

**SURVEYS OF THE FISH RESOURCES OF
THE WESTERN GULF OF GUINEA
(Benin, Togo, Ghana & Côte d'Ivoire)**

**Survey of the pelagic and demersal resources
29 August – 17 September 2000**

**Centre de Recherches Océanologiques
Abidjan
Côte d'Ivoire**

**Direction des Pêches
Cotonou
Benin**

**Direction de l'Élevage et de la Pêche
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Ghana**

**Centre Béninois de Recherche Scientifique et Technique
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Benin**

**Institute of Marine Research (IMR)
Bergen
Norway**

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The programme has previously conducted the following surveys in the Gulf of Guinea:

Area	Period
Cape Verga (Rep. of Guinea) to Cape St. Paul (Ghana)	02 – 25 June 1981
Togo to Cameroon	07 – 20 August 1981
Côte d'Ivoire and Ghana	12 – 20 October 1989
Benin, Togo, Ghana and Côte d'Ivoire	19 April – 06 May 1999

CRUISE REPORTS "DR. FRIDTJOF NANSEN"

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29 August – 17 September 2000
Revised edition**

by

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TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION

1.1	Objectives	1
1.2	Participation.....	1
1.3	Narrative	2
1.4	Survey effort.....	3

CHAPTER 2 METHODS

2.1	Meteorological and hydrographical sampling.....	5
2.2	Biological sampling.....	6
2.3	Biomass estimates.....	6

CHAPTER 3 OCEANOGRAPHIC CONDITIONS..... 10

CHAPTER 4 RESULTS OF THE ACOUSTIC SURVEY: FISH DISTRIBUTION AND ABUNDANCE ESTIMATE OF PELAGIC SPECIES

4.1	Benin.....	16
4.2	Togo.....	20
4.3	Ghana.....	21
4.4	Côte d'Ivoire.....	22
4.5	Review of results	23

CHAPTER 5 RESULTS FROM THE TRAWL SURVEY: CATCH DISTRIBUTION, COMPOSITION AND SWEEPED-AREA BIOMASS ESTIMATES OF DEMERSAL FISH

5.1	Benin.....	25
5.2	Togo.....	29
5.3	Ghana.....	32
5.4	Côte d'Ivoire.....	37
5.5	Review of results	43

CHAPTER 6 FISHING TRIALS ON THE DEEP CONTINENTAL SHELF AND UPPER SLOPE..... 45

REFERENCES..... 48

Annex I	Records of fishing stations
Annex II	Length distributions of main species
Annex III	Families/genera in swept-area estimates
Annex IV	Swept-area biomass estimates
Annex V	Total length-fork length and L-W-relationships
Annex VI	Instruments and fishing gear used

CHAPTER 1 INTRODUCTION

Following a request from the Government of Ghana, later supported by the Governments of Benin, Togo and Côte d'Ivoire, IMR, NORAD and FAO agreed to conduct a survey in the western Gulf of Guinea covering the waters of the above four countries. This was a follow-up of a similar survey conducted in the period 19 April-6 May 1999. The survey was organised by IMR and FAO under the project GCP/INT/730/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 previously discussed and agreed upon during a pre-survey meeting held in Tema, Ghana on the 26 August 2000 where representatives from Côte d'Ivoire, Ghana, Togo, Benin, Norway and FAO participated. There was a request from Benin and Togo that the results from this year's survey should be treated and analysed separately for the two countries, by this the survey report would be more meaningful to the two countries.

1.1 Objectives

The main objectives of the survey were:

- to map the distribution and estimate the acoustic abundance of the main pelagic species
- to describe the distribution, composition and estimate the abundance of the main demersal species by a swept-area trawl programme
- to map the general hydrographic regime by using a CTD-sonde to monitor the temperature, salinity and oxygen at bottom trawl stations and in hydrographical transects
- to do on-the-job training on the main survey routines

Following the interest expressed by Ghana to have a fair idea about fishery resources in waters deeper than 100 m, an effort was made during the survey to trawl at such depths.

1.2 Participation

Direction des Pêches, Cotonou, Bénin:

Amélie Gbaguidi

Centre Béninois de Recherche Scientifique et Technique, Cotonou, Bénin:
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Direction de l'Élevage et de la Pêche, Lomé, Togo:
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Comfort Yeboah.

Centre de Recherches Oceanologiques, Abidjan, Côte d'Ivoire:
Doumini Boubéri

FAO Fisheries Department (FIRM), Rome, Italy:
Merete Tandstad

Institute of Marine Research, Bergen, Norway:
Oddgeir Alvheim, Thor Egil Johansson, Tore Mørk, Else Torstensen (cruise leader).

1.3 Narrative

The vessel left Tema (Ghana) in the evening of 29 August and steamed eastwards to the western part of Benin where the survey started in the morning of 30 August. The shelf was surveyed during daytime (0600 to 1800) by parallel course tracks about 20 NM (nautical miles) apart. In Benin and Togo the inter-transect distance was 15-20 NM, allowing for 3 transects in Benin and 2 in Togo. Semi-random swept-area hauls were carried out on the shelf within the depth zones 20-30 m, 31-50 m and 51-100 m during daytime. In addition seven bottom trawl hauls were made deeper than 100 m in areas with suitable trawling grounds. Continuous acoustic registrations were done throughout the survey. To obtain a denser acoustic coverage, night-time registrations were made in between the daytime-course tracks. Pelagic trawling with a mid-water trawl was carried out during dark hours. Blind trawl hauls were made close to the surface, in the “blind” sector of the echo sounder.

The CTD-stations were taken at most of the bottom trawl stations. In addition, five hydrographical profiles were made with CTD from surface down to 500 m depths. In Ghanaian waters zooplankton samples were taken at six locations close to bottom trawl stations. Zooplankton was sampled with a 1-metre diameter ICITA (Juday) net in step oblique hauls. The plankton stations were taken where the bottom depth was 30-60 m.

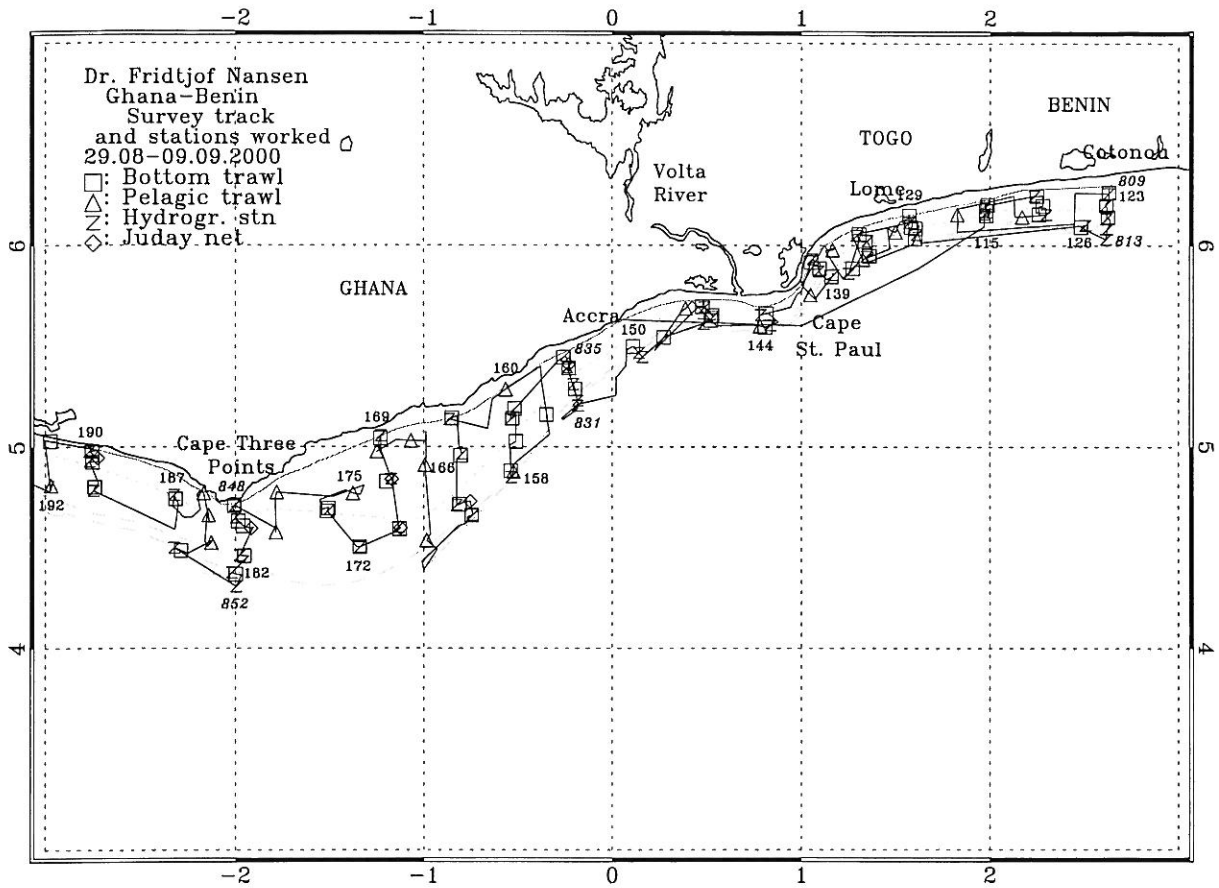
The shelf off Benin was covered from 30 to 31 August. One hydrographic transect was made off Cotonou. The Togo area was surveyed from 31 August to 1 September. The shelf off Ghana was surveyed from 1 to 8 September. In this area two hydrographic transects were made, off Accra and Cape Three Points. Côte d'Ivoire shelf area was covered from 8 to 15 September with two hydrographic transects off Grand Jacques on the central part and Grand Bérébi in the west. The survey was completed in the early hours of 15 September at a position about 15 NM from the Côte d'Ivoire-Liberia border. The vessel arrived in Tema in the afternoon of 16 September. There was a strong easterly current that gave an additional speed over bottom of 2-3 knots.

