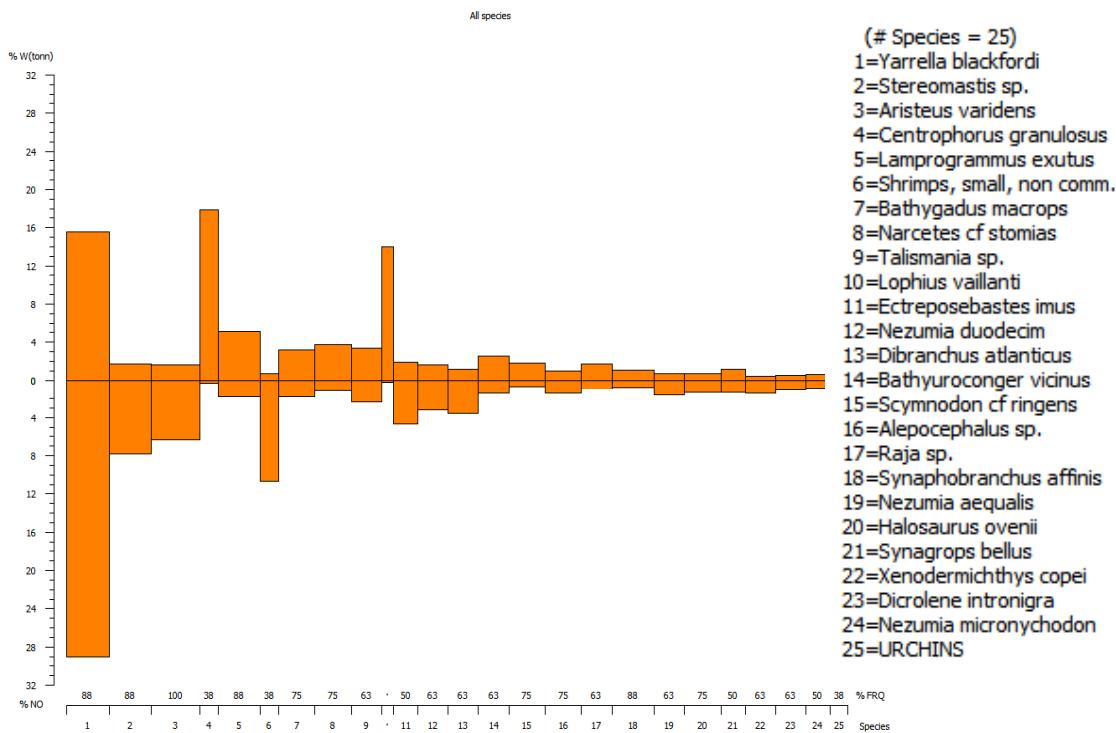
## Upper slope



## Mid slope



## Lower slope



**Figure 4.1.** Index of relative Importance calculated from swept-area bottom-trawl hauls on per depth region a) outer shelf (< 100 m), b) upper slope (100-300 m), c) mid slope (300-600 m) and d) lower slope (>600 m)

The total number of species and species group identified was 277 (including species only identified to Genus or higher taxa). The total number of species and species group identified per depth region were 84 on the outer shelf, 126 on the upper slope, 127 on the mid slope and 102 at the lower slope. Not taking into account the sampling intensity in each depth the biodiversity is highest on the upper and middle slope.

A number of new species previously not recorded in Ghana was reported during this survey. These species has been identified by Oddgeir Alvheim and Tomio Iwamoto and specimens have been stored for future reference at the California Academy of Sciences, USA. Table 5.2 contains a preliminary list of previously non reported specimens from Ghanaian waters.

Table 4.2 lists all species recorded in the catches of the current survey. A total of 183 species of fishes were identified, but this number should be used cautiously because not all specimens could be determined to species because of limitations in time and references available on the ship. The species for which specimens and tissues were preserved are listed in Table XX. The whole specimens will be deposited in the California Academy of Sciences in San Francisco, USA; the tissue samples will be sent to the University of Kansas for deposit in the Tissue Collection. The preserved specimens and tissues will serve to document the species of the survey and will be used to more-definitively determine their correct identifications.

**Table 4.2.** Preliminary list of species previously not recorded in Ghana

Genus	species	# Spec.	Tissues	vial#	Sta.
Adioryx	hastata	1			21
Aldrovandia	phalacra	3			26
Alepocephalus	sp.B	1	54		3
Alepocephalus	sp.B	1			12
Alepocephalus	sp	2			26
Alepocephalus	2 spp	4			33
Alepocephalus	sp	2			35
Alepocephalus	deep-body from DFN 20100403	1	16	[3]	
Alepocephalus	filamentous pectoral DFN20100403	1	15	[3]	
Anguiformes	leptocephalus	1			8
Anthias	anthias	1			2
Anthias	anthias	2			19
Antigonia	capros?	2			11
Antigonia	capros?	1			18
Antigonia	capros?	2			20
Argyropelecus	sp	1			26
Ariomma	bondi	1			1
Ariomma	bondi	5			2
Ariomma	bondi	1			20
Ariomma	bondi	1			23
Ariomma	bondi	2			25
Arnoglossus	imperialis	2			1
Arnoglossus	imperialis	2	86, 87		4
Bajacalifornia	megalops?	3			26
Bajacalifornia	megalops?	3			33
Bajacalifornia	megalops?	2			35
Bathophilus	sp.	1			8
Bathygadus	macrops	1	76		3
Bathygadus	macrops	1			8
Bathygadus	melanobranchus	1			8
Bathypterois	phenax	1			8
Bathypterois	phenax	1			26
Bathypterois	viridensis	1			26
Bembrops	greyae	2	50,51		6
Brama	brama	1			3
Branchiostegus	semifasciatus	1			21
Caristius	maderensis	1			8
Caristius	maderensis	1			35
Chaetodon	marcellae	1	100		1
Chaulax	pictus	1	46		6
Cheilodonichthys	gaboensis	1			9
Chiasmodontid	sp	1	33		12
Coelorinchus	geronimo	2	47,48		6
Coloconger	cadenati	1			35
Congridae	sp	1			2
Congridae	sp	1	45		6
Coryphaenoides	zaniophorus	1	36		8
Coryphaenoides	zaniophorus	1	24		25
Cryptosarasa	cousei	1			26
Cynoglossus	canariensis	1			13
Decapterus	punctatus	5	67, 68		5
Dentex	angolensis	1	96, 97		1
Dentex	canariensis	1	98, 98		1
Dentex	congoensis	1			1
Dicologoglossus	cuneatus	1	83		4
Diceratias	pileatus	1			33
Dicrolene	introna	1	21		25
Diretmoides	parini	4	71,72		3
Diretmoides	parini	1			12
Diretmoides	parini	1			23
Diretmoides	parini	1			24
Diretmoides	parini	1			25
Ebinania	costaecanarie	1	64		3
Ephippion	guttifer				
Epigonus	sp	1			23
Epigonus	pandionus?	1			24
Gadomus	arcuatus	1			8
Gobiidae	sp white spots	1	82		4

Halosaurus	ovenii	1	26
Histiobranchus	bathybius	1	8
Hoplostethus	mediterraneus	1	2
Hymenocephalus	italicus	2	22,23
Lamprogrammus	niger	1	26
Lepidotrigla	cadmani	1	21
Lepidotrigla	carolae	2	94, 95
Lepidotrigla	carolae	2	21
Leseurogobius	sp	1	2
Leseurogobius	koumans?	5	88, 89, 90
Lophioides	kempi	1	2
Luciobrotula	nolfi	1	12
Luciobrotula	nolfi	1	35
Melanocetus	johsoni	1	8
Melanocetus	johsoni	1	26
Melanostomias	sp	1	62
Melanostomias	sp	1	12
Microchirus	frechkopi	1	1
Microchirus	frechkopi	4	85
Microchirus	wittei	2	2
Monolene	microstoma	2	2
Monomitopus	metriosoma	2	55
Myctophids	sp.	4	2
Myctophids	sp.	7	4
Myctophids	2 spp	3	24
Myctophids	sp	1	27
Narcetes	stomias?	2	56, 57
Narcetes	stomias?	1	8
Nettastomatid	sp	3	2
Nezumia	aqualis	1	75
Nezumia	aqualis	1	49
Nezumia	aqualis	1	31
Nezumia	aqualis	1	25
Nezumia	africana	1	20
Nezumia	duodecim	1	25
Nezumia	micronychodon	3	34,35
Notocanthus	sexspinis	1	32
Ophichthid	sp	2	29
Ophidion	lozanoi	4	52,53
Pachycara	crossacanthum	1	12
Pagrus	pagrus africanus	1	1
Paralepidid	Lestidiops?	2	23
Parasudis?	sp	6	17
Pentheroscion	mbizi	1	93
Photonectes	braueri?	1	35
Physiculus	cyanostrophus	1	39
Physiculus	huloti	7	41,42
Physiculus	huloti	3	40
Polyacanthonotus	cf africanus	1	8
Pontinus	kuhlii	1	30
Priacanthus	arenatus	1	20
Prometichthys	prometheus	1	
Prometichthys	prometheus	2	26
Prometichthys	prometheus	2	26
Psenes	sp	1	11
Pythonichthys	microphthalmus	2	80, 81
Rouleina	maderensis	1	8
Scomber	japonicus	1	20
Scombrolabrax	heterolepis	2	29,30
Scopelarchoides	danae?	2	18,19
Scorpaena	normani	1	22
Serranus	accraensis	1	1
Serranus	africanus	1	13
Serranus	cabrilla	1	1
Serranus	sp	1	4
Serranus	sp	2	66
Sigmops	elongatum	2	60, 63
Sigmops	elongatum	1	35
Snyderidia	canina	1	32
Snyderidia	canina	2	12
Snyderidia	canina	3	27,28

Spicara	alta	1	1
Synchiropus	phaeton	2	29
Synchiropus	phaeton	1	30
Synaphobranchus	affinis	1	12
Talismania	sp	1	15
Thorogobius	sp	1	13
Trachinus	pellegrini	2	21
Uranoscopus	albesca	2	91, 92
Uroconger?	sp	1	23
Xenodermichthys	copei	2	58, 59
Xenodermichthys	copei	1	26
Xenolepidichthys	dahlgleishi	1	24
Yarrella	blackfordi	1	61
Zenion	longipinnis	2	23
<b>TOTAL TELEOSTS</b>		<b>245</b>	
<hr/>			
<b>CONDRICHTHYANS</b>			
Deania	profundorum	1	8
Deania	profundorum	1	25
Oxynotus	centrina	1	6
Heptranchus	perlo	1	23
Hydrolagus	alberti	1	25
Neohariota	pinnata	1	31
Skate egg case		1	4
Zameus?	sp	1	8
<b>TOTAL CHONDRICHTHYANS</b>		<b>8</b>	
<hr/>		<hr/>	
<b>TOTAL ALL FISHES</b>		<b>253</b>	
<hr/>			
<b>INVERTEBRATES</b>			
Sea fans	branching	2	32
barnacles	big	2	28
barnacles & scallops	from lithodid legs	10	29
Calappa	species	1	6
Canchro1id squid	species	1	26
Crabs	species	1	3
Crabs	lithodid	1	29
Gastropods	species	14	3
Pelecypods	species	4	3
Todaroides?	species	1	20
<b>TOTAL INVERTEBRATES</b>		<b>37</b>	

#### 4.3. Consideration for commercial trawling

The purpose of this survey was to investigate the fish resources on the slope of Ghana. Previous surveys have only covered the shelf of Ghana with an occasional trawl in deeper depths. The observations from this survey will guide in the management also of the deep water slope. The slope off Ghana is falling rapidly at depths around 100 m to depths beyond 1000 m. Large areas of the slope is steep and rugged with canyons tearing trough making these areas mostly inaccessible to bottom trawling. This applies specifically to an area just of Volta river mouth, to the south west of Accra and off three points. Commercially valuable demersal species were only caught in very small amounts on the slope with declining densities with depth.

## Annex I      Records of fishing stations

R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 1	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 3
DATE : 30/04/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°54'.77	DATE : 30/04/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°51.72
start stop duration		Lon E 1°16.15	start stop duration		Lon E 1°16.79
TIME : 17:29:22 17:57:06	27.7 (min)	Purpose : 3	TIME : 22:16:59 22:46:22	29.4 (min)	Purpose : 3
LOG : 7946.58	7947.91	1.3	LOG : 7967.24	7968.64	1.4
FDEPTH: 94	95	Gear cond.: 0	FDEPTH: 554	552	Gear cond.: 0
BDEPTH: 94	95	Validity : 1	BDEPTH: 554	552	Validity : 0
Towing dir: 0°	Wire out : 230 m	Speed : 2.9 kn	Towing dir: 0°	Wire out : 1290 m	Speed : 2.9 kn
Sorted : 177	Total catch: 330.57	Catch/hour: 715.00	Sorted : 71	Total catch: 70.61	Catch/hour: 144.25
SPECIES	CATCH/HOUR	% OF TOT. C	SPECIES	CATCH/HOUR	% OF TOT. C
weight numbers			weight numbers		
Dentex congogensis	393.66	5249	Lophius vaillanti	26.56	6
Spicara alta	149.24	203	Bathygadus macrops	15.38	55
Sepia officinalis hierredda	62.73	144	Laemonema laureysi	14.30	92
Dentex gibbosus	41.10	15	Octopus vulgaris	8.99	20
Pagrus caeruleostictus	11.25	26	Nezumia aequalis	8.13	244
Fistularia petimba	10.38	19	Anemones, white	7.87	94
Mustelus mustelus	8.65	2	Sea cucumber	5.62	6
Pagrus africanus	8.22	4	Merluccius polli	5.41	4
Epinephelus aeneus	8.11	6	HALOSAURIIDAE	5.39	65
Rhinobatos albomaculatus	7.68	4	Centrophorus sp.	4.49	2
Dentex angolensis	5.52	48	Scymnodon cf ringens	3.58	16
Brotula barbata	3.79	4	Plesiopenaeus edwardsianus	3.35	31
Raja miraletus	1.08	2	Yarrella blackfordi	3.31	57
Branchiostegus semifasciatus *	1.08	2	Malacocephalus laevis	2.86	35
Umbrina canariensis	0.48	2	Stereomastis sp.	2.55	97
Serranus cabrilla	0.41	2	Chaceon maritae	2.29	4
Sargocentron hastatum	0.32	2	Aristeus varidens	1.96	0
Zeus faber	0.22	6	Iujimai laoppei	1.94	2
Pythonichthys microphthalmus	0.17	4	Benthodesmus sp.	1.88	30
Priacanthus arenatus	0.15	4	Aristeus varidens	1.84	186
Ariomma bondi	0.15	4	Lampruguinus exutus	1.57	4
Lepidotrigla cadmuni	0.13	2	Trichiurus lepturus	1.55	2
Chaetodon marcellae	0.11	2	Sea urchins (strong spines)	1.43	12
Arnoglossus imperialis	0.11	2	Lithodes ferox	1.29	12
Serranus sp.	0.11	9	Raja miraletus	1.12	4
Spicara alta	0.09	2	Nessorhamphus of ingolfianus	0.88	12
Microchirus frechkopi	0.04	2	RAJIDAE	0.82	4
Saurida brasiliensis	0.04	6	Centrophorus lusitanicus	0.82	6
			Stomias sp.	0.78	12
Total	715.00	100.00	ALEPOCEPHALIDAE	0.72	2
			OPISTHOTHEUTHIDAE	0.67	4
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 2	Dibranchus sp.	0.55	6
DATE : 30/04/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°53.89	ALEPOCEPHALIDAE	0.55	25
start stop duration		Lon E 1°16.37	Xenodermichthys copei	0.51	20
TIME : 20:04:58 20:35:11	30.2 (min)	Purpose : 3	Todaropsis eblanae	0.51	4
LOG : 7954.76	7956.26	1.5	Nephrops atlantica	0.37	37
FDEPTH: 201	208	Region : 2600	C E P H A L O P O D A	0.35	2
BDEPTH: 201	208	Gear cond.: 0	Monomotipus sp.	0.33	8
Towing dir: 0°	Wire out : 500 m	Validity : 0	Diretmoides parini	0.31	8
Sorted : 218	Total catch: 217.92	Congridae	Genostoma elongatum	0.25	6
		Echinanira costaeccanarie	0.22	2	
SPECIES	CATCH/HOUR	% OF TOT. C	Ectreposebastis imus	0.16	2
weight numbers			Melanonus zugmayeri	0.14	2
Rhinobatos albomaculatus	218.40	0	Todaropsis eblanae	0.12	2
Brotula barbata	58.57	69	Caristius maderensis	0.12	2
Dentex angolensis	18.27	64	Synagrops bellus	0.10	4
Aulopus cadenati	16.58	81	PASIPHAEIDAE	0.04	10
Pentheroscion mbizi	13.90	42	Nemichthys scolopaceus	0.02	2
Mustelus mustelus	9.93	2	Diretmus argenteus	0.02	2
Raja miraletus	9.73	16	Total	144.25	100.00
Oxynotus centrina	9.13	2	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 4
Lepidotrigla cadmuni	8.24	93	DATE : 01/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°49.26
Squalus sp.	7.94	2	start stop duration		Lon E 1°17.57
Bembrops heterurus	7.54	60	TIME : 04:02:21 04:21:28	19.1 (min)	Purpose : 3
Torpedo torpedo	6.75	12	LOG : 8005.63	8005.57	0.9
Todaropsis eblanae	5.16	52	FDEPTH: 80	74	Region : 2600
Spicara alta	3.77	26	BDEPTH: 80	74	Gear cond.: 0
Scorpaena scrofa	3.77	10	Towing dir: 0°	Wire out : 200 m	Validity : 2
Spicara alta	3.47	24	Sorted : 185	Total catch: 184.75	Speed : 3.0 kn
Pterothrissus belloci	3.08	10			Catch/hour: 579.76
CONGRIDAE	2.99	32			
Hoplostethus mediterraneus	2.78	355	SPECIES	CATCH/HOUR	% OF TOT. C
Aristeus varidens	2.70	101	weight numbers		
Uranoscopus sp.	2.48	16	Pentheroscion mbizi	142.00	860
Peristedion cataphractum	1.79	56	Dentex angolensis	126.46	3056
Epigonus sp.	1.49	283	Sepia officinalis hierredda	111.72	417
Gadella imberbis	1.49	40	Fistularia petimba	43.93	97
Promethichthys prometheus	1.49	14	Scorpaena maderensis *	31.22	1249
Octopus vulgaris	1.49	2	Pseudotolithus senegalensis	23.06	104
Microchirus wittei	1.29	28	TRIGLIDAE	20.08	417
Lagocephalus sp.	1.19	2	Lophius vaillanti	12.24	0
Monolepis microstoma	0.99	54	Scorpaena scrofa	11.30	19
Lophiodes kempfi	0.97	6	Umbria canariensis	10.04	141
Parapercis longirostris	0.97	89	Trichiurus lepturus	8.94	50
Antigonias capros	0.79	40	Brotula barbata	7.37	28
Lepidotrigla carolae	0.60	16	Uraspis sp.	5.81	44
MICROPHIIDAE	0.56	105	Epinephelus goreensis	4.71	3
Malacocephalus laevis	0.44	16	Raja miraletus	4.39	9
Syacium micrurum	0.30	2	Priacanthus arenatus	4.08	44
Ariomma bondi	0.28	8	Citharichthys stampflii	2.67	78
Physiculus sp.	0.28	16	Octopus vulgaris	2.51	3
OPHIIDIIDAE	0.24	10	Unidentified fish	2.04	286
Sepia officinalis hierredda	0.18	0	Bothus podas africanus	1.41	13
Malacocephalus occidentalis	0.18	8	Uranoscopus sp.	1.10	6
Physiculus huloti	0.18	6	Brachydeuterus auritus	0.94	9
Setarches guentheri	0.10	6	Pagellus bellottii	0.94	53
Octopus sp.	0.08	2	SOLEIDAE	0.78	6
Synagrops bellus	0.06	8			
Trichiurus lepturus	0.04	2			
NETTASTOMATIDAE	0.04	2			
Total	432.67	100.00	Total	579.76	100.00

R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 5	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 7		
DATE :01/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°37.06	DATE :01/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°31.92		
start stop duration		Lon E 0°34.47	start stop duration		Lon E 0°17.36		
TIME :11:39:07 12:08:54	29.8 (min)	Purpose : 3	TIME :20:21:04 20:51:38	30.6 (min)	Purpose : 3		
LOG : 8061.86	8063.40	Region : 2600	LOG : 8109.01	8110.51	Region : 2600		
FDEPTH: 46	45	Gear cond.: 0	FDEPTH: 606	610	Gear cond.: 0		
BDEPTH: 46	45	Validity : 1	BDEPTH: 606	610	Validity : 0		
Towing dir: 0°	Wire out : 130 m	Speed : 3.1 kn	Towing dir: 0°	Wire out : 1350 m	Speed : 2.9 kn		
Sorted : 169	Total catch: 168.58	Catch/hour: 339.54	Sorted : 373	Total catch: 497.58	Catch/hour: 976.60		
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers				weight numbers			
J E L L Y F I S H	253.07	105	74.53	Sea cucumber	588.81	0	60.29
Pagrus caeruleostictus	23.46	160	6.91	Yarrella blackfordi	125.61	2924	12.86
Alectis alexandrinus	14.00	10	4.12	Lampruguinus exutus	53.39	208	5.47
Dentex canariensis	10.47	28	3.08	Lophius vaillanti	48.28	8	4.94
Fistularia petimba	9.87	28	2.91	Merluccius polli	19.82	16	2.03
Pagellus bellottii	8.16	48	2.40	Ectrepobestes imus	18.45	502	1.89
Balistes capricrus	3.44	6	1.01	URCHINS	16.17	141	1.66
Sepia officinalis hierredda	3.12	6	0.92	Ijimaia loppei	13.74	27	1.41
Chilomycterus spinosus mauret.	2.82	4	0.83	Stereomastis sp.	12.72	336	1.30
Psettodes belcheri	2.42	4	0.71	ANTHOZOA (Sea anemones)	8.16	16	0.84
Alectis ciliaris	2.26	6	0.66	Benthodesmus tenuis	8.16	86	0.84
Epinephelus aeneus	1.11	2	0.33	ALEPOCEPHALIDAE	8.09	16	0.83
Trichiurus lepturus	1.01	6	0.30	Bathygadus macrops	5.97	47	0.61
Dactylopterus volitans	0.79	2	0.23	Centrophorus lusitanicus	5.59	2	0.57
Aluterus heudelotii	0.62	4	0.18	Raja sp.	5.57	47	0.57
Syacium micrurum	0.60	12	0.18	Scymnodon cf ringens	4.55	24	0.47
Rhinobatos sp.	0.56	42	0.17	Laemonema laureysi	3.38	31	0.35
Sea urchins (strong spines)	0.44	6	0.13	Anemones, white	3.14	16	0.32
Penaeus notialis	0.36	6	0.11	Malacocephalus occidentalis	2.90	31	0.30
Lolliguncula mercatoris	0.24	42	0.07	Nezumia aequalis	2.28	55	0.23
Branchiostegus semifasciatus *	0.20	10	0.06	Aristeus varidens	2.28	212	0.23
BOTHIDAE	0.20	56	0.06	Bathyuroconger vicinus	2.20	24	0.23
Decapterus sp.	0.10	18	0.03	Ebihania costaeacanarie	2.12	8	0.22
Pseudupeneus prayensis	0.10	4	0.03	Malacocephalus laevis	1.81	31	0.18
Microchirus frechkopi	0.06	0	0.02	MELANOSTOMATIDAE	1.73	24	0.18
Arnoglossus imperialis	0.02	2	0.01	Nezumia microrychodon	1.73	39	0.18
Citharus linguatula	0.02	2	0.01	Alepocephalus sp.	1.65	31	0.17
Total	339.54	100.00	Starfish	1.57	2	0.16	
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 6	Chaceon maritae	1.26	39	0.13	
DATE :01/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°32.70	Raja miraletus	0.94	8	0.10	
start stop duration		Lon E 0°16.63	Lophius vaillanti	0.86	8	0.09	
TIME :17:58:12 18:28:05	29.9 (min)	Purpose : 3	Lithodes ferox	0.55	8	0.06	
LOG : 8099.37	8100.86	Region : 2600	Nephropsis atlantica	0.55	39	0.06	
FDEPTH: 316	313	Gear cond.: 0	Glypus marsupialis	0.47	24	0.05	
BDEPTH: 316	313	Validity : 0	Synaphobranchus affinis	0.47	8	0.05	
Towing dir: 0°	Wire out : 800 m	Speed : 3.0 kn	Chascanopsetta lugubris	0.39	16	0.04	
Sorted : 103	Total catch: 1069.82	Catch/hour: 2147.51	Monolete microstoma	0.31	8	0.03	
Total	2147.51	100.00	Xenodermichthys copei	0.24	8	0.02	
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	Total	976.80	100.02	
weight numbers							
Synagrops bellus	1132.75	44999	52.75	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 8	
Chlorophthalmus atlanticus	632.32	32636	29.44	DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29	
Malacocephalus occidentalis	82.02	397	3.82	start stop duration		Lon E 0°18.17	
Lophius vaillanti	55.00	0	2.56	TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3	
Laemonema laureysi	49.50	397	2.31	LOG : 8120.75	8122.25	Region : 2600	
Setarches guentheri	36.13	4065	1.68	FDEPTH: 904	913	Gear cond.: 0	
Chascanopsetta lugubris	27.46	1247	1.28	BDEPTH: 904	913	Validity : 0	
Galeus polli	18.07	434	0.84	Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn	
Lophius vaillanti	16.98	145	0.79	Sorted : 47	Total catch: 47.31	Catch/hour: 90.19	
Unidentified fish	12.29	626	0.57	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Centrophorus lusitanicus	10.34	4	0.48	DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29	
Torpedo nobiliana	6.93	6	0.32	start stop duration		Lon E 0°18.17	
Bembrops greyi	6.87	36	0.32	TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3	
Malacocephalus laevis	6.50	181	0.30	LOG : 8120.75	8122.25	Region : 2600	
Trichiurus lepturus	6.22	20	0.29	FDEPTH: 904	913	Gear cond.: 0	
Calappa-like with spines	5.78	72	0.27	BDEPTH: 904	913	Validity : 0	
Promethichthys prometheus	5.78	36	0.27	Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn	
Parapenaeus longirostris	4.70	506	0.22	Sorted : 47	Total catch: 47.31	Catch/hour: 90.19	
Caelorinchus coelori. geronimo	4.34	36	0.20	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Raja miraletus	3.01	8	0.18	DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29	
Oxynotus centrina	2.97	4	0.14	start stop duration		Lon E 0°18.17	
Lophiodon kempfi	2.61	4	0.12	TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3	
Cyttopsis roseus	2.53	145	0.12	LOG : 8120.75	8122.25	Region : 2600	
Trigla lyra	1.85	6	0.09	FDEPTH: 904	913	Gear cond.: 0	
Bathyuroconger vicinus	1.81	36	0.08	BDEPTH: 904	913	Validity : 0	
NETTASTOMATIDAE	1.81	36	0.08	Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn	
Peristedion cataphractum	1.81	181	0.08	Sorted : 47	Total catch: 47.31	Catch/hour: 90.19	
Sepla sp.	1.81	108	0.08	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Nezumia aequalis	1.45	36	0.07	DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29	
Chascanopsetta lugubris	1.20	4	0.06	start stop duration		Lon E 0°18.17	
Zenopsis conchifera	0.94	4	0.04	TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3	
Solenocera africana	0.72	36	0.03	LOG : 8120.75	8122.25	Region : 2600	
Dibranchus atlanticus	0.72	36	0.03	FDEPTH: 904	913	Gear cond.: 0	
Galeus polli	0.68	8	0.03	BDEPTH: 904	913	Validity : 0	
Merluccius polli	0.40	2	0.02	Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn	
Octopus vulgaris	0.32	2	0.01	Sorted : 47	Total catch: 47.31	Catch/hour: 90.19	
Chaunax pictus	0.00	2	0.00	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Total	2147.51	100.00	DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913	Gear cond.: 0		
			BDEPTH: 904	913	Validity : 0		
			Towing dir: 0°	Wire out : 1900 m	Speed : 2.9 kn		
			Sorted : 47	Total catch: 47.31	Catch/hour: 90.19		
			SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
			DATE :01/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°31.29		
			start stop duration		Lon E 0°18.17		
			TIME :23:17:56 23:49:24	31.5 (min)	Purpose : 3		
			LOG : 8120.75	8122.25	Region : 2600		
			FDEPTH: 904	913</td			