1.4 Survey effort

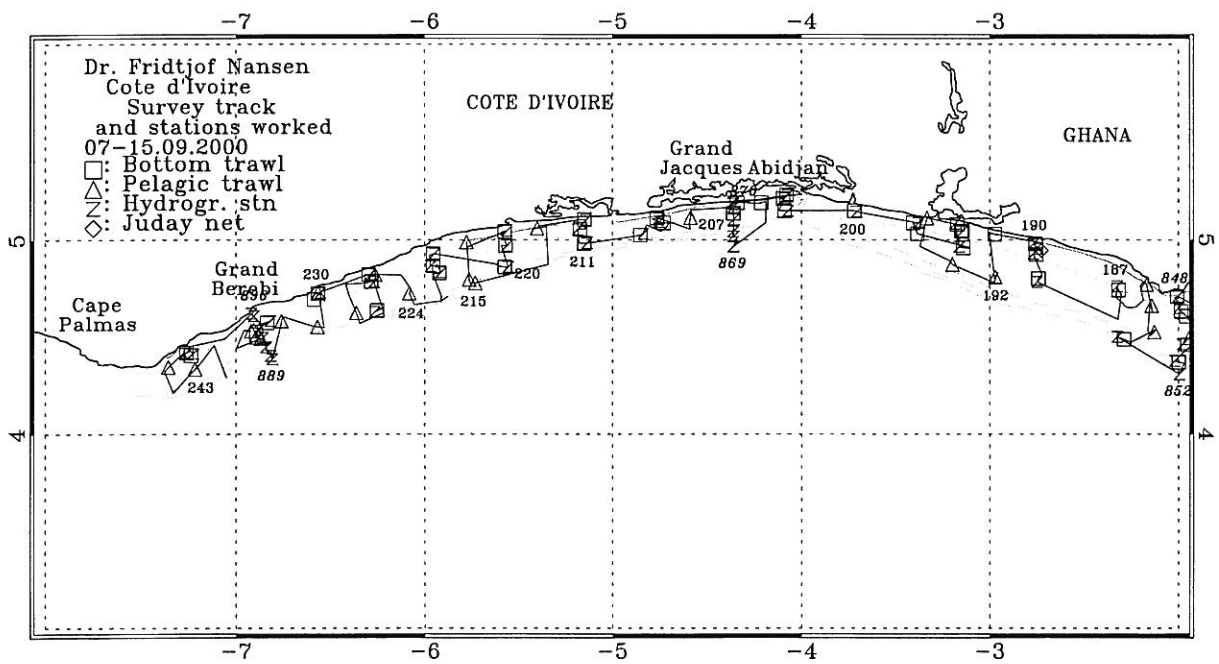
Figure 1 shows the cruise tracks with fishing, hydrographic and plankton stations. Table 1 summarises the survey effort in each sector.

Table 1. Number of hydrographic (CTD), plankton (P), pelagic trawl (PT) and bottom trawl (BT) stations, successful swept-area hauls and distance surveyed (NM) by area.

Region	CTD	P	PT	BT	Swept-area hauls			Distance surveyed (NM)
					0-30 m	31-50m	51-100 m	
Benin	11	-	2	10	3	3	3	160
Togo	6	-	2	7	2	2	2	145
Ghana	37	6	17	37	8	12	10	1055
Côte D'Ivoire	41	-	19	32	10	11	11	870
Total	95	6	40	86	23	28	26	2 230



a) Benin-Ghana



b) Ghana-Côte d'Ivoire

Figure 1. Course track with fishing and hydrographic stations for a) Benin-Ghana and b) Ghana-Côte d'Ivoire. 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 500 m. Two Niskin bottles were triggered for water samples at a few of the stations, one near the bottom and the other near the surface (5 m depth). The samples were analysed for salinity using a Guildline Portasal salinometer, and the oxygen content was determined using the Winkler method. These laboratory values were used to calibrate the CTD, though after removing obvious outliers.

For oxygen, 18 samples out of 20 were accepted for the calibration. A linear regression gave the following formula for correcting the oxygen values:

$$O_2 = O_{2ctd} * 0,980 - 0.244$$

For the salinity calibration, a total of 20 samples were accepted. The salinometer did not work and the samples were be analysed by the Marine Fisheries Research Division, Tema, Ghana.

Current speed and direction measurements (ADCP)

A ship-born Acoustic Doppler Current Profiler (ADCP) from RD Instruments was activated on every CTD station with bottom depth greater than 50 m. The ADCP was set to ping every 8seconds, the depth cell was chosen to 8 m and the number of cells to 50. As a routine the data were averaged over 300 seconds for analyses onboard. Both the raw and averaged data were stored on files. The data were analysed by the PC software UMS (Underway Mapping System).

Meteorological observations

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

2.2 Biological 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 total length of fish was recorded to the nearest 1 cm below, for anchovy to the nearest 0.5 cm. In addition, total length and total body weight (g) were recorded for the target species in the acoustic survey. Basic information recorded at each fishing stations, i.e. trawl haul, and is presented in Annex I. Pooled length frequency distributions, raised to catch per hour, of selected species by area are shown in Annex II. Families of demersal fish included in the swept area analysis are given in Annex III. The swept-area biomass estimates are presented in Annex IV.

L-W-relationships for selected species were calculated based on individual length and weights (Annex V). A description of the fishing gears used, acoustic instruments and their standard settings is given in Annex VI.

2.3 Biomass estimates

Acoustic abundance estimation

A SIMRAD EK500 Echo sounder was used and the echograms were stored on both paper and files. The acoustic biomass estimates were based on the integration technique. The Bergen Integrator (BEI) was used for analysis and allocation of the integrated s_A -values (average area back scattering coefficient in m^2/NM) The splitting and allocation of the integrator outputs (s_A -values) was based on a combination of a visual scrutiny of the behaviour pattern as deduced from echo diagrams, the BEI analysis, and the catch combinations. The mean integrator value in each sampling unit (s_A -values) was divided between the standard categories/groups of fish, as noted below, on the basis of trawl catches and characteristics of echo traces:

- plankton
- sardinella (*Sardinella aurita* and *S. maderensis*)
- anchovy (*Engraulis encrasicolus*)
- Chub mackerel (*Scomber japonicus*)
- PEL 1 (other clupeids than sardinella and anchovy)
- PEL 2 (carangids, other scombrids than chub mackerel, barracudas, hairtail)
- mesopelagic fish
- demersal fish

The following target strength (TS) function was applied to convert s_A -values (mean integrator value for a given area) to number of fish (sardinella, anchovy, PEL 2):

$$TS = 20 \log L - 72 \text{ dB} \quad (1)$$

or in the form

$$C_F = 1.26 \cdot 10^6 \cdot L^{-2} \quad (2)$$

where L is total length and C_F is the reciprocal back scattering strength, or the so-called fish conversion factor. In order to split and convert the allocated s_A -values (m^2/NM^2) to fish densities (number per length group per NM^2) the following formula was used

$$N_i = A \cdot s_A \cdot \frac{p_i}{\sum_{i=1}^n \frac{p_i}{C_{Fi}}} \quad (3)$$

where:
 N_i = number of fish in length group i
 A = area (NM^2) of fish concentration
 s_A = mean integrator value (echo density) in area A (m^2/NM^2)
 p_i = proportion of fish in length group i in samples from the area
 C_{Fi} = fish conversion factor for length group i

The number per length group (N_i) was then summed and the total number of fish obtained:

$$N = \sum_{i=1}^n N_i \quad (4)$$

The length distribution of a given species within an area was computed by simple adding of the length frequencies obtained in the pelagic trawl samples within the area. In the case of co-occurrence of target species, the s_A value was split in accordance with length distribution and catch rate in numbers in the trawl catches. Biomass per length group (B_i) was estimated by applying weights by length (W_i) relations when available or theoretical weights (calculated by using condition factors), multiplied with number of fish in the same length group (N_i). A condition factor of 0.91 was used in the biomass estimates of PEL 2. The total biomass in each area was obtained by summing the biomass of each length group:

$$B = \sum_{i=1}^n N_i \bar{W}_i \quad (5)$$

The number and biomass per length group in each concentration were then added up to obtain totals for each region.