R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 9	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 12	
DATE :02/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 5°34.02	DATE :02/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°24.69	
start stop duration		Lon E 0°15.46	start stop duration		Lon E 0°8.12	
TIME :02:54:49	03:16:45	21.9 (min)	Purpose : 3		Purpose : 3	
LOG : 8134.83	8135.92	1.1	Region : 2600		Region : 2600	
FDEPTH: 104	101		Gear cond.: 0		Gear cond.: 0	
BDEPTH: 104	101		Validity : 0		Validity : 0	
Towing dir: 0°	Wire out :	280 m	Speed : 3.0 kn		Speed : 3.0 kn	
Sorted : 54	Total catch:	53.52	Catch/hour: 146.36		Catch/hour: 826.08	
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	
	weight numbers				% OF TOT. C	
Dentex angolensis	54.97	744	37.56	21	Lophius vaillanti	307.10
Trichiurus lepturus	17.78	30	12.14		Centrophorus granulosus	238.00
Boops boops	12.85	562	8.78	23	Sea cucumber	115.16
Pentheroscion mbizi	9.16	38	6.26		Bathygadus macrops	27.64
Lepidotrigla carolae	9.02	107	6.17		Ectrepopebastes imus	20.12
Dentex congensis	8.48	98	5.79	20	Aristeus varidens	15.55
Umbrina canariensis	8.20	60	5.61		Laemonema laureysi	468
Pagellus bellottii	5.06	443	3.46	22	Iijimaiia lopphei	13.28
Brotula barbata	4.79	8	3.27		Raja sp.	9.40
Syacium micrurum	2.46	96	1.68		Lamprichthys exutus	8.91
Chelidonichthys gabonensis	2.22	30	1.51		Scymnodon cf ringens	8.83
Sepia orbigniana	1.97	14	1.35		Trichiurus lepturus	8.45
Synagrops bellus	1.91	57	1.31		Halosaurus sp.	6.53
Dibranchus atlanticus	1.67	77	1.14		Merluccius polli	6.07
Physiculus huloti	1.09	5	0.75		Nezumia aequalis	4.51
Octopus defilippi	0.85	8	0.58		Synagrops bellus	4.38
Raja miraletus	0.82	3	0.56		Rhinobatos albomaculatus	4.22
Dicologoglossa hexophthalma	0.82	22	0.56		Narcetes cf stomaia	3.93
Physiculus cyanostrophes	0.68	3	0.47		Gadella imberbis	3.53
Promethichthys prometheus	0.63	16	0.43		Malacocephalus laevis	3.38
Ornithotheuthis antillarum	0.60	25	0.41		Chaceon maritae	2.84
Cynoglossus sp.	0.33	36	0.22		Shrimps, small, non comm.	2.76
					Lithodes ferox	2.46
Total	146.36	100.00			CONGRIDAE	2.00
					Lithodidae	54
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 10	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 11	
DATE :02/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°26.08	DATE :02/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°16.44	
start stop duration		Lon E 0°3.67	start stop duration		Lon W 0°10.65	
TIME :06:16:37	06:46:11	29.6 (min)	Purpose : 3		TIME :17:29:05	
LOG : 8160.58	8162.03	1.5	Region : 2600		17:59:09	
FDEPTH: 87	85		Gear cond.: 1		30.1 (min)	
BDEPTH: 87	85		Validity : 0		Purpose : 3	
Towing dir: 0°	Wire out :	220 m	Speed : 2.9 kn		Region : 2600	
Sorted : 296	Total catch:	296.47	Catch/hour: 601.56		Gear cond.: 0	
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	
	weight numbers				% OF TOT. C	
Brachydeuterus auritus	442.54	7790	73.57	24	Total	826.08
Boops boops	42.25	511	7.02			100.00
Sepia officinalis hierredda	21.31	41	3.54			
Dentex angolensis	14.73	377	2.45	25	R/V Dr. Fridtjof Nansen	SURVEY:2010404
Sardinella aurita	13.76	365	2.29		STATION: 13	
Fistularia petimba	13.39	30	2.23	DATE :02/05/2010	GEAR TYPE: BT NO: 21	
Dentex congensis	11.20	511	1.86	POSITION:Lat N 5°16.44		
Priacanthus arenatus	5.97	122	0.99	start stop duration		
Raja miraletus	4.97	8	0.83	Purpose : 3		
Brotula barbata	4.67	2	0.78	Region : 2600		
Pagrus caeruleostictus	3.90	24	0.65	Gear cond.: 0		
Decapterus sp.	3.77	85	0.63	Validity : 0		
Trachurus trecae	3.29	97	0.55	Towing dir: 0°		
Chelidonichthys gabonensis	2.56	73	0.43	Wire out : 225 m		
S H A R K S	2.37	4	0.39	Speed : 3.1 kn		
Caranx sp.	1.83	85	0.30	Sorted : 45		
Branchiostegus semifasciatus *	1.64	2	0.26	Total catch: 44.57		
Unidentified fish	1.46	61	0.24	Catch/hour: 88.90		
Octopus sp.	1.44	4	0.24			
Rhinobatos albomaculatus	1.42	4	0.24			
Grammoplites gruvelli	1.22	24	0.20			
Dicologoglossa cuneata	0.73	49	0.12			
Selar crumenophthalmus	0.61	12	0.10			
Perulibatrachus elminiensis	0.53	2	0.09			
Trachurus trecae	0.12	110	0.02			
Total	601.56	100.00				
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 11	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 13	
DATE :02/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°25.20	DATE :02/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°16.44	
start stop duration		Lon E 0°5.12	start stop duration		Lon W 0°10.65	
TIME :08:17:11	08:47:36	30.4 (min)	Purpose : 3		TIME :17:29:05	
LOG : 8165.24	8170.74	1.5	Region : 2600		17:59:09	
FDEPTH: 217	226		Gear cond.: 1		30.1 (min)	
BDEPTH: 217	226		Validity : 0		Purpose : 3	
Towing dir: 0°	Wire out :	550 m	Speed : 3.0 kn		Region : 2600	
Sorted : 128	Total catch:	1666.99	Catch/hour: 3289.03		Gear cond.: 0	
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	
	weight numbers				% OF TOT. C	
Antigonia sp.	2642.49	11744	80.34	Total	88.90	
Ephippion guttifer	120.75	292	3.67		100.00	
Dentex angolensis	85.85	233	2.61			
Zeus faber	72.77	116	2.21			
Umbrina canariensis	58.20	87	1.77			
Uranoscopus cadenati	44.83	116	1.36			
Diplodus sp.	37.84	553	1.15			
Antigonia sp capros	36.38	612	1.11			
Pseudotolithus senegalensis	27.64	116	0.84			
Brotula barbata	26.20	29	0.80			
RHINOBATIDAE	24.07	14	0.73			
Unidentified fish	23.28	146	0.71			
Squalus sp.	21.82	30	0.66			
Starfish	18.94	30	0.58			
Illex coindetii	14.56	146	0.44			
Cynoglossus sp.	7.00	2	0.21			
BOTHIDAE	5.82	1223	0.18			
Ariomma bondi	5.82	30	0.18			
Syacium micrurum	4.38	30	0.13			
Trigla lyra	2.96	30	0.09			
TRIGLIDAE	2.96	30	0.09			
Spicara alta	2.92	29	0.09			
TRIGLIDAE	1.48	30	0.04			
Luciobrotula nolfi	0.00	2	0.00			
Total	3288.97	100.00				