Biomass estimates based on Swept-area method

In the bottom trawl survey, stock biomasses was estimated by the swept-area method with catch per haul as the index of abundance (see Strømme 1992). The general formula to estimate biomass B, using this method is:

$$B = \frac{A}{a} \cdot \frac{\bar{X}}{q} \quad (6)$$

A is the total area surveyed, a is the swept area of the net per haul, \bar{X} is the average catch per haul (the index of abundance) and q is the proportion of fish in the path of the net that are actually caught. The density of the resource is estimated as biomass per unit area. In a stratified survey of k non-overlapping strata, if the mean catch per haul in stratum i and its variance are denoted by \bar{X}_i and σ_i^2 respectively, then an unbiased estimate of the population mean \bar{X} is the stratified mean \bar{X}_{st} which is given by:

$$\bar{X}_{st} = \frac{1}{N} \sum_{i=1}^k N_i \bar{X}_i = \sum_{i=1}^k W_i \bar{X}_i \quad (7)$$

where $W_i = \frac{N_i}{N} = \frac{A_i}{A}$ is the relative size of the ith stratum (A_i is the area of the ith stratum and A is the total area surveyed). The variance of the stratified mean is given by

$$\text{var}(\bar{X}_{st}) = \sum_{i=1}^k W_i^2 \text{var} \bar{X}_i = \sum_{i=1}^k W_i^2 \frac{s_i^2}{n_i} \quad (8)$$

where n_i is number of hauls in the ith stratum and n is the total number of hauls in the survey.

Table 2 shows the areas used in the swept-area method to estimate biomass for the different regions. A stratified semi-random design was used, with depth and main area as stratification

factors. Estimated total biomass by species/group was obtained by summing estimates for each depth stratum.

The swept-area-per-haul (a) is calculated as the product of the distance covered during trawling and the distance between the wings of the trawl. The bottom trawl on “Dr. Fridtjof Nansen” has an estimated headline height of 5 m and a distance between wings during towing of about 18 m. All trawl hauls were monitored by SCANMAR trawl sensors, allowing improved accuracy in determining the actual time the trawl was fishing on the bottom. A more detailed description of the fishing gear is given in Annex IV. For conversion of catch rates to fish densities the area between the wings is assumed to be the effective fishing area. The catchability coefficient q was assumed to be 1. The length of a haul, recorded as distance over the bottom, was measured by GPS.

Table 2. Area (NM^2) used in the swept-area biomass estimates for the different regions.

Depth stratum (m)	Benin	Togo	Ghana	Côte d’Ivoire
0 – 30	387	149	1 412	563
31 – 50	134	78	2 064	701
51 – 100	244	100	2 751	1 619

CHAPTER 3 OCEANOGRAPHIC CONDITIONS

Surface distribution

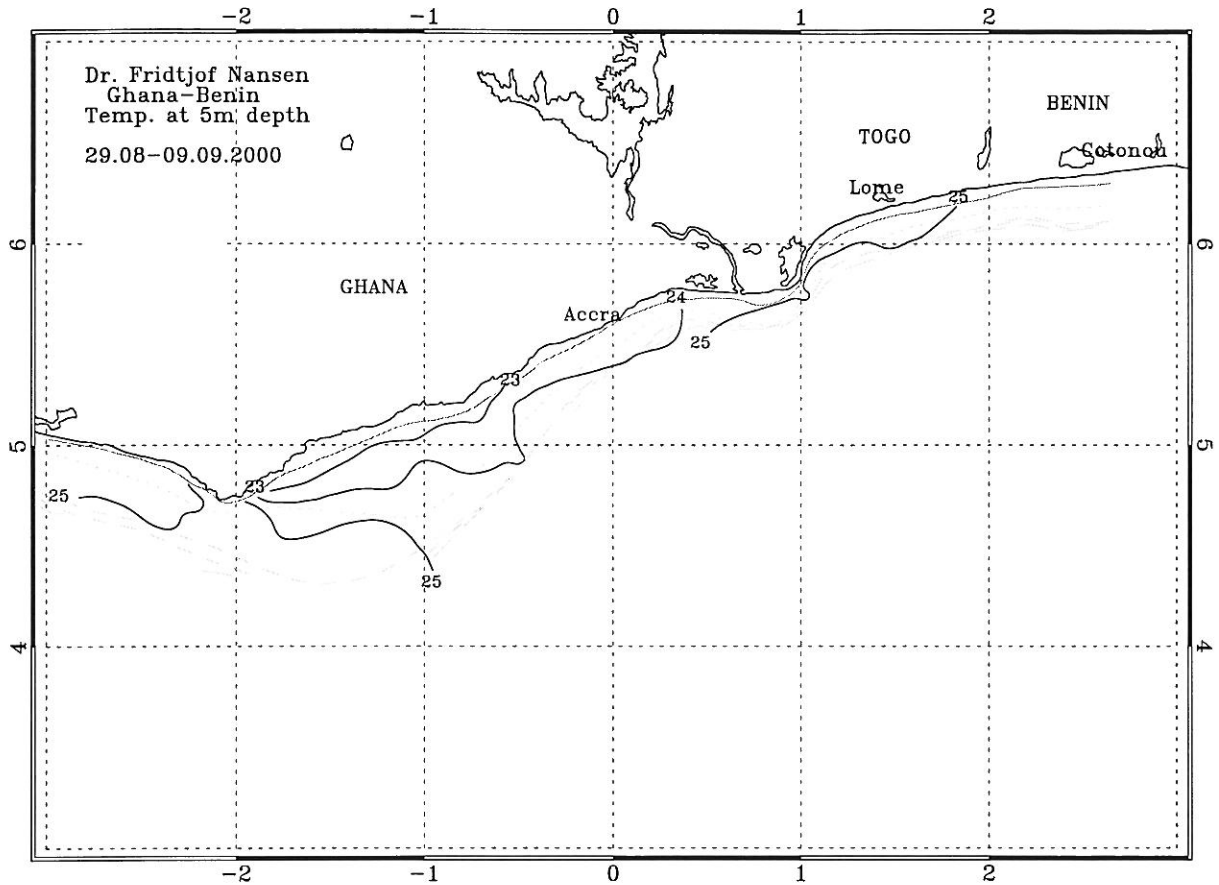
The surface layer temperature was continuously recorded during the cruise. Figures 2a and b show the horizontal distribution of sea surface temperature (SST) for the Benin-Ghana and western Ghana-Côte d'Ivoire areas respectively. The lowest temperature of 19°C was recorded off Grand Bérébi on the western side of Côte d'Ivoire. The surface temperatures showed a progressive increase from west to east of the survey area reaching a value of 25°C off Togo-Benin. In addition, coastal temperatures were lower than in offshore areas. This is expected at this time of the year when a seasonal coastal upwelling occurs in the survey area. This pattern of surface temperature distribution is in agreement with previous observations about the differential intensity of the coastal upwelling along the western Gulf of Guinea coast (Pezennec and Bard, 1992; Koranteng and Pezennec, 1998).

The salinity contours (Figures 3a and b) were difficult to follow having no clear patterns. This may be due to the season of the year which is at the tail end of the major upwelling season. The surface salinity ranged between 34.6‰ and 35.6‰ in the whole survey area and in the Benin-Togo-Ghana area, the coastal salinity was lowest around the Volta River estuary in Ghana.