R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 14	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 17			
DATE :02/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 5°3.99	DATE :03/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°55.66			
start stop duration		Lon W 0°21.39	start stop duration		Lon W 0°31.11			
TIME :20:55:18 21:15:20	20.0 (min)	Purpose : 3	TIME :07:16:01 07:43:15	27.2 (min)	Purpose : 3			
LOG : 8253.57	8254.63	Region : 2600	LOG : 8313.13	8314.48	Region : 2600			
FDEPTH: 103	101	Gear cond.: 1	FDEPTH: 99	98	Gear cond.: 0			
BDEPTH: 103	101	Validity : 0	BDEPTH: 99	98	Validity : 0			
Towing dir: 0°	Wire out : 260 m	Speed : 3.2 kn	Towing dir: 0°	Wire out : 250 m	Speed : 3.0 kn			
Sorted : 55	Total catch: 245.39	Catch/hour: 734.70	Sorted : 114	Total catch: 3592.34	Catch/hour: 7912.64			
SPECIES	CATCH/HOUR	% OF TOT. C	SPECIES	CATCH/HOUR	% OF TOT. C			
weight numbers			weight numbers					
Priacanthus arenatus	429.34	0	58.44	Trachurus trecae	4729.07	211916	59.77	38
Unidentified fish	56.59	0	7.70	Boops boops	1856.83	88313	23.47	36
Boops boops	53.71	0	7.31	Dentex congensis	659.43	31720	8.33	39
Trachurus trecae	53.53	1716	7.29	Sardinella aurita	357.16	20090	4.51	37
Dasyatis marmorata	31.44	18	4.28	Lepidotrigla cadmani	84.43	1689	1.07	
Trichiurus lepturus	31.14	36	4.24	Sepia officinalis hierredda	63.33	84	0.80	0
Pagrus caeruleostictus	17.07	54	2.32	Dentex angolensis	46.43	2870	0.59	42
TRIGLIDAE	15.99	126	2.18	Pagellus bellottii	37.14	844	0.47	40
Rhizoprionodon acutus	10.18	3	1.39	Dentex gibbosus	23.79	29	0.30	41
Rhinobatos sp.	6.59	3	0.90	Lagocephalus laevigatus	15.20	84	0.19	
NETTASTOMATIDAE	4.67	323	0.64	Engraulis encrasicolus	14.36	0	0.18	
Dentex angolensis	3.95	72	0.54	Squatina oculata	7.38	7	0.09	
Ariomma bondi	3.77	108	0.51	Fistularia petimba	7.27	24	0.09	
Torpedo torpedo	3.44	3	0.47	Zeus faber	3.19	4	0.04	
Pagellus bellottii	3.23	108	0.44	Priacanthus arenatus	2.53	169	0.03	
Raja miraletus	2.69	18	0.37	Sepia officinalis hierredda	2.20	4	0.03	
Laemonema laureysii	2.51	90	0.34	Spicara alta	1.69	253	0.02	
Cynoponticus ferox	1.44	36	0.20	Pagrus caeruleostictus	0.77	2	0.01	
Illex coindetii	1.44	36	0.20	Dentex canariensis	0.44	2	0.01	
Syacium micrurum	1.26	54	0.17					
S H R I M P S	0.54	737	0.07	Total	7912.64		100.00	
Unidentified fish	0.18	36	0.02					
Total	734.70	100.00						
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 15	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 18			
DATE :03/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°53.21	DATE :03/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°45.56			
start stop duration		Lon W 0°29.46	start stop duration		Lon W 0°40.70			
TIME :03:43:18 04:11:25	28.1 (min)	Purpose : 3	TIME :09:40:13 10:05:41	25.5 (min)	Purpose : 3			
LOG : 8295.98	8297.38	Region : 2600	LOG : 8329.66	8330.98	Region : 2600			
FDEPTH: 565	523	Gear cond.: 0	FDEPTH: 103	102	Gear cond.: 0			
BDEPTH: 565	523	Validity : 0	BDEPTH: 103	102	Validity : 0			
Towing dir: 0°	Wire out : 1450 m	Speed : 3.0 kn	Towing dir: 0°	Wire out : 265 m	Speed : 3.1 kn			
Sorted : 131	Total catch: 131.33	Catch/hour: 280.22	Sorted : 101	Total catch: 954.16	Catch/hour: 2247.73			
SPECIES	CATCH/HOUR	% OF TOT. C	SPECIES	CATCH/HOUR	% OF TOT. C			
weight numbers			weight numbers					
Sea cucumber	189.90	0	67.77	Trachurus trecae	1451.12	123176	64.56	51
Yarrella blackfordi	28.49	704	10.17	Dentex congensis	369.38	10035	16.43	48
Lophius vaillanti	18.03	4	6.43	Engraulis encrasicolus	149.73	15260	6.66	50
Melanostomias sp.	5.95	4	2.12	Lepidotrigla cadmani	55.41	693	2.46	
Trichiurus lepturus	5.65	196	2.02	Boops boops	40.24	2441	1.79	
Paragaleus pectoralis	5.44	2	1.94	Dentex angolensis	26.74	137	1.19	46
Glyphus marsupialis	4.50	19	1.61	Dentex angolensis	22.76	627	1.01	52
Stereomastis sp.	4.44	220	1.58	Dentex canariensis	19.20	42	0.85	47
Malacocephalus laevis	4.05	30	1.45	Sardinella aurita	15.83	759	0.70	49
Lamprichthys exutus	1.92	15	0.69	Synagrops bellus	14.46	33	0.64	
Caelorinchus coelori. geronimo	1.90	19	0.68	Sepia officinalis hierredda	13.85	66	0.62	0
Scomberobrax heterolepis	1.69	19	0.60	Lagocephalus laevigatus	12.86	66	0.57	
Chaecon maritae	1.49	4	0.53	Squatina oculata	9.78	9	0.43	
Histioteuthis miranda	1.34	15	0.48	Pagellus bellottii	8.90	330	0.40	
Priacanthus arenatus	1.26	43	0.45	Dentex gibbosus	7.07	16	0.31	44
Aristeus varidens	1.24	94	0.44	Sepia officinalis hierredda	5.77	5	0.26	
Merluccius polli	0.83	4	0.30	Fistularia petimba	4.59	12	0.20	
Acanthocybium solandri	0.60	4	0.21	Zeus faber	3.77	2	0.17	
Narcetes cf stomics	0.55	2	0.20	Dentex canariensis	3.30	99	0.15	
Trigla lyra	0.43	2	0.15	Ariomma bondi	3.30	122	0.15	
Talismania sp.	0.43	2	0.15	Raja miraletus	2.47	5	0.11	
Xenodermichthys copei	0.09	4	0.03	Pagrus caeruleostictus	2.12	7	0.09	43
Total	280.22	100.00	Priacanthus arenatus	1.41	5	0.06		
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 16	Dentex congensis	1.30	9	0.06	45	
DATE :03/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°53.82	Branchiostegus semifasciatus *	1.06	2	0.05		
start stop duration		Lon W 0°30.39	Anthias anthias	0.66	99	0.03		
TIME :05:32:39 06:01:49	29.2 (min)	Purpose : 3	Citharus linguatula	0.66	33	0.03		
LOG : 8303.64	8305.14	Region : 2600	Total	2247.73		100.00		
FDEPTH: 264	264	Gear cond.: 0						
BDEPTH: 264	264	Validity : 0						
Towing dir: 0°	Wire out : 660 m	Speed : 3.1 kn						
Sorted : 66	Total catch: 287.76	Catch/hour: 591.90						
SPECIES	CATCH/HOUR	% OF TOT. C						
weight numbers								
Ariomma bondi	370.80	0	62.65					
Lophius vaillanti	48.65	8	8.22					
Chelidonichthys gabonensis	42.45	247	7.17					
Rhizoprionodon acutus	25.65	8	4.33					
Brotula barbata	22.56	8	3.81					
Physiculus huloti	22.30	35	3.77					
Dasyatis sp.	19.46	8	3.29					
Cyttopsis roseus	9.46	372	1.60					
Dentex congensis	6.11	8	1.03					
Priacanthus arenatus	4.61	80	0.78					
Zenion hololepis	3.81	346	0.64					
NETTASTOMATIDAE	3.72	107	0.63					
Paraconger notialis	3.72	19	0.63					
Antigonia capros	3.54	8	0.60					
Panulirus regius	2.04	169	0.34					
PALAEOMONIDAE	1.42	1415	0.24					
Sepia sp., juvenile	0.53	35	0.09					
PARALEPIDIDAE	0.45	8	0.08					
Polytmus corythaeola	0.35	27	0.06					
Caelorinchus sp.	0.19	8	0.03					
Syacium micrurum	0.08	8	0.01					
Total	591.90	100.00						
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 19						
DATE :03/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°35.10						
start stop duration		Lon W 0°52.19						
TIME :14:46:58 15:17:48	30.8 (min)	Purpose : 3						
LOG : 8365.13	8366.82	Region : 2600						
FDEPTH: 114	112	Gear cond.: 0						
BDEPTH: 114	112	Validity : 0						
Towing dir: 0°	Wire out : 305 m	Speed : 3.3 kn						
Sorted : 62	Total catch: 138.57	Catch/hour: 269.77						
SPECIES	CATCH/HOUR	% OF TOT. C						
weight numbers								
Dentex congensis	184.94	7244	68.56	54				
Trachurus trecae	23.36	1468	8.66	56				
Boops boops	15.83	372	5.87					
Spicara alta	9.73	1335	3.61					
Sepia officinalis hierredda	8.57	8	3.18					
Pagellus bellottii	6.09	107	2.26	55				
Mustelus mustelus	4.77	2	1.77					
Sepia sp.	3.17	53	1.18					
Dentex angolensis	2.34	8	0.87	57				
Chelidonichthys gabonensis	2.20	19	0.82					
Zeus faber	1.75	8	0.65					
Fistularia petimba	1.46	6	0.54					
Dentex angolensis	0.97	131	0.36	53				
Lagocephalus laevigatus	0.97	6	0.36					
Priacanthus arenatus	0.97	55	0.36					
Torpedo torpedo	0.68	2	0.25					
Citharus linguatula	0.49	19	0.18					
Lepidotrigla carolae	0.49	39	0.18					
Ariomma bondi	0.49	25	0.18					
Lophiodes kempfi	0.49	6	0.18					
Total	269.77		100.00					

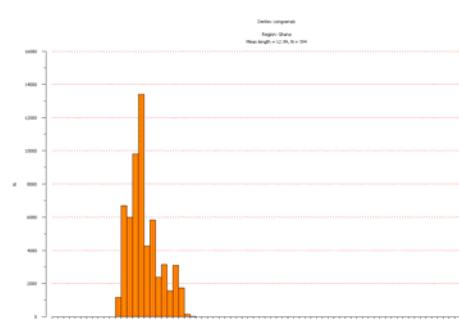
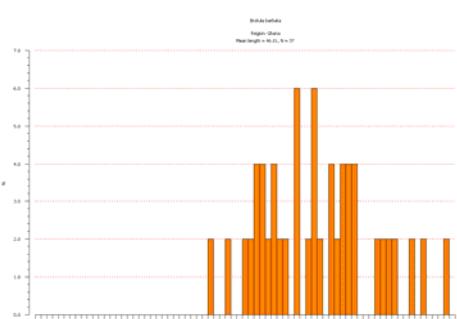
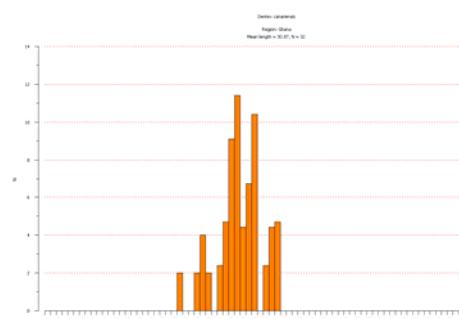
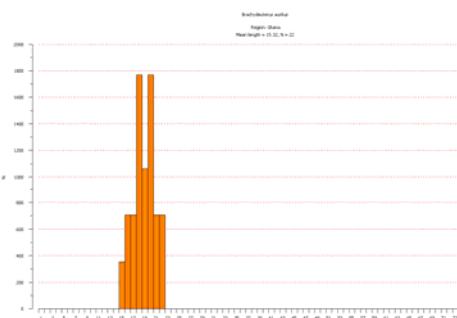
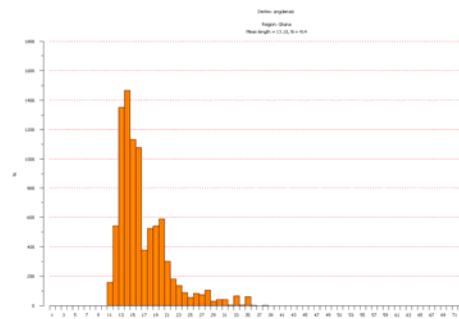
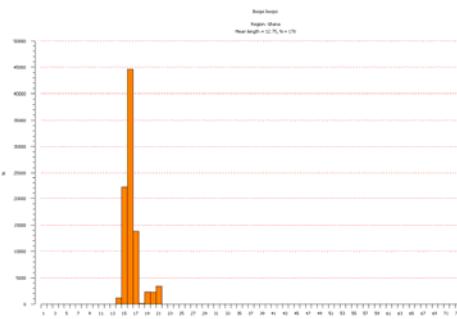
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 20	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 22	
DATE :03/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°24.91	DATE :04/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°15.23	
start stop duration		Lon W 1°3.79	start stop duration		Lon W 1°29.46	
TIME :17:52:53 18:22:33	29.7 (min)	Purpose : 3	TIME :04:00:41 04:29:53	29.2 (min)	Purpose : 3	
LOG : 8386.70	8388.24	Region : 2600	LOG : 8453.82	8455.31	Region : 2600	
FDEPTH: 99	99	Gear cond.: 0	FDEPTH: 130	135	Gear cond.: 1	
BDEPTH: 99	99	Validity : 0	BDEPTH: 130	135	Validity : 0	
Towing dir: 0°	Wire out : 295 m	Speed : 3.1 kn	Towing dir: 0°	Wire out : 365 m	Speed : 3.1 kn	
Sorted : 73	Total catch: 553.20	Catch/hour: 1118.71	Sorted : 146	Total catch: 423.69	Catch/hour: 870.89	
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	
weight numbers				weight numbers		
Antigonia capros	303.34	15666	27.11	Antigonia capros	378.31	20267
Boops boops	174.92	8164	15.64	Ariomma bondi	131.35	1702
Trachurus trecae	172.90	13385	15.46	Boops boops	54.76	1054
Ariomma bondi	160.77	25970	14.37	Dentex congensis	51.80	592
Dentex congensis	106.17	2552	9.49	Aulopus cadenati	37.00	740
Priacanthus arenatus	83.32	1167	7.45	Chelidonichthys gabonensis	32.00	146
Lagocephalus laevigatus	39.84	243	3.56	Pagellus bellottii	23.49	832
Sepia officinalis hierredda	17.59	26	1.57	Priacanthus arenatus	23.49	222
Zeus faber	9.61	36	0.86	Anthias anthias	19.24	1350
Octopus sp.	9.10	20	0.81	Sphoeroides pachgaster	19.05	111
Lepidotrigla cadmami	8.70	162	0.78	Trigla lyra	17.76	814
Raja miraletus	7.08	16	0.63	Trachurus trecae	13.69	1091
Lepidotrigla carolae	5.26	121	0.47	Torpedo nobiliana	13.67	2
Syacium micrurum	4.85	101	0.43	Squalus megalops	10.79	10
Chelidonichthys gabonensis	4.85	61	0.43	Scomber japonicus	9.80	185
Lagocephalus laevigatus	4.85	12	0.43	Uranoscopus cadenati	6.84	37
Sepia sp.	2.43	142	0.22	Dentex angelensis	5.36	314
Dactylopterus volitans	1.21	2	0.11	Mustelus mustelus	4.93	2
Grammoplites gruveli	0.81	40	0.07	Squatina oculata	3.80	4
Lophiodes kempfi	0.40	20	0.04	Synagrops bellus	3.14	92
Monolepis microstoma	0.40	61	0.04	Trachinus pellegrini	2.77	92
Engraulis encrasicolus	0.20	40	0.02	Raja miraletus	2.77	8
Monolepis sp.	0.10	20	0.01	Torpedo torpedo	2.26	4
Total	1118.71	100.00		Scorpaena normani	2.03	18
				Branchiostegus semifasciatus *	0.74	18
						0.08
Total	870.89	100.00				
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 21	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 23	
DATE :04/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°20.69	DATE :04/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°12.79	
start stop duration		Lon W 1°16.24	start stop duration		Lon W 1°31.97	
TIME :00:29:47 00:59:58	30.2 (min)	Purpose : 3	TIME :05:49:18 06:12:10	22.9 (min)	Purpose : 3	
LOG : 8427.19	8428.82	Region : 2600	LOG : 8462.24	8463.39	Region : 2600	
FDEPTH: 108	106	Gear cond.: 0	FDEPTH: 287	288	Gear cond.: 0	
BDEPTH: 108	106	Validity : 0	BDEPTH: 287	288	Validity : 0	
Towing dir: 0°	Wire out : 320 m	Speed : 3.2 kn	Towing dir: 0°	Wire out : 725 m	Speed : 3.0 kn	
Sorted : 71	Total catch: 339.77	Catch/hour: 675.26	Sorted : 105	Total catch: 795.87	Catch/hour: 2087.98	
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	
weight numbers				weight numbers		
Boops boops	386.75	13369	57.27	Zenion hololepis	1561.52	0
Chelidonichthys gabonensis	58.99	556	8.74	Synagrops bellus	153.21	0
Trachurus trecae	47.72	3309	7.07	Squalus megalops	55.62	42
Pentheroscion mbizi	15.02	111	2.23	Lophius vaillanti	45.65	8
Umbrina canariensis	13.22	42	1.96	Parasudis fraser-brunneri	26.03	756
Ariomma bondi	12.80	181	1.90	Ariomma bondi	25.19	588
Priacanthus arenatus	10.16	209	1.50	Bembrops sp.	24.77	252
Raja miraletus	10.14	26	1.50	Lophiodes kempfi	22.67	42
Raja miraletus	9.88	28	1.46	S H R I M P S	18.89	8311
Lepidotrigla carolae	9.46	584	1.40	Trigla lyra	17.84	52
Lepidotrigla cadmami	9.46	181	1.40	Merluccius polli	16.66	29
Dentex congensis	9.04	237	1.34	Xenodermichthys copei	14.69	965
Spicara alta	8.76	1868	1.30	Todaropsis eblanae	11.33	84
Squatina oculata	8.65	4	1.28	Aulopus cadenati	10.91	84
Pagellus bellottii	8.21	306	1.22	Mundipopsis sp.	10.07	0
Mustelus mustelus	7.25	4	1.07	Calappa-like with spines	9.65	126
Sepia officinalis hierredda	6.66	8	0.99	Synagrops microlepis	8.40	294
Pentheroscion mbizi	5.37	42	0.79	Raja alba	7.61	5
Uranoscopus cadenati	4.87	56	0.72	Antigonia capros	7.14	168
Scorpaena normalis	4.73	14	0.70	Torpedo nobiliana	6.69	3
Brotula barbata	4.37	4	0.65	Lepidotrigla carolae	5.88	42
Todaropsis eblanae	2.92	14	0.43	Lestidiops sp.	5.04	126
Priacanthus arenatus	2.48	12	0.37	Chlorophthalmus atlanticus	4.62	0
Microchirus frechkopi	2.37	42	0.35	Malacocephalus occidentalis	4.20	42
Umbrina canariensis	2.19	8	0.32	Epigonichthys sp.	3.78	798
Dactylopterus volitans	1.81	14	0.27	Chimaenopsetta lugubris	2.52	42
Synagrops bellus	1.67	42	0.25	Sepia sp.	1.68	168
Pagrus caeruleostictus	1.67	14	0.25	Monolepis microstoma	1.68	84
Uranoscopus cadenati	1.55	4	0.23	Spicara alta	1.26	42
Citharus linguatula	1.53	83	0.23	SOLEIDAE	1.26	42
Sepia sp.	1.53	42	0.23	Trigla lyra	0.84	84
Sargocentron hastatum	1.39	14	0.21	Priacanthus arenatus	0.84	84
Pagrus caeruleostictus	0.87	2	0.13			0
Pagellus bellottii	0.70	2	0.10			
Zeus faber	0.52	2	0.08			
Dactylopterus volitans	0.44	2	0.06			
Citharus linguatula	0.14	2	0.02			
Total	675.26	100.00		Total	2088.12	100.01