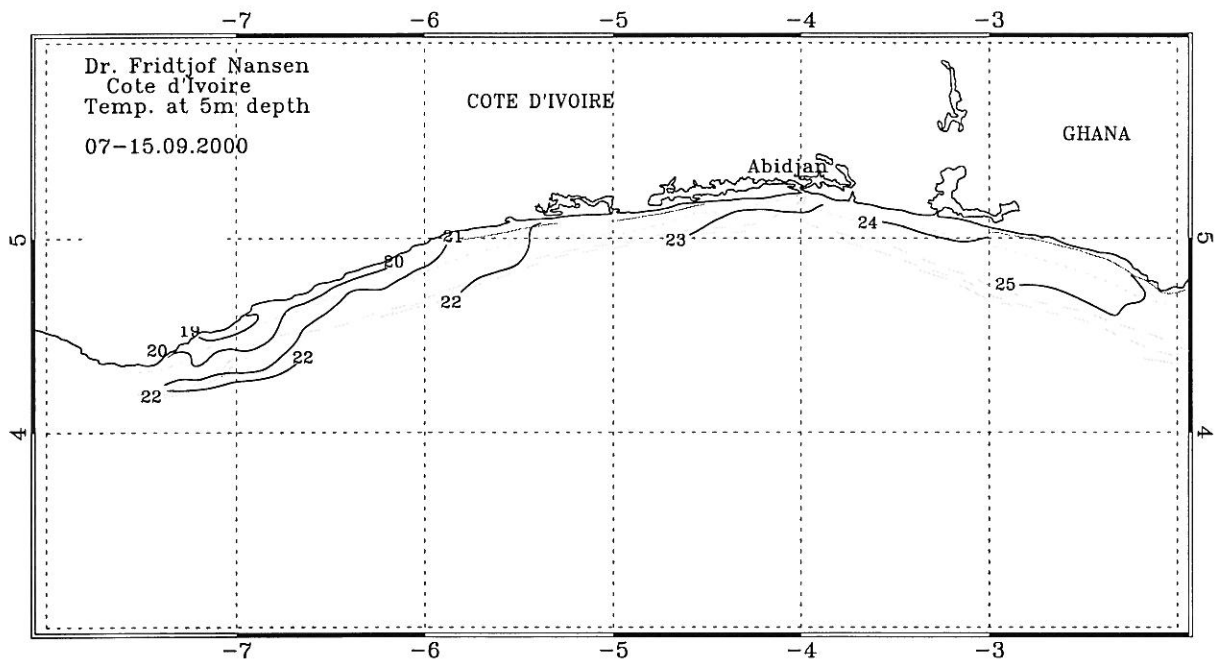
Vertical sections

Figures 4a-e show the vertical distribution of temperature, salinity and dissolved oxygen as recorded on the five hydrographic transects worked during the survey. The top of the thermocline, which is known to be comparatively weak at this time of the year, was found at between 17 and 33 m depth. The thermocline was shallowest off Grand Bérébi.

Surface salinity varied between 34.6‰ off Cape Three Points (Ghana) and 35.4‰ off Grand Jacques and Grand Bérébi (Côte d'Ivoire). Dissolved oxygen values ranged between 2 at the bottom and 5 ml/l at the surface.

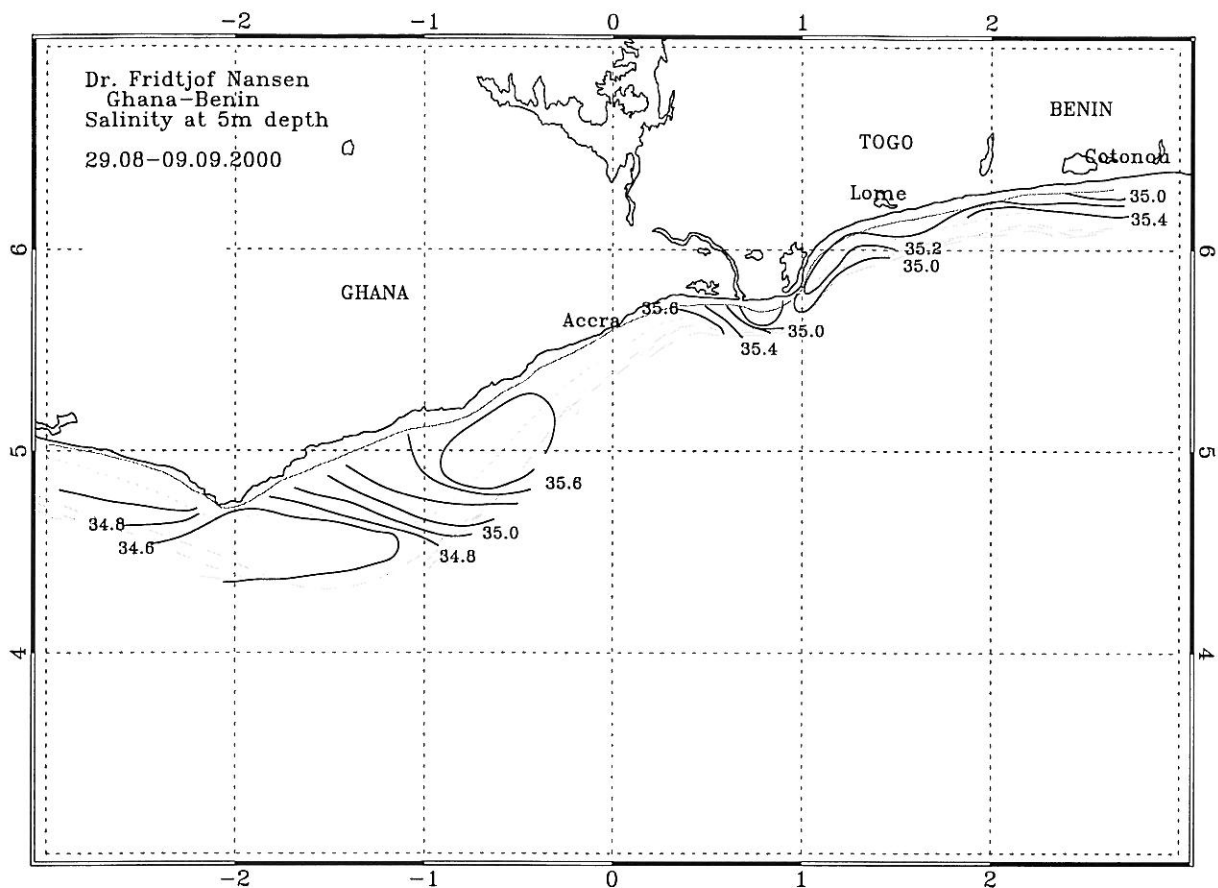


a) Benin-Ghana

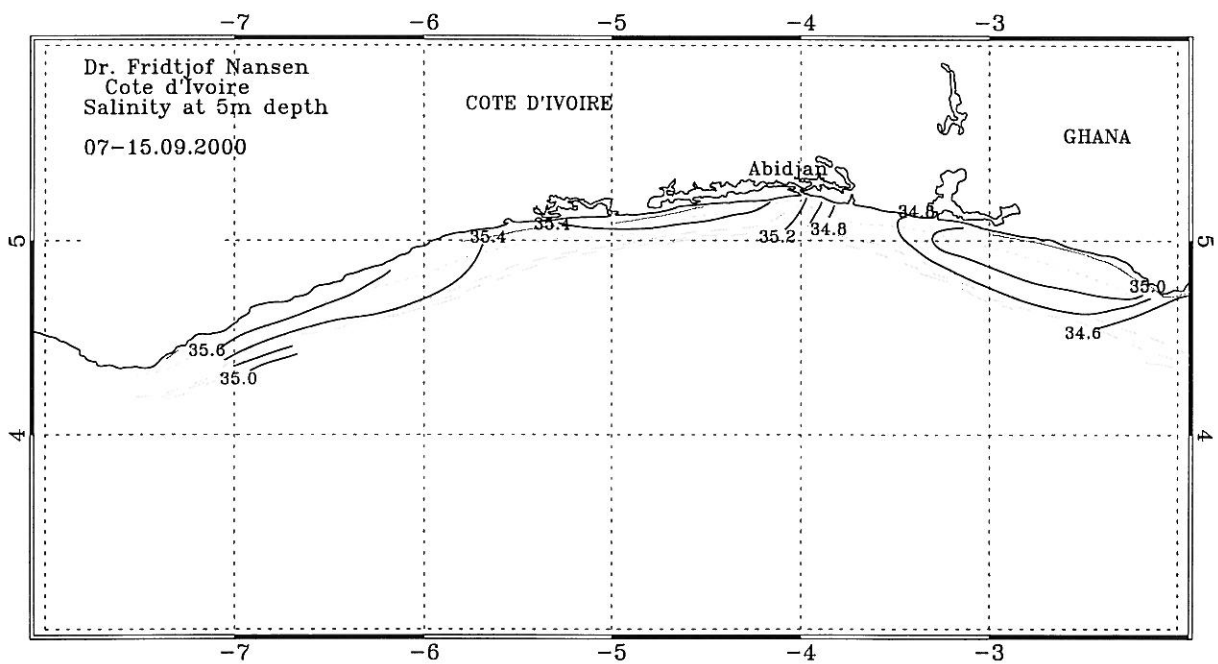


b) Ghana-Côte d'Ivoire

Figure 2. Horizontal distribution of surface temperature (5 m depth) at a) Benin-Ghana and b) Ghana-Côte d'Ivoire. Depth contours as in Fig. 1.