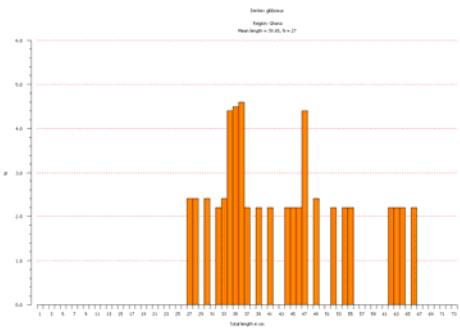
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 24	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 26		
DATE :04/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°10.74	DATE :04/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 4°7.84		
start stop duration		Lon W 1°31.60	start stop duration		Lon W 1°45.62		
TIME :07:47:04 08:17:08	30.1 (min)	Purpose : 3	TIME :15:51:41 16:21:30	29.8 (min)	Purpose : 3		
LOG : 8470.81	8472.36	Region : 2600	LOG : 8509.43	8510.98	Region : 2600		
FDEPTH: 447	455	Gear cond.: 0	FDEPTH: 814	830	Gear cond.: 0		
BDEPTH: 447	455	Validity : 0	BDEPTH: 814	830	Validity : 0		
Towing dir: 0°	Wire out : 1000 m	Speed : 3.1 kn	Towing dir: 0°	Wire out : 1910 m	Speed : 3.1 kn		
Sorted : 58	Total catch: 219.09	Catch/hour: 437.16	Sorted : 33	Total catch: 33.06	Catch/hour: 66.52		
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers				weight numbers			
Nematocarcinus africanus	157.13	54996	35.94	Centrophorus granulosus	14.89	4	22.38
Trichiurus lepturus	80.81	1947	18.49	Yarrella blackfordi	11.67	64	17.54
Hymenocephalus italicus	59.36	4799	13.58	Narcetes cf stomias	9.11	24	13.70
Synagrops bellus	38.17	1273	8.73	Coryphenocephalus zaniophorus	3.88	24	5.84
Merluccius polli	10.48	6	2.40	Melanostomias sp.	2.54	36	3.81
Chascanopsetta lugubris	8.44	305	1.93	Talismania sp.	2.47	10	3.72
Setarches guentheri	7.90	457	1.81	Bathygadus macrops	2.29	12	3.45
Malacocephalus occidentalis	7.36	99	1.68	Aristeus varidens	2.21	2	3.33
Raja sp.	7.10	9	1.62	CENTROLOPHIDAE	1.83	2	2.75
S H R I M P S	6.82	423	1.56	Trichiurus lepturus	1.51	68	2.27
Chlorophthalmus atlanticus	6.64	108	1.52	Melanonus zugmayeri	1.43	26	2.15
Bembrops greyi	4.95	36	1.13	Synaphobranchus affinis	1.31	12	1.97
Malacocephalus laevis	4.59	108	1.05	Nezumia duodecim	1.23	18	1.85
Rajidae sp.	4.39	4	1.00	Deania sp.	1.19	8	1.78
Laemonema laureysi	4.22	18	0.97	Octopus sp.	1.03	0	1.54
Helicolenus dactylopterus	4.11	6	0.94	MYCTOPHIDAE	1.03	8	1.54
Benthodesmus tenuis	4.05	9	0.93	Hydrolagus sp.	0.97	2	1.45
Xenolepidichthys dagleishi	2.69	99	0.62	Dicrolene intronigra	0.76	14	1.15
Chauanax pictus	2.43	4	0.56	Alepocephalus sp.	0.62	22	0.94
Epigonus pandonis	2.15	27	0.49	Cranchia sp.	0.62	2	0.94
Helicolenus dactylopterus	2.15	18	0.49	Halosaurus oovenii	0.58	24	0.88
Chauanax pictus	1.80	9	0.41	Scomberolabrax heterolepis	0.52	4	0.79
Zenopsis conchifer	1.72	4	0.39	Benthodesmus tenuis	0.52	2	0.79
Parasudis fraser-brunneri	1.17	68	0.27	Lamprichthys sp.	0.44	2	0.67
Todaropsis eblaniae	1.06	8	0.24	Priacanthus arenatus	0.40	34	0.60
Etmopterus pusillus	0.99	9	0.23	Nesiarchus nasutus	0.30	2	0.45
Zenion hololepis	0.90	108	0.21	Directoides parini	0.28	6	0.42
Synagrops microlepis	0.64	18	0.15	Nezumia africana	0.20	2	0.30
PORTUNIDAE	0.64	9	0.15	Snyderidria sp.	0.20	4	0.30
Todaropsis eblaniae	0.64	27	0.15	Rouleau sp.	0.12	2	0.18
Promethichthys prometheus	0.45	9	0.10	Glyptus marsupialis	0.08	2	0.12
Trigla lyra	0.44	2	0.10	Xenodermichthys copei	0.08	2	0.12
Chascanopsetta lugubris	0.40	2	0.09	Melanocetus johnsoni	0.04	2	0.06
Caelorinchus coelori. geronimo	0.36	9	0.08	Gonostoma elongatum	0.04	2	0.06
Total	437.16	100.00		Bathypterois viridensis	0.04	2	0.06
				Nephropsis atlantica	0.02	2	0.03
				Bathypterois phenax	0.02	2	0.03
				S H R I M P S	0.02	2	0.03
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 25	Total	66.52	100.00		
DATE :04/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°9.78					
start stop duration		Lon W 1°32.15					
TIME :10:29:55 11:00:33	30.6 (min)	Purpose : 3					
LOG : 8483.07	8484.57	Region : 2600					
FDEPTH: 710	728	Gear cond.: 0					
BDEPTH: 710	728	Validity : 0					
Towing dir: 0°	Wire out : 1550 m	Speed : 2.9 kn					
Sorted : 103	Total catch: 209.49	Catch/hour: 410.36					
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers				weight numbers			
Centrophorus granulosus	199.80	43	48.69	Nematocarcinus africanus	432.92	83792	55.18
Lamprichthys eximus	33.50	118	8.16	Centrophorus sp.	181.08	34	23.08
Yarrella blackfordi	25.27	521	6.16	Iijimaia lopezi	37.45	8	4.77
Talismania sp.	22.41	168	5.46	Trichiurus lepturus	29.52	541	3.76
Scymnodon cf ringens	19.63	59	4.78	Melanostomias sp.	24.27	397	3.09
Synagrops bellus	17.04	217	4.15	Gadella imberbis	13.18	30	1.68
Bathygadus macrops	12.22	43	2.98	Unidentified fish	11.53	30	1.47
Bathyuroconger vicinus	10.15	74	2.47	Yarrella blackfordi	10.64	256	1.36
Snyderidria sp.	9.29	180	2.26	Lophiodes kampeni	9.99	4	1.27
Sea cucumber	8.23	0	2.00	Xenodermichthys copei	5.25	180	0.67
Narcetes cf stomias	8.11	24	1.98	Directoides parini	4.65	165	0.59
Chauanax pictus	5.45	4	1.33	Aristeus varidens	3.89	225	0.50
Melanostomias sp.	5.17	67	1.26	Rajidae sp.	3.10	2	0.39
Aristeus varidens	5.01	192	1.22	Plesiopenaeus edwardsianus	3.00	45	0.38
Hydrodamus alberti	4.86	12	1.18	Bathygadus macrops	2.56	60	0.33
Malacocephalus laevis	4.27	16	1.04	Bathyuroconger vicinus	2.40	30	0.31
Synaphobranchus affinis	3.17	20	0.77	Plesiopenaeus edwardsianus	2.10	28	0.27
Ectrepobranchus imus	2.82	31	0.69	Priacanthus arenatus	2.10	90	0.27
Melanonus zugmayeri	2.78	16	0.68	Chaceon maritae	1.66	15	0.21
Nezumia duodecim	2.04	24	0.50	Aristeus varidens	1.10	38	0.14
Ariomma bondi	1.25	16	0.31	Gymnophyllum serpens	0.82	2	0.10
Ebihania costaeacanarie	1.18	4	0.29	Polymetme corythaeola	0.60	30	0.08
Plesiopenaeus edwardsianus	1.14	12	0.28	Dibranchus atlanticus	0.60	75	0.08
Alepocephalus sp.	1.06	43	0.26	Caristius maderensis	0.16	15	0.02
Benthodesmus tenuis	0.98	4	0.24				
Directoides parini	0.86	24	0.21				
Promethichthys prometheus	0.82	20	0.20				
Nezumia aequalis	0.72	24	0.18				
Stereomastis sp.	0.39	20	0.10				
Coryphanocephalus zaniophorus	0.31	4	0.08				
Nephropsis atlantica	0.24	4	0.06				
Monomitus metriostoma	0.20	4	0.05				
Total	410.36	100.00					
			Total	784.55	100.00		

R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 28	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 30			
DATE :05/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 4°19.56	DATE :05/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°32.98			
start stop duration		Lon W 2°9.97	start stop duration		Lon W 2°23.79			
TIME :07:19:15 07:50:12	30.9 (min)	Purpose : 3	TIME :13:38:08 14:08:51	30.7 (min)	Purpose : 3			
LOG : 8577.79	8579.38	Region : 2600	LOG : 8612.75	8614.36	Region : 2600			
FDEPTH: 736	735	Gear cond.: 0	FDEPTH: 200	209	Gear cond.: 0			
BDEPTH: 736	735	Validity : 0	BDEPTH: 200	209	Validity : 0			
Towing dir: 0°	Wire out : 1650 m	Speed : 3.1 kn	Towing dir: 0°	Wire out : 530 m	Speed : 3.1 kn			
Sorted : 68	Total catch: 401.24	Catch/hour: 778.10	Sorted : 64	Total catch: 604.78	Catch/hour: 1181.20			
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight numbers				weight numbers				
Sea cucumber	325.79	0	41.87	0	Priacanthus arenatus	896.48	51228	75.90
Sea cucumber	104.72	0	13.46		Ariomma bondi	118.65	3164	10.05
Yarrella blackfordi	48.99	1530	6.30		Antigonia capros	44.82	2268	3.79
Nezumia duodecem	27.93	640	3.59		Todaropsis eblanae	34.28	316	2.90
Shark eggs	23.27	0	2.99		Squalus megalops	15.63	6	1.32
Dibranchus atlanticus	21.76	663	2.80		Lophiodes kempfi	14.45	26	1.22
Bathygadus macrops	19.43	81	2.50		Peristedion cataphractum	10.55	316	0.89
Hydrolagus sp.	18.27	70	2.35		Bembrops greyi	10.16	61	0.86
Talismania sp.	15.94	151	2.05		Lepidotrigla carolae	6.58	264	0.56
Bathyuroconger vicinus	15.36	105	1.97		URCHINS	5.27	26	0.45
Narcetes cf stomiis	15.13	81	1.94		Lepidotrigla cadmani	3.96	53	0.34
Anemones, white	13.96	35	1.79		Zeus faber	2.73	14	0.23
Shrimps, small, non comm.	11.03	0	1.42		Dibranchus atlanticus	2.64	105	0.22
Alepocephalus sp.	8.73	105	1.12		Lophiodes kempfi	2.15	4	0.18
Lampruguinus exutus	8.61	47	1.11		Raja miraletus	1.66	2	0.14
Synagrops bellus	8.38	70	1.08		Pentheroscion mbizi	1.56	10	0.13
Synaphobranchus affinis	8.03	93	1.03		Monolepis sp.	1.31	53	0.11
Coryphaenoides zaniophorus	7.80	7	1.00		Synagrops bellus	1.31	26	0.11
Balanomorpha	6.63	23	0.85		Bembrops heterurus	1.27	12	0.11
Nezumia aequalis	5.35	163	0.69		Dentex angelensis	0.88	6	0.07
Aristeus varidens	5.24	477	0.67		Dentex congoensis	0.88	10	0.07
Nezumia africana	5.00	35	0.64		Uranoscopus sp.	0.88	6	0.07
Nezumia micronychodon	5.00	70	0.64		Lophius vaillanti	0.78	2	0.07
Stereomastis sp.	4.77	303	0.61		Brotula barbata	0.78	2	0.07
Halosaurus ovenii	4.65	105	0.60		Sphoeroides pacificus	0.59	2	0.05
CENTROLOPHIDAE	4.07	12	0.52		Sea cucumber	0.39	2	0.03
Chaceon maritae	3.49	6	0.45		Spicara alta	0.29	2	0.02
Diretmoides parini	3.49	12	0.45		Synchiropus phaeton	0.26	26	0.02
Scymnodon cf ringens	3.14	12	0.40		Total	1181.20		100.00
Bathygadus melanobranchus	2.79	12	0.36					
Plesiopeneaus edwardsianus	2.44	35	0.31					
			0					
Raja sp.	1.94	16	0.25					
Todaropsis eblanae	1.86	12	0.24					
Dicrolene intronigra	1.86	58	0.24					
Nephrops atlantica	1.63	163	0.21					
Raja sp., juvenile	1.51	35	0.19					
Ariomma bondi	1.40	23	0.18					
URCHINS	0.93	23	0.12					
Lithodes ferox	0.93	12	0.12					
Benthodesmus tenuis	0.93	12	0.12					
Xenodermichthys copei	0.89	47	0.11					
Snyderida sp.	0.81	12	0.10					
Malacocephalus laevis	0.47	12	0.06					
Melanonus zugmayeri	0.35	12	0.04					
Polytmus corythaeola	0.35	12	0.04					
Monomitus metriostoma	0.23	12	0.03					
Aldrovandia phalarca	0.00	2	0.00					
	Total	777.23	99.89					
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 29	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 31			
DATE :05/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°26.82	DATE :05/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°28.12			
start stop duration		Lon W 2°13.21	start stop duration		Lon W 2°23.38			
TIME :10:35:57 11:06:00	30.1 (min)	Purpose : 3	TIME :15:51:24 16:21:12	29.8 (min)	Purpose : 3			
LOG : 8594.20	8595.75	Region : 2600	LOG : 8624.31	8625.79	Region : 2600			
FDEPTH: 337	341	Gear cond.: 0	FDEPTH: 520	514	Gear cond.: 0			
BDEPTH: 337	341	Validity : 0	BDEPTH: 520	514	Validity : 0			
Towing dir: 0°	Wire out : 800 m	Speed : 3.1 kn	Towing dir: 0°	Wire out : 1200 m	Speed : 3.0 kn			
Sorted : 98	Total catch: 298.73	Catch/hour: 596.46	Sorted : 169	Total catch: 169.02	Catch/hour: 340.19			
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight numbers				weight numbers				
Chlorophthalmus atlanticus	248.29	6437	41.12	Shrimps unidentified	163.64	34714	48.10	
Parasudis fraser-brunneri	72.78	6274	12.20	Yarrella blackfordi	41.66	1286	12.25	
Synagrops bellus	47.08	1068	7.89	Centrophorus granulosus	25.36	6	7.45	
Lophiodes kempfi	33.54	28	5.62	Trichiurus lepturus	24.64	520	7.24	
Malacocephalus occidentalis	29.38	26	4.93	Todaropsis eblanae	22.93	118	6.74	
Ariomma bondi	21.56	545	3.62	Stereomastis sp.	8.06	498	2.37	
Cyttopsis roseus	16.62	1338	2.79	Hoplostethus cadenati	6.44	127	1.89	
Merluccius polli	13.68	24	2.29	Aristeus varidens	5.58	153	1.64	
Raja doultriei	12.98	2	2.18	Leptocephalus	5.39	6	1.59	
Todaropsis eblanae	11.77	90	1.97	Chaunax pictus	4.25	10	1.25	
Caelorinchus coelori. geronimo	11.59	243	1.94	MYCTOPHIDAE	3.99	1765	1.17	
Lithodes ferox	10.98	8	1.84	Squalus megalops	3.04	4	0.89	
Chascionus lugubris	7.91	207	1.33	Raja sp.	2.54	2	0.75	
Malacocephalus laevis	6.65	144	1.11	Histioteuthis sp.	2.54	9	0.75	
Laemonema laureysi	5.39	54	0.90	Plesiopeneaus edwardsianus	2.09	48	0.62	
Parapeneus longirostris	5.21	440	0.87	Merluccius polli	1.99	2	0.59	
Nezumia aequalis	5.12	216	0.86	Laemonema laureysi	1.81	27	0.53	
Trigla lyra	4.09	12	0.69	Iijimaiia lopeii	1.49	2	0.44	
Polytmus corythaeola	4.04	234	0.68	Xenodermichthys copei	1.45	119	0.43	
Iijimaiia lopeii	3.23	9	0.54	Octopus vulgaris	1.37	2	0.40	
Scyliorhinus cervigoni	3.19	2	0.54	PORTUNIDAE	1.19	18	0.35	
Dibranchus atlanticus	2.88	153	0.48	Hydrolagus sp.	1.15	2	0.34	
Squalus megalops	2.80	2	0.47	MELASTOMATIDAE	1.09	28	0.32	
Lophiodes kempfi	2.70	36	0.45	Diretmoides parini	0.83	27	0.24	
Shark eggs	2.16	108	0.36	Bathygadus macrops	0.64	4	0.19	
Calappa-like with spines	2.07	36	0.35	Lophiodes kempfi	0.54	9	0.16	
Synagrops microlepis	1.80	27	0.30	Scymnodon cf ringens	0.52	4	0.15	
Shrimps, small, non comm.	1.71	279	0.29	Histioteuthis sp.	0.50	2	0.15	
Epigonus sp.	1.44	45	0.24	Synagrops bellus	0.46	9	0.14	
OPHIDIIDAE	1.35	18	0.23	Parasudis sp.	0.36	5	0.11	
Sepla sp.	1.26	54	0.21	Shrimps, small, non comm.	0.36	154	0.11	
Bembrops greyi	1.08	9	0.18	Laemonema laureysi	0.32	4	0.09	
Munidopsis sp.	0.99	135	0.17	Peristedion cataphractum	0.24	4	0.07	
Galeus polli	0.81	9	0.14	Scopelarchoides cf danae	0.18	18	0.05	
Zenion hololepis	0.54	108	0.09	PORTUNIDAE	0.12	2	0.04	
Peristedion cataphractum	0.45	27	0.08	Leptocephalus	0.09	1	0.03	
Zenopsis conchifer	0.26	2	0.04	Total	340.19		100.00	
CALLIONYMIDAE	0.09	9	0.02					
Total		596.46	100.00					