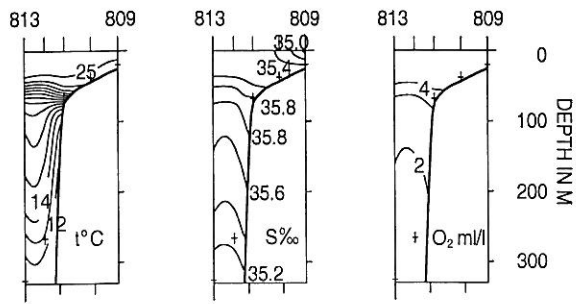


a) Benin-Ghana

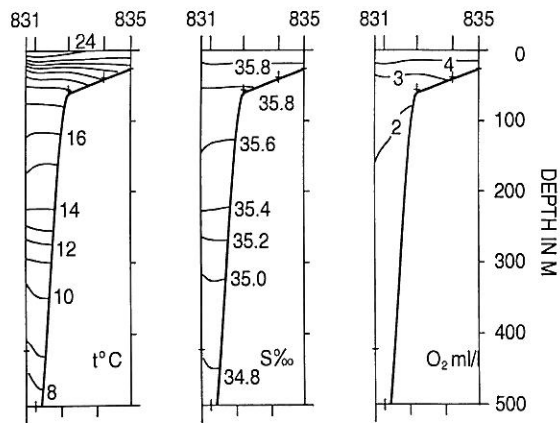


b) Ghana-Côte d'Ivoire

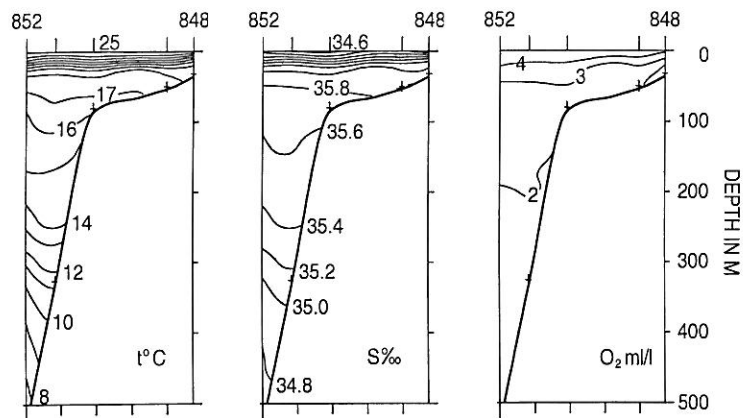
Figure 3. Horizontal distribution of salinity (5 m depth) at a) Benin-Ghana and b) Ghana-Côte d'Ivoire. Depth contours as in Fig. 1.



a) Cotonou – 31.08.2000

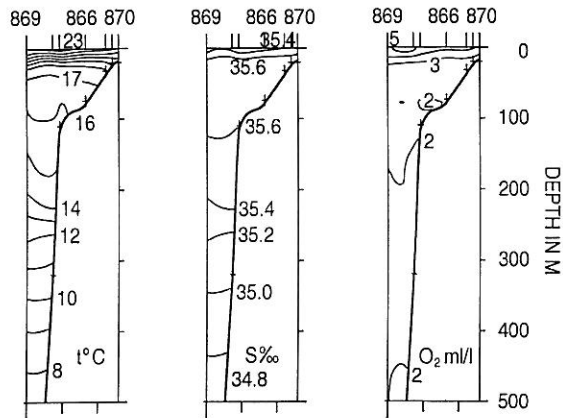


b) Accra – 04.09.2000

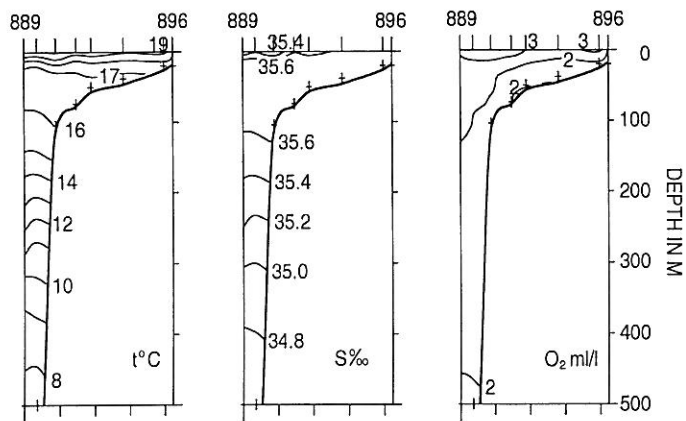


c) Cape Three Points – 07.09.2000

Figure 4. Vertical sections of temperature, salinity and oxygen at a) Cotonou, b) Accra, c) Cape Three Points, d) Grand Jacques and e) Grand-Bérébi.



d) Grand Jacques – 10-11.09.2000



e) Grand Bérébi – 14.09.2000

Figure 4. Continuation

ADCP current measurements

A subset of vectors obtained at 19 m depth is shown in Figure 5. No averaging has been done except the 5 minutes averaging done in real time. Therefore at deep stations lasting more than 10 minutes, several vectors are plotted at the same position, and there is some variability both within and between stations due to variability in time and space.

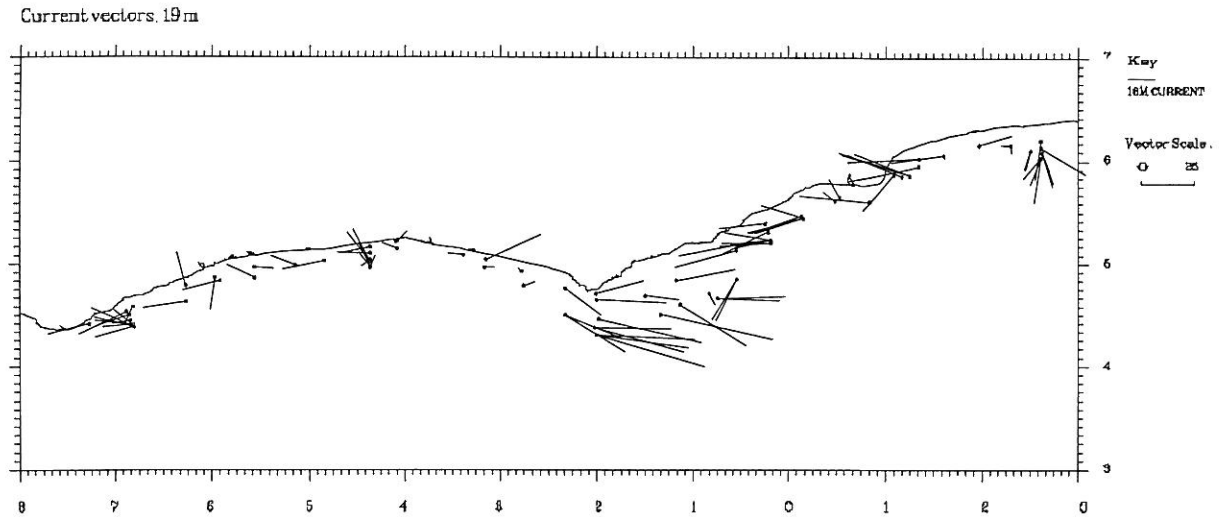


Figure 5. ADCP current at 19 m depth vectors (scale = 50 cm/s) off Benin - Côte d'Ivoire.

The current vectors show a marked and strong current both towards and away from the coastline. The figure portrays some inconsistency in the strength and direction of the current. At 19 m it is clear that the current being measured is the Guinea current although one cannot rule out the possibility of encountering the Guinea Under Current. The strength of the currents around the two large capes in the sub-region, Cape Palmas and Cape Three Points, is also noticeable. The importance of the two capes in the dynamics of water movements in the sub-region have been noted in a number of works (e.g. Marchal and Picaut, 1977).

CHAPTER 4 RESULTS OF THE ACOUSTIC SURVEY: FISH DISTRIBUTION AND ABUNDANCE ESTIMATE OF PELAGIC SPECIES

Figures 6-8 show the distribution of the main groups of pelagic fish, i.e. sardinellas, anchovies and other fish (mainly carangids) defined as category PEL 2, as observed with the acoustic integration system. The acoustic densities (in m^2/NM^2) are illustrated by a scale normally used on acoustic surveys with “Dr. Fridtjof Nansen”.

4.1 Benin

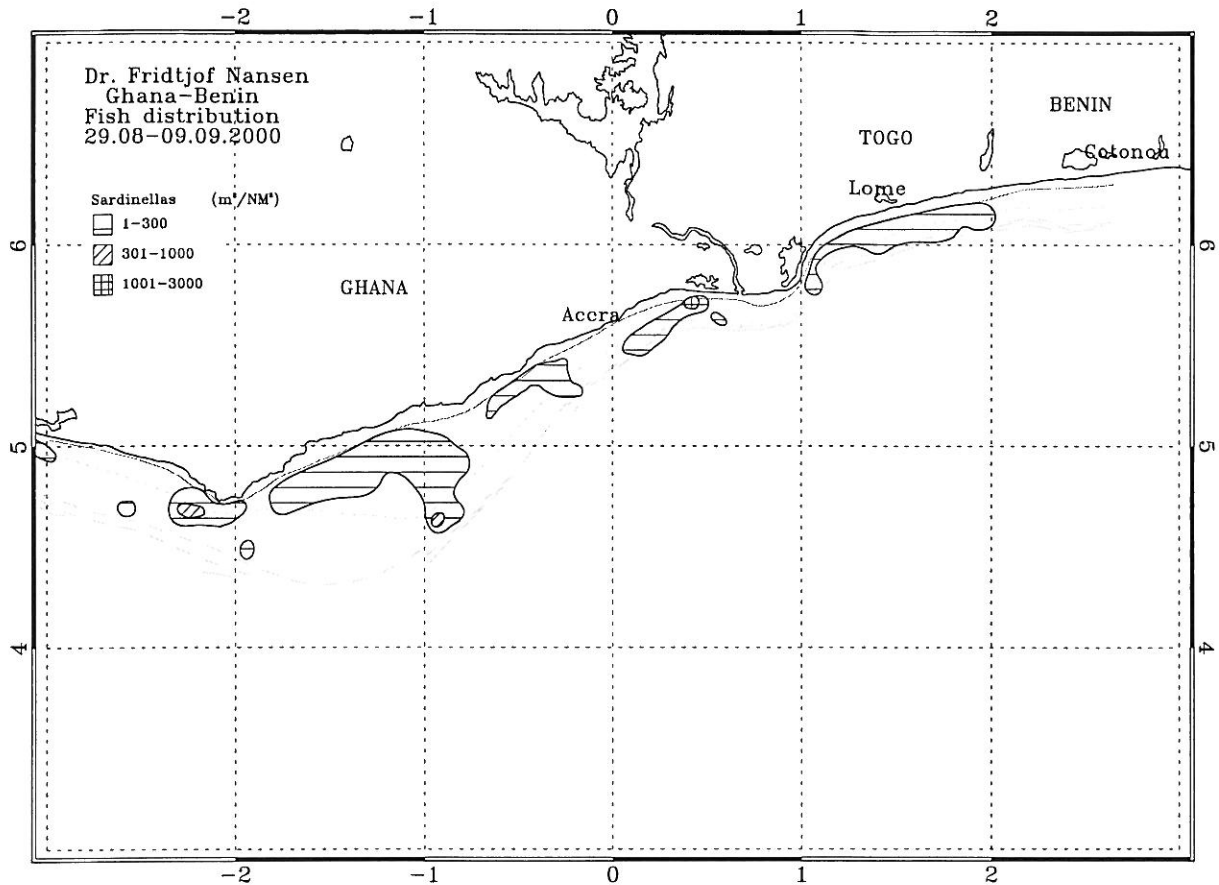
Clupeids

Sardinella aurita and *S. maderensis* were in general caught in small quantities in the bottom trawl hauls in Benin waters. The largest catches were taken in the outer and inner shelf, respectively. *S. aurita* was found both on the inner (fish of sizes 6.5-9.5 cm) and outer (10.0-22.0 cm) shelf while *S. maderensis* (9.5-28.0 cm) was found only on the inner shelf. The acoustic registration of pelagic fish by the echo sounder was scattered. Some low-density fish schools were mainly attributed to anchovies. For the acoustic abundance estimates the pelagic trawl hauls were used for the species composition and length distribution. The biomass of the two sardinella species together was estimated to be about 200 tonnes.

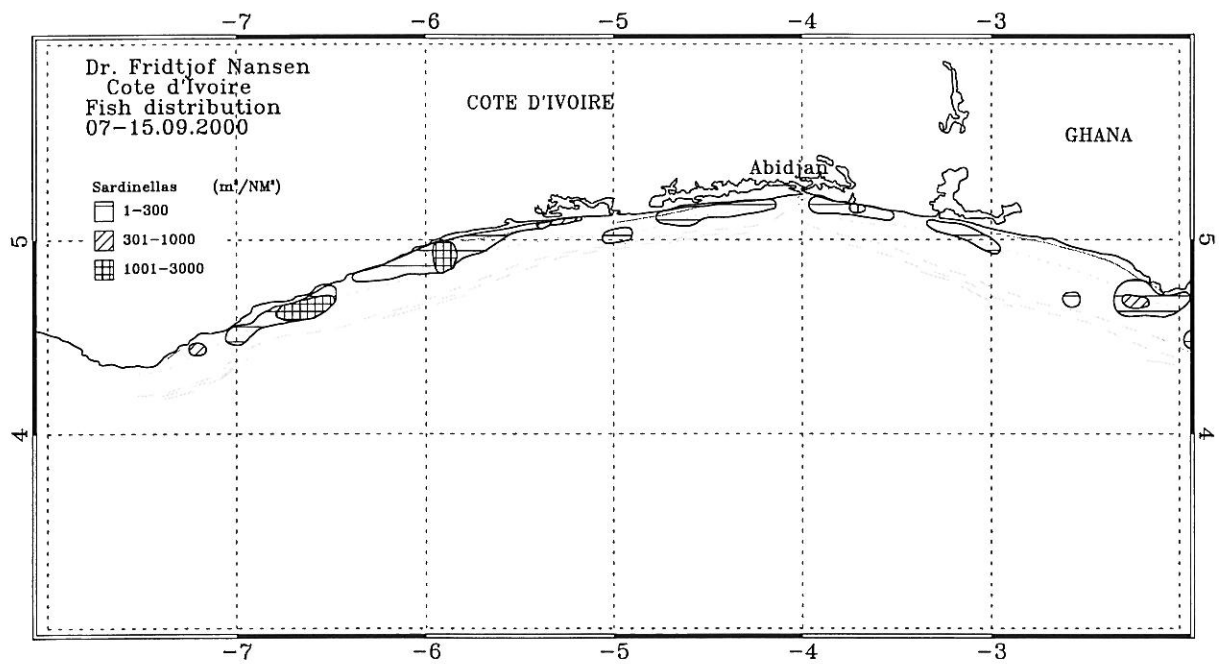
Ilisha africana was caught in two of the bottom-trawl hauls on the inner shelf area in the eastern part of Benin waters; catch rates were 0.6-55.08 kg/h. As only a few specimens of the species were taken in the pelagic haul in the area no s_A -values were attributed to this species and no estimate of abundance was made.

Anchovy

Engraulis encrasicolus was caught in two bottom trawl hauls on the inner shelf, and as the dominant pelagic species in one of the hauls. Schools of *E. encrasicolus* were recorded at low densities on the inner shelf (Fig. 7a). It was the dominant species in the pelagic trawl haul in the area. Only juvenile fish (4.5-8.0 cm TL) were caught. The biomass of anchovy was estimated to be about 1 500 tonnes.