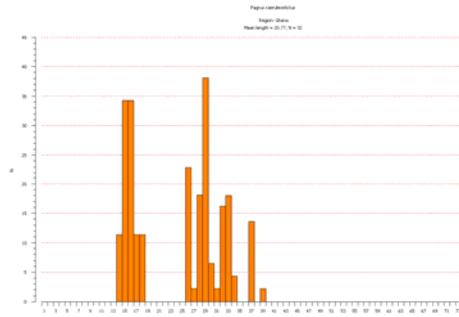
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 32	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 34			
DATE :05/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°22.00	DATE :06/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°39.24			
start stop duration		Lon W 2°23.90	start stop duration		Lon W 2°45.41			
TIME :18:27:42 18:57:35	29.9 (min)	Purpose : 3	TIME :08:20:12 08:50:08	29.9 (min)	Purpose : 3			
LOG : 8636.36	8637.85	Region : 2600	LOG : 8705.45	8706.93	Region : 2600			
FDEPTH: 867	860	Gear cond.: 0	FDEPTH: 117	120	Gear cond.: 0			
BDEPTH: 867	860	Validity : 0	BDEPTH: 117	120	Validity : 0			
Towing dir: 0°	Wire out : 1920 m	Speed : 3.0 kn	Towing dir: 0°	Wire out : 310 m	Speed : 3.0 kn			
Sorted : 29	Total catch: 1110.30	Catch/hour: 2228.77	Sorted : 89	Total catch: 292.15	Catch/hour: 585.48			
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight numbers				weight numbers				
Sea cucumber	2007.36	0	90.07	Trachurus trecae	320.64	6038	54.77	78
Yarrella blackfordi	71.96	542	3.23	Ariomma bondi	86.77	1735	14.82	
Bathyuroconger vicinus	34.13	161	1.53	Pentheroscion mbizi	54.11	414	9.24	79
Narcetes cf stomias	24.49	110	1.10	Scomber japonicus	39.54	381	6.75	82
Bathygadus macrops	14.35	201	0.64	Boops boops	25.51	377	4.36	
Synaphobranchus affinis	10.34	50	0.46	Dentex congoidensis	23.45	415	4.00	80
Halosaurus ovenii	9.13	151	0.41	Priacanthus arenatus	14.03	100	2.40	
Narcetes cf stomias	8.53	2	0.38	Dentex angelensis	8.02	94	1.37	81
Dicrolene intronigra	6.12	130	0.27	Raja miraletus	4.07	20	0.69	
Nezumia aequalis	5.92	100	0.27	Erotula barbata	3.11	2	0.53	
Glyphus marsupialis	5.22	141	0.23	Pagellus bellottii	2.00	40	0.34	83
Raja sp.	5.22	2	0.23	Sepia officinalis hierredda	1.47	13	0.25	
Nezumia micronychedon	4.72	70	0.21	Zeus faber	1.26	6	0.22	
Rouleina sp.	4.22	30	0.19	Fistularia petimba	0.90	4	0.15	
Nezumia africana	3.81	10	0.17	Sphyraena sphyraena	0.60	2	0.10	
Stereomastis sp.	3.61	191	0.16					
Talismania sp.	2.91	10	0.13	Total	585.48	100.00		
Lampruguinus niger	1.71	10	0.08					
Todaropsis eblanae	1.51	10	0.07					
Coryphaenoides zaniophorus	0.90	10	0.04					
Trichiurus lepturus	0.80	50	0.04	R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 35		
Notacanthus cf sexspinus	0.60	10	0.03	DATE :07/05/2010	GEAR TYPE: BT NO: 24	POSITION:Lat N 4°53.19		
Melanonus zugmayeri	0.50	10	0.02	start stop duration		Lon W 0°29.45		
Aristeus varidens	0.40	10	0.02	TIME :00:00:50 00:31:18	30.5 (min)	Purpose : 3		
Dibranchus atlanticus	0.30	20	0.01	LOG : 8850.89	8852.34	Region : 2600		
	Total	2228.77	100.00	FDEPTH: 584	529	Gear cond.: 0		
				BDEPTH: 584	529	Validity : 0		
				Towing dir: 0°	Wire out : 1280 m	Speed : 2.9 kn		
				Sorted : 85	Total catch: 85.30	Catch/hour: 167.97		
R/V Dr. Fridtjof Nansen	SURVEY:2010404	STATION: 33	SPECIES	CATCH/HOUR	% OF TOT. C	SAMP		
DATE :06/05/2010	GEAR TYPE: BT NO: 21	POSITION:Lat N 4°33.24	weight numbers					
start stop duration		Lon W 2°40.77	J E L L Y F I S H	78.77	0	46.89		
TIME :05:11:04 05:40:28	29.4 (min)	Purpose : 3	Yarrella blackfordi	23.83	553	14.19		
LOG : 8690.13	8691.63	Region : 2600	Benthodesmus tenuis	17.33	358	10.32		
FDEPTH: 756	751	Gear cond.: 0	Laemonema laureysi	9.69	75	5.77		
BDEPTH: 756	751	Validity : 0	MELANOSTOMIATIDAE	7.48	112	4.45		
Towing dir: 0°	Wire out : 1700 m	Speed : 3.1 kn	Lophius vaillanti	5.71	2	3.40		
Sorted : 116	Total catch: 550.84	Catch/hour: 1124.16	Merluccius polli	4.92	4	2.93	84	
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	Stereomastis sp.	4.41	18	2.63	
weight numbers				Sea cucumber	2.76	104	1.64	
Sea cucumber	773.47	0	68.80	Nezumia aequalis	1.50	43	0.89	
Yarrella blackfordi	111.02	2141	9.88	Narcetes cf stomias	1.36	6	0.81	
Talismmania sp.	41.57	294	3.70	Malacocephalus laevis	1.28	18	0.76	
Lampruguinus exutus	25.24	88	2.25	Aristeus varidens	1.18	146	0.70	
Anemones, white	22.86	29	2.03	Histioteuthis sp.	1.10	10	0.66	
Narcetes cf stomias	17.96	54	1.60	Anemones, white	0.81	2	0.48	
Stereomastis sp.	13.39	922	1.19	Etmopterus pusillus	0.73	2	0.43	
Raja sp.	12.86	14	1.14	Xenodermichthys copei	0.71	30	0.42	
Alepocephalus sp.	11.53	131	1.03	Shrimps, small, non comm.	0.61	89	0.36	
Scymnodon cf ringens	10.12	43	0.90	Hoplostethus cadenati	0.57	12	0.34	
Nezumia duodecim	9.80	163	0.87	NETTASTOMATIDAE	0.43	4	0.26	
Xenodermichthys copei	9.47	271	0.84	Halosaurus ovenii	0.33	6	0.20	
Bassanago albescens	8.92	65	0.79	Narcetes cf stomias	0.32	6	0.19	0
Aristeus varidens	8.71	265	0.78	Colatopogonias sp.	0.26	2	0.15	
Narcetes cf stomias	8.57	12	0.76	Gnatopogonias zoea	0.26	49	0.15	
Raja sp.	7.84	120	0.70	Bajacalifornia magalops	0.20	6	0.12	
Dibranchus atlanticus	5.79	251	0.51	Neoscoelopus macrolepidotus	0.18	6	0.11	
Chaecon maritae	5.51	8	0.49	Alepocephalus sp.	0.16	10	0.09	
MELANOSTOMIATIDAE	1.96	414	0.17	Luciobrotula nolfi	0.16	2	0.09	
Synaphobranchus affinis	1.96	11	0.17	Monomitaetus metriostoma	0.14	6	0.08	
Diceratias pileatus	0.84	2	0.07	Directromides parini	0.14	4	0.08	
Nezumia africana	0.76	11	0.07	SOLEIDAE	0.12	2	0.07	
Halosaurus ovenii	0.65	22	0.06	Dibranchus atlanticus	0.10	2	0.06	
Gonostoma elongatum	0.55	11	0.05	Priacanthus arenatus	0.10	6	0.06	
Benthodesmus tenuis	0.55	11	0.05	Chlorophthalmus atlanticus	0.08	2	0.05	
Bassanago albescens	0.51	2	0.05	Glyphus marsupialis	0.08	2	0.05	
Heterocarpus laevigatus	0.33	11	0.03	Lampruguinus exutus	0.06	4	0.04	
Shrimps, small, non comm.	0.33	65	0.03	Synaphobranchus affinis	0.04	2	0.02	
	Total	1124.36	100.02	Gonostoma elongatum	0.04	2	0.02	
				Raja sp., juvenile	0.02	2	0.01	
				Nemichthys scolopaceus	0.02	2	0.01	
				Stomias sp.	0.02	2	0.01	
				Total	167.97	100.00		