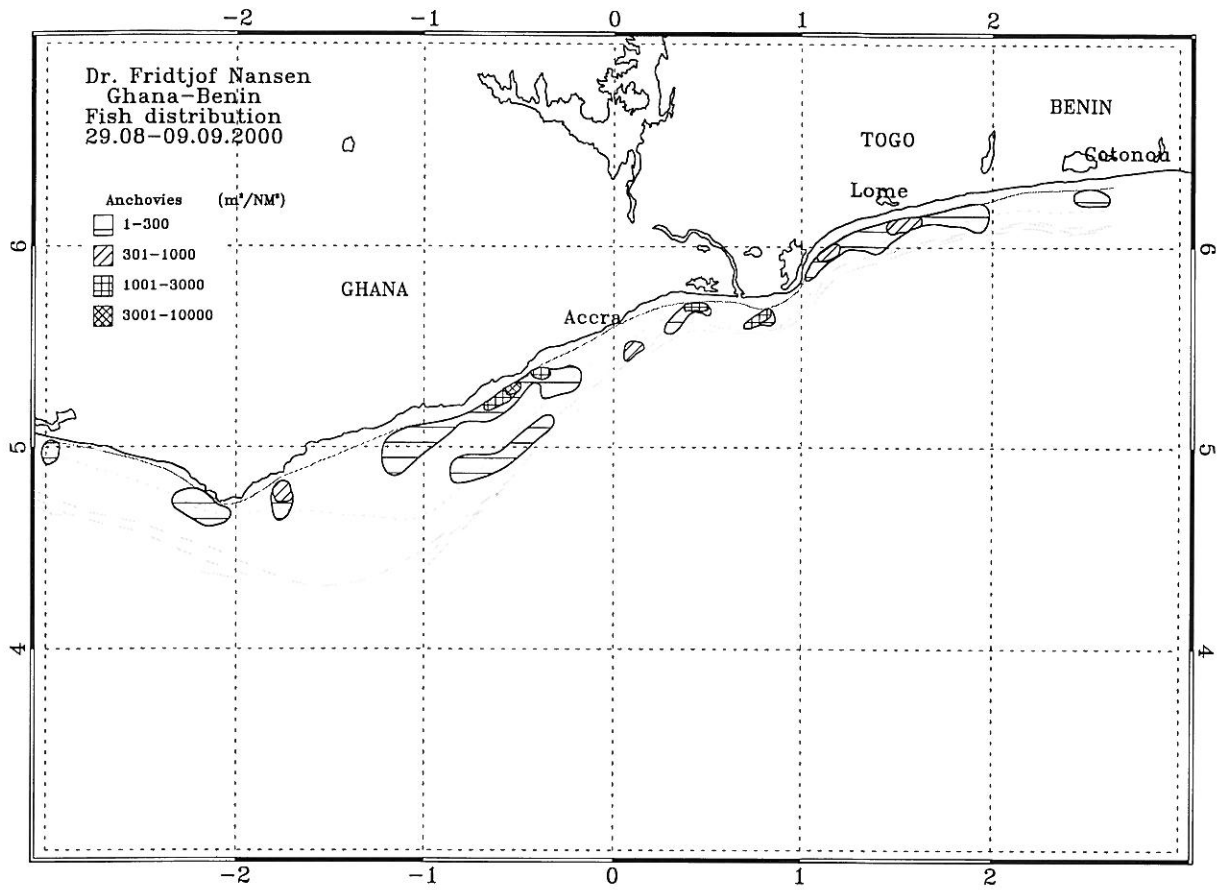


a) Benin-Ghana

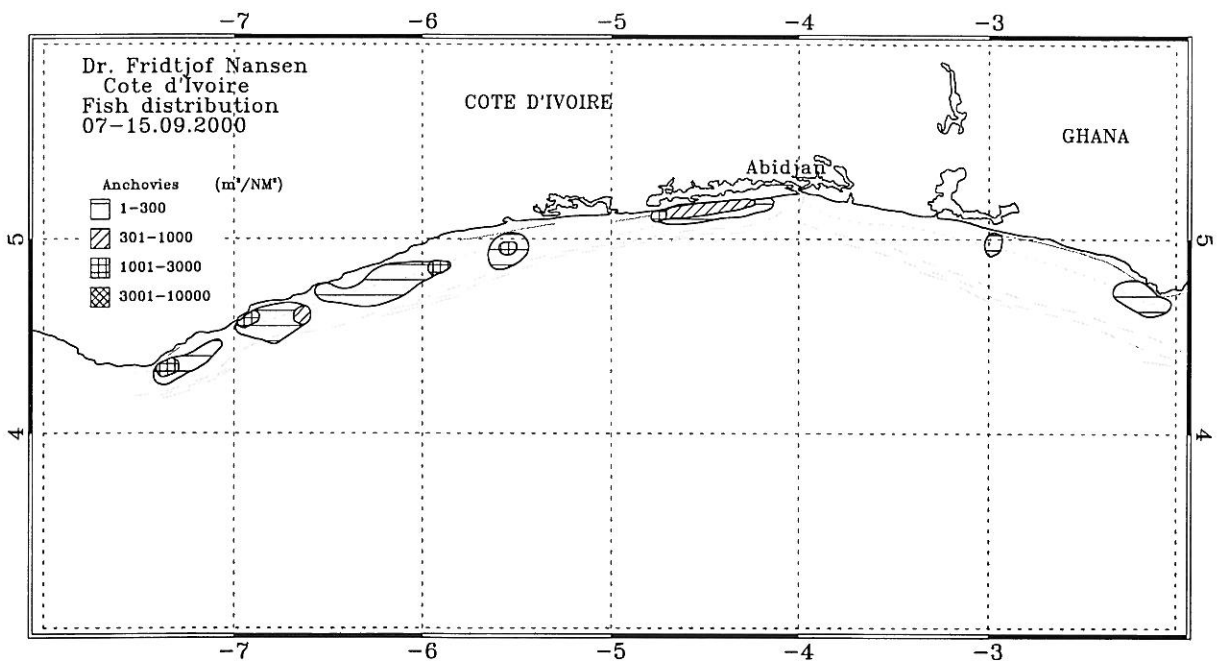


b) Ghana- Côte d'Ivoire

Figure 6. Distribution of *Sardinella* spp. off a) Benin-Ghana and b) Ghana-Côte d'Ivoire. Depth contours as in Fig. 1.

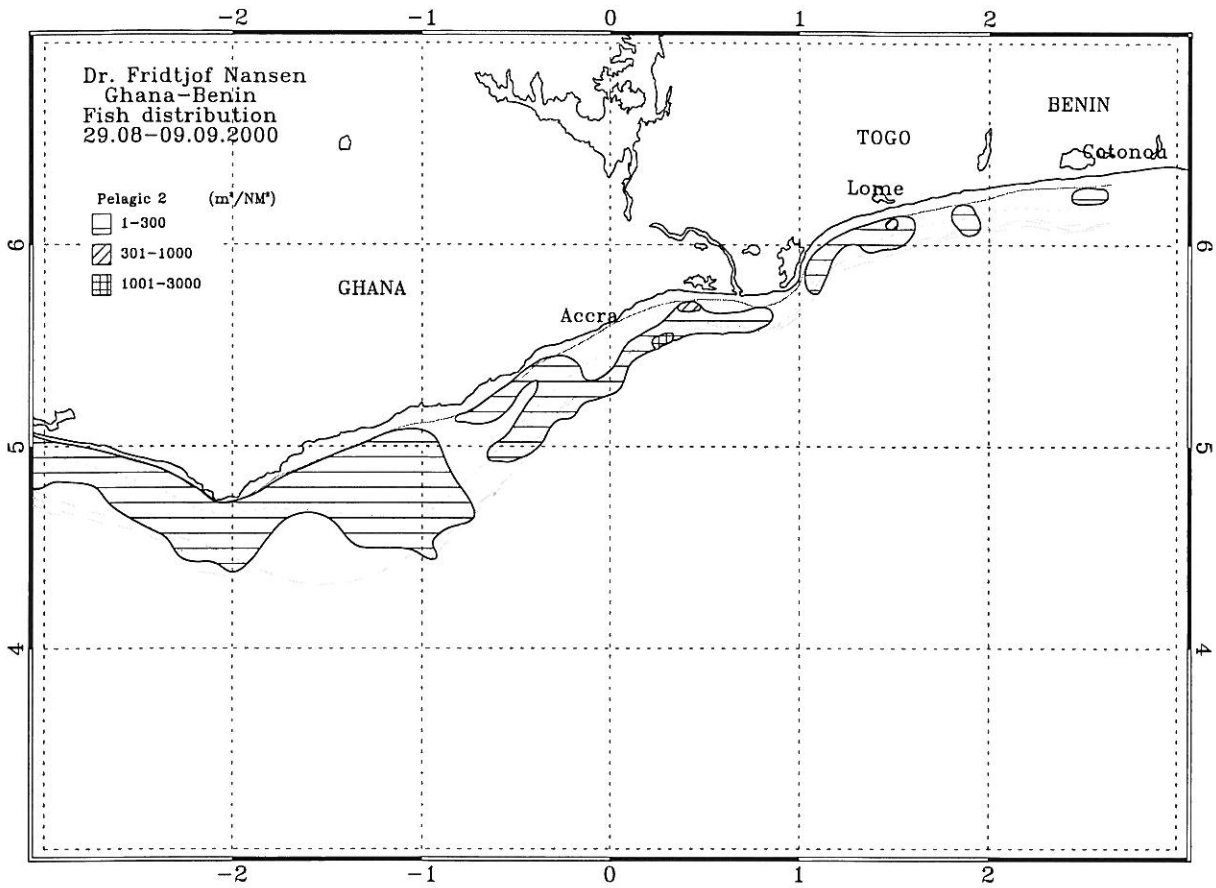


a) Benin-Ghana

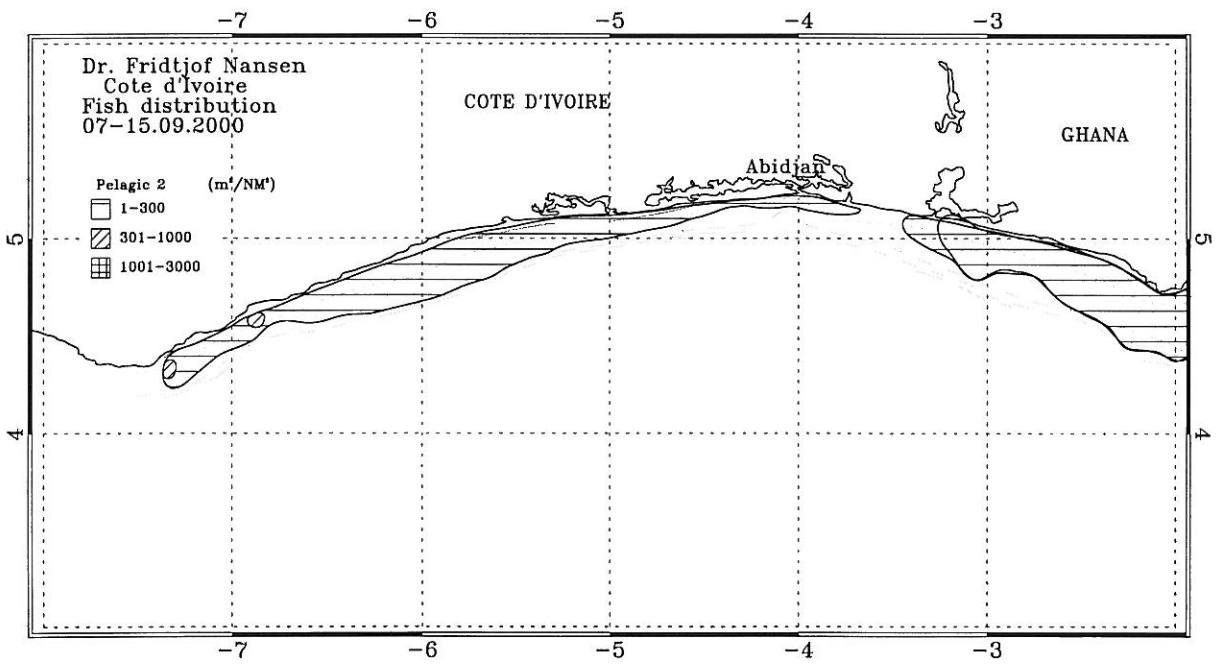


b) Ghana-Côte d'Ivoire

Figure 7. Distribution of anchovy (*Engraulis encrasicolus*) off a) Benin-Ghana and b) Ghana-Côte d'Ivoire. Depth contours as in Fig.1.



a) Benin-Ghana



b) Ghana-Côte d'Ivoire

Figure 8. Distribution of PEL 2 (Carangids, scombrids, barracudas and hairtail) off a) Benin-Ghana and b) Ghana-Côte d'Ivoire. Depth contours as in Fig.1.

PEL 2 (carangids, scombrids, barracudas and hairtail)

This group consisted mainly of carangids with *Chloroscombrus chrysurus*, *Selene dorsalis* and *Alectis alexandrinus* as the most abundant species in the bottom-trawl hauls. While *C. chrysurus* was caught at the inner shelf, *S. dorsalis* and *A. alexandrinus* were caught at both the inner and outer parts of the shelf. The carangids *Decapterus macarellus* and *Trachurus trecae* were caught at few stations. Few specimens of the scombrids *Scomberomorus tritor* were caught in the bottom trawls. Barracudas, *Sphyræna guachancho*, *S. sphyraena* and *S. afra*, were distributed at the inner shelf area, none were caught at the outer shelf. The hairtail *Trichiurus lepturus* was caught at three of the inner shelf stations and one at the outer shelf. Few scattered schools, all of low density, were attributed to this group. The distribution of PEL 2 as allocated from the acoustic data is shown in Fig. 8a. In the pelagic hauls *Decapterus rhonchus* was the dominant carangids at the outer shelf and *C. chrysurus* at the inner shelf. Few *Scomber japonicus* was caught in the pelagic haul at the outer shelf. Based on a pooled length distribution of *C. chrysurus* (10-20 cm TL), *D. rhonchus* (20-25 cm TL) and *T. trecae* (16-20 cm TL), the biomass of this group was estimated to be 1 500 tonnes.

4.2 Togo

Clupeids

Sardinella aurita and *S. maderensis* were caught in small quantities in the bottom trawl; *S. maderensis* in the shallower area while *S. aurita* was caught both at the inner and the outer shelf. Distribution of sardinella from acoustic registration is presented in Fig. 8a. Both species were taken in pelagic hauls in the inner shelf area, *S. aurita* 6-24 cm TL and *S. maderensis* 6-30 cm TL, with a dominance of juvenile fish. Based on a combined length distribution the total biomass was estimated to be 4 000 tonnes.

Anchovy

Engraulis encrasicolus was caught in one bottom-trawl haul and one pelagic trawl haul, both in shallow waters (20-30 m). In both hauls anchovy was the dominant species. It was recorded in small schools and scattered layers at the inner and outer shelf areas. The total biomass in the area was estimated to be about 2 500 tonnes.

Ilisha africana was not caught in Togo.

PEL 2 (carangids, scombrids, barracudas and hairtail)

Carangids and associated species were found over the entire shelf. The species composition in the trawl hauls in this area is seen in Annex 1. Catches of this group consisted mainly of

carangids. *Alectis alexandrinus* and *Selene dorsalis* were the dominant species at the inner shelf area and *Trachurus trecae* at the outer shelf. Scombrids (*Scomberomorus tritor*) were caught at one station at the inner and one at the outer shelf. No hairtails were caught in this or the outer shelf. Barracuda (*Sphyraena guachancho*) was caught in low numbers in two hauls at the inner shelf. Only scattered layers and small, little dense schools were recorded by the acoustic registration. Based on a pooled length distribution of *Chloroscombrus chrysurus* (20-25 cm TL) and *T. trecae* (16-20 cm TL), the biomass of this group was estimated to be 2 500 tonnes.

4.3 Ghana

Clupeids

Sardinellas were caught at most of the stations, with *Sardinella aurita* as the dominant species. This specie was found over the entire shelf area and *S. maderensis* on the inner shelf. Several small and some larger schools of medium density were allocated to sardinella (Fig. 6a, b). The highest concentrations were recorded east of Accra, where the main species was *S. aurita*, both juvenile of about 8-9 cm TL and adults of about 20 cm TL. The total biomass of sardinellas was estimated to be about 32 500 tonnes.

Ilisha africana was caught in one bottom trawl haul in shallow waters (30-50 m) but as no S_A -values were attributed to this species no estimate of abundance was made.

Anchovy

Some small schools of *Engraulis encrasicolus* were recorded but anchovies were mostly observed in mixed scattered layers in the inner shelf area. Dense concentrations were registered around Accra (Fig. 7a). Large catches of anchovy (140 kg/h-1 350 kg/h) were taken in the pelagic trawl haul east of Cape St. Paul, off Accra and east of Cape Three Points. Anchovy was taken at seven out of thirty-nine bottom trawl stations along the inner shelf. The biomass of anchovy was estimated to be about 24 000 tonnes.

PEL 2 (carangids, scombrids, barracudas and hairtail)

As in Benin and Togo waters this group consisted mainly of carangids. *Trachurus trecae* was the most abundant in the bottom trawl catches in the inner shelf area. *Chloroscombrus chrysurus*, *Selene dorsalis* and *Decapterus punctatus* were the other common species in the bottom trawl hauls at the shallow part of the shelf. In the outer part of the shelf, *T. trecae* was the carangid caught in the bottom trawl. The catch rates of *T. trecae* were high with a mean of 280 kg/h. Most of the carangids were juveniles (10-16 cm). *Scomber japonicus* was the most common scombrid in the bottom-trawl hauls, while *Scomberomorus tritor* was caught at three stations, two pelagic trawl hauls during night time and one bottom-trawl haul. The

barracudas, *Sphyraena guachancho* and *S. sphyraena*, were found in about half of the bottom-trawl hauls, all at the inner shelf. The hairtail