## Annex II Length distributions of main species

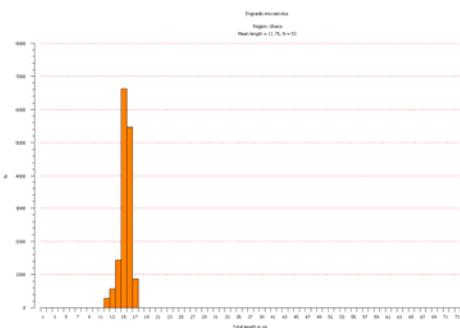




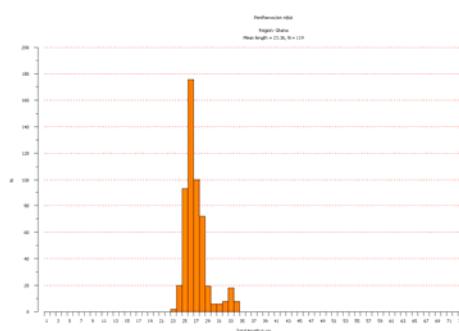
*Dentex gibbosus* N = 27



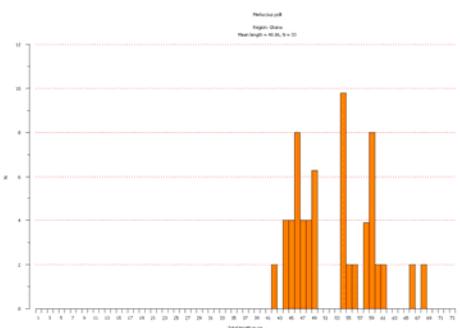
*Pagrus caeruleostictus* N = 32



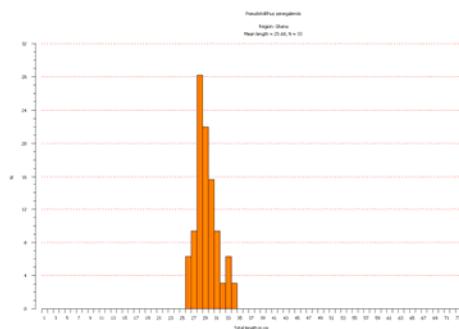
*Engraulis encrasicilus* N = 53



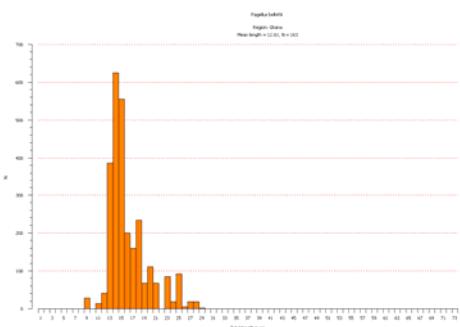
*Pentheroscion mbizi* N = 119



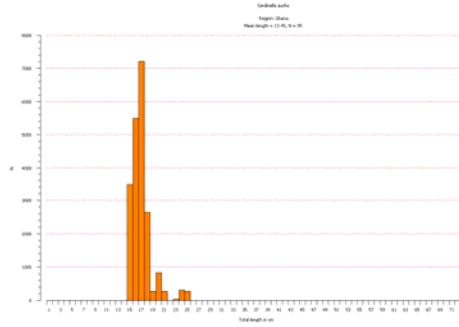
*Merluccius polli* N = 33



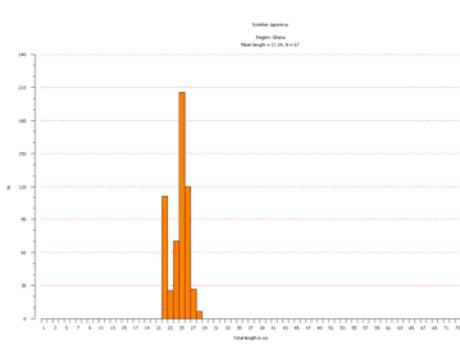
*Pseudotolithus senegalensis* N = 33



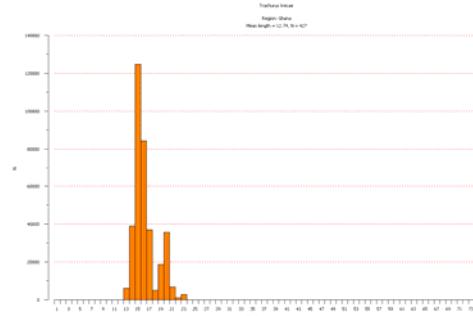
*Pagellus bellottii* N = 163



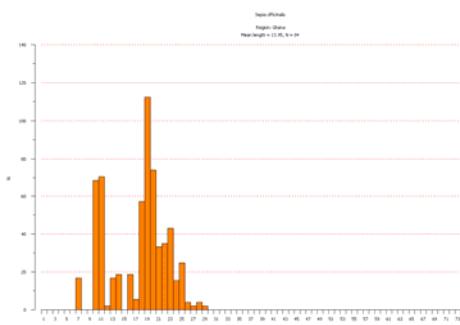
*Sardinella aurita* N = 95



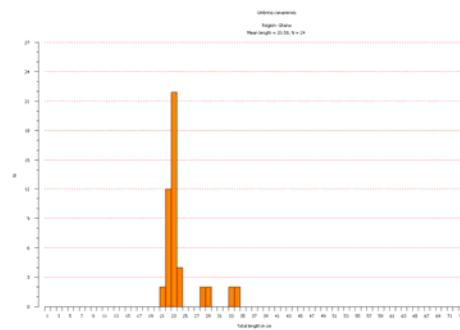
*Scomber japonicus*      N = 67



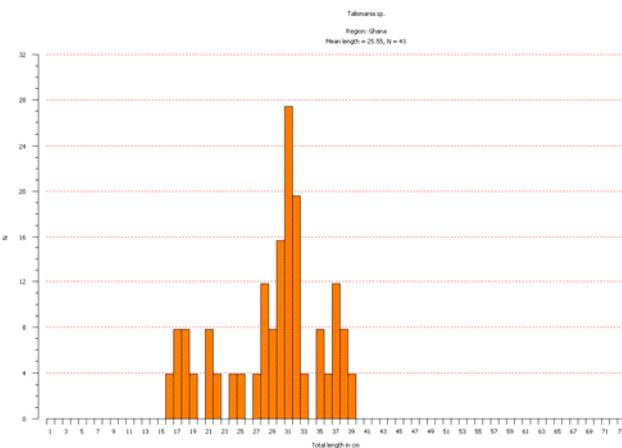
*Trachurus declivis*      N = 427



*Sepia officinalis*      N = 36



*Umbrina canariensis*      N = 24



*Talismania sp.*      N = 43

### Annex III Swept-area estimate per depth region

SPECIES NAME	SAMPLE DISTRIB. BY CATCH CLASSES Lower limits, Kg/nm							Mean Dens. t/nm <sup>2</sup>	Mean densities by bottom depth strata t/nm <sup>2</sup>			
	>0	10	30	100	300	1000	% Inci- dence		0-100m	100- 300m	300- 600m	600- 1000m
<i>Trachurus trecae</i>	4	2	1	1	1	1	28.6	6.5	23.5	5.2		
<i>Sea cucumber</i>	3		3	3	1		28.6	3.9		0.0	0.8	16.3
<i>Antigonia</i> sp.					1		2.9	2.6		7.4		
<i>Dentex congensis</i>	8	1	2	3			40.0	1.8	5.8	1.7		
<i>Zenion hololepis</i>	3				1		11.4	1.5		4.3		0.0
<i>Synagrops bellus</i>	12	2	1		1		45.7	1.4		0.5	5.1	0.1
<i>Priacanthus arenatus</i>	16	1		2			54.3	1.4	0.5	3.7	0.0	0.0
<i>Ariommia bondi</i>	12	1	3	1			48.6	0.9	0.8	2.1	0.1	0.0
<i>Chlorophthalmus atlanticus</i>	3		1	1			14.3	0.8		0.0		3.7
<i>Antigonia capros</i>	3	1	1	1			17.1	0.7	1.4	1.2		
<i>Lophius vaillanti</i>	7	4		1			34.3	0.6	0.1	0.3	0.5	1.5
<i>Nematocarcinus africanus</i>			1	1			5.7	0.5				2.4
<i>Yarrella blackfordi</i>	7	3	2				34.3	0.5			0.5	1.7
<i>Centrophorus granulosus</i>	2			2			11.4	0.5			0.1	1.9
<i>Brachydeuterus auritus</i>	1			1			5.7	0.4	2.2			
<i>Dentex angolensis</i>	10	3	1				40.0	0.4	1.0	0.6		
<i>Sardinella aurita</i>	2			1			8.6	0.4	1.8	0.0		
<i>Sepia officinalis hierredda</i>	10	2	1				37.1	0.3	1.5	0.1		
J E L L Y F I S H	1	1					5.7	0.3	1.2		0.3	
<i>Pentheroscion mbizi</i>	5	1	1				20.0	0.2	0.7	0.3		
<i>Rhinobatos albomaculatus</i>	3		1				11.4	0.2	0.0	0.6		0.0
<i>Trichiurus lepturus</i>	14	1					42.9	0.2	0.0	0.1	0.6	0.0
<i>Spicara alta</i>	8		1				25.7	0.2	0.8	0.1		
<i>Centrophorus</i> sp.	1		1				5.7	0.2			0.7	
<i>Lepidotrigla cadmani</i>	6	2					22.9	0.2	0.5	0.2		
Shrimps unidentified			1				2.9	0.2			0.7	
<i>Engraulis encrasiculus</i>	2		1				8.6	0.2	0.1	0.4		
<i>Chelidonichthys gabonensis</i>	5	3					22.9	0.1	0.0	0.4		
<i>Brotula barbata</i>	10	1					31.4	0.1	0.1	0.3		
<i>Lampruguinus exutus</i>	8	2					28.6	0.1			0.0	0.6
<i>Malacocephalus occidentalis</i>	5	1					17.1	0.1		0.0	0.5	0.0
<i>Ephippion guttifer</i>			1				2.9	0.1		0.3		
<i>Laemonema laureysi</i>	8	1					25.7	0.1		0.0	0.4	0.1
<i>Bathygadus macrops</i>	10						28.6	0.1			0.1	0.3
Unidentified fish	6	1					20.0	0.1	0.0	0.2		0.1
<i>Pagellus bellottii</i>	9	1					28.6	0.1	0.2	0.2		
<i>Parasudis fraser-bruenneri</i>	3	1					11.4	0.1		0.1		0.3
<i>Zeus faber</i>	9	1					28.6	0.1	0.1	0.2		
<i>Narcetes cf stomias</i>	8						22.9	0.1			0.0	0.4
<i>Umbrina canariensis</i>	5	1					17.1	0.1	0.1	0.2		
<i>Fistularia petimba</i>	8	1					25.7	0.1	0.4	0.0		
<i>Todaropsis eblanae</i>	9	1					28.6	0.1		0.1	0.2	0.0
<i>Lophiodes kempfi</i>	9	1					28.6	0.1	0.0	0.1	0.2	
<i>Squalus megalops</i>	4	1					14.3	0.1		0.2		0.0
<i>Talismania</i> sp.	5	1					17.1	0.1			0.0	0.4
<i>Merluccius pollie</i>	10						28.6	0.1		0.0	0.2	0.1
<i>Dentex gibbosus</i>	2	1					8.6	0.1	0.3	0.0		
<i>Lagocephalus laevigatus</i>	5	1					17.1	0.1	0.3	0.0		
<i>Bathyuroconger vicinus</i>	6	1					20.0	0.1			0.0	0.3
<i>Ijimaia loppei</i>	5	1					17.1	0.1			0.2	0.1
<i>Raja miraletus</i>	15						42.9	0.1	0.1	0.1	0.0	0.0
<i>Aulopus cadenati</i>	2	1					8.6	0.1		0.2		
<i>Stereomastis</i> sp.	11						31.4	0.1			0.1	0.2
<i>Aristeus varidens</i>	14						40.0	0.1		0.0	0.1	0.2
<i>Raja</i> sp.	9						25.7	0.1			0.1	0.2
<i>Pagrus caeruleostictus</i>	7						20.0	0.1	0.2	0.1		
<i>Uranoscopus cadenati</i>	2	1					8.6	0.1		0.2		

<i>Hymenocephalus italicus</i>	1	2.9	0.1		0.2	
<i>Pseudotolithus senegalensis</i>	2	5.7	0.0	0.1	0.1	
<i>Scymnodon cf ringens</i>	8	22.9	0.0		0.0	0.2
<i>Scomber japonicus</i>	1	5.7	0.0		0.1	
<i>Ectreposebastes imus</i>	5	14.3	0.0		0.0	0.2
<i>Anemones, white</i>	5	14.3	0.0		0.0	0.2
<i>Chascanopsetta lugubris</i>	5	14.3	0.0		0.0	0.2
<i>Trigla lyra</i>	7	20.0	0.0		0.1	0.0
<i>Setarches guentheri</i>	2	8.6	0.0		0.2	
<i>Nezumia duodecim</i>	5	14.3	0.0			0.2
TRIGLIDAE	3	8.6	0.0	0.1	0.1	
<i>Diplodus</i> sp.	1	2.9	0.0		0.1	
<i>Melanostomias</i> sp.	4	11.4	0.0		0.1	0.0
<i>Antigonia</i> sp <i>capros</i>	1	2.9	0.0		0.1	
<i>Dibranchus atlanticus</i>	11	31.4	0.0		0.0	0.1
<i>Lepidotrigla carolae</i>	7	20.0	0.0	0.0	0.1	
<i>Malacocephalus laevis</i>	11	31.4	0.0		0.0	0.1
<i>Nezumia aequalis</i>	9	25.7	0.0		0.1	0.1
<i>Mustelus mustelus</i>	5	14.3	0.0	0.0	0.1	
<i>Rhizoprionodon acutus</i>	2	5.7	0.0		0.1	
<i>Benthodesmus tenuis</i>	8	22.9	0.0		0.1	0.0
<i>Xenodermichthys copei</i>	11	31.4	0.0		0.0	0.0
<i>Dentex canariensis</i>	3	8.6	0.0	0.1	0.1	
Shrimps, small, non comm.	7	20.0	0.0		0.0	0.1
<i>Scorpaena maderensis</i> *	1	2.9	0.0	0.2		
URCHINS	4	11.4	0.0		0.0	0.1
<i>Squalus</i> sp.	2	5.7	0.0		0.1	
<i>Dasyatis marmorata</i>	1	2.9	0.0		0.1	
<i>Squatina oculata</i>	4	11.4	0.0	0.0	0.1	
<i>Cytopsis roseus</i>	3	8.6	0.0		0.0	0.1
<i>Synaphobranchus affinis</i>	8	22.9	0.0			0.1
ALEPOCEPHALIDAE	3	8.6	0.0		0.0	0.1
<i>Torpedo nobiliana</i>	3	8.6	0.0		0.1	0.0
S H R I M P S	4	11.4	0.0		0.1	0.0
<i>Alepocephalus</i> sp.	7	20.0	0.0		0.0	0.1
Shark eggs	2	5.7	0.0		0.0	0.1
<i>Bembrops</i> sp.	1	2.9	0.0		0.1	
RHINOBATIDAE	1	2.9	0.0		0.1	
<i>Physiculus huloti</i>	3	8.6	0.0		0.1	
<i>Bembrops greyi</i>	4	11.4	0.0		0.0	0.1
Starfish	2	5.7	0.0		0.1	
<i>Hydrolagus</i> sp.	3	8.6	0.0		0.0	0.1
<i>Galeus poll</i>	2	5.7	0.0			0.1
<i>Anthias anthias</i>	2	5.7	0.0		0.1	
<i>Sphoeroides pachgaster</i>	2	5.7	0.0		0.1	
<i>Dasyatis</i> sp.	1	2.9	0.0		0.1	
<i>Chaceon maritae</i>	7	20.0	0.0		0.0	0.1
<i>Caelorinchus coelori, geronimo</i>	4	11.4	0.0		0.1	
<i>Halosaurus ovenii</i>	7	20.0	0.0		0.0	0.1
<i>Gadella imberbis</i>	3	8.6	0.0		0.0	0.0
Calappa-like with spines	3	8.6	0.0		0.0	0.0
<i>Centrophorus lusitanicus</i>	3	8.6	0.0		0.0	0.0
<i>Nezumia micronychodon</i>	4	11.4	0.0			0.1
<i>Plesiopenaeus edwardsianus</i>	6	17.1	0.0		0.0	0.0
<i>Illex coindetii</i>	2	5.7	0.0		0.0	
<i>Scorpaena scrofa</i>	2	5.7	0.0	0.1	0.0	
<i>Chaunax pictus</i>	4	11.4	0.0		0.0	0.0
<i>Octopus vulgaris</i>	5	14.3	0.0	0.0	0.0	0.0
<i>Octopus</i> sp.	6	17.1	0.0	0.1		0.0
<i>Peristedion cataphractum</i>	5	14.3	0.0		0.0	0.0
<i>Syacium micrurum</i>	7	20.0	0.0	0.0	0.0	
MELANOSTOMIATIDAE	4	11.4	0.0		0.0	0.0
<i>Alectis alexandrinus</i>	1	2.9	0.0	0.1		
<i>Coryphaenoides zaniophorus</i>	5	14.3	0.0			0.1
<i>Torpedo torpedo</i>	4	11.4	0.0		0.0	
<i>Raja doutei</i>	1	2.9	0.0		0.1	

<i>Dicrolene intronigra</i>	5	14.3	0.0			0.1
<i>Oxynotus centrina</i>	2	5.7	0.0	0.0	0.0	
<i>Sepia</i> sp.	7	20.0	0.0	0.0	0.0	
<i>Glyphus marsupialis</i>	6	17.1	0.0		0.0	0.0
<i>Munidopsis</i> sp.	2	5.7	0.0	0.0	0.0	
<i>Rouleina</i> sp.	3	8.6	0.0			0.0
<i>Parapenaeus longirostris</i>	3	8.6	0.0	0.0	0.0	
<i>Synagrops microlepis</i>	3	8.6	0.0	0.0	0.0	
Sum all species		31.5	44.5	34.2	20.3	27.1
Sum SNAPPERS, JOBFISHES						
Sum GROUPERS, SEABASSES		0.0	0.1			
Sum GRUNTS, SWEETLIPS		0.4	2.2			
Sum CROAKERS, DRUMS, WEAKF., KOBS		0.4	0.9	0.6		
Sum PANDORAS, PORGIES, SEABREAMS,		2.5	7.6	2.8		
Sum SHARKS, CHIMAERAS		1.0	0.1	0.6	1.1	2.3
Sum BATOID FISHES, RAYS		0.5	0.1	1.1	0.2	0.2
Sum CEPHALOPODS		0.5	1.5	0.3	0.2	0.0
Numbers of stations included in analysis, total and by depth strata		35	7	12	8	8

## **Annex IV Instruments and fishing gear used**

The Simrad ER-60 scientific echo sounder connected to 18, 38, 120 and 200 kHz transducers was run during the survey only for observation of fish and bottom conditions. No scrutinizing of the recordings was done.

Last standard sphere calibrations were carried out 07.03.2010 in Baia dos Elefantes. Angola using Cu-64, Cu-60, WC-38.1 add WC-38.1 spheres for 18, 38, 120 and 200 kHz, respectively. The details of the settings of the 38 kHz echo sounder where as follows:

### **Transceiver-2 menu (38 kHz)**

Transducer depth	5.50 m
Absorbtion coeff.	8,5 dB/km
Pulse duration	medium (1,024ms)
Bandwidth	2,43 kHz
Max power	2000 Watt
2-way beam angle	-20,6dB
gain	25,23 dB
SA correction	-0,51 dB
Angle sensitivity	21.9
3 dB beamwidth	7,35° along ship
7,31° athwardship	
Alongship offset	-0.05°
Athwardship offset	0.06°

**Bottom detection menu      Minimum level -40 dB**

## Fishing gear

The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super bottom trawl". During the present survey only the bottom trawl was used.

The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm mesh size in the codend with an inner net of 10 mm mesh size. The trawl height was about 4.5 m and distance between wings during towing about 21 m. The sweeps are 40 m long. The trawl is equipped with a 12" rubber bobbins gear. Since 19.02.08 new and heavier "Thyborøn" combi trawl doors ( $7.41 \text{ m}^2$ , 1720 kg) have been in used. During the present survey the door distance was kept nearly constant at about 50 m at all depths by the use of a 9 m strap between the wires at 120 m distance from the doors (normally applied at depths greater than 80 m). At depths greater than 300 m the trawl was equipped with a tickler chain, which improves the catchability of bottom living and borrowing species, particularly shrimps.

The SCANMAR system was used on all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to provide information on their distance, and the trawl was equipped with a trawl eye that provides information about the trawl opening. A catch sensor on the cod-end indicated the size of the catch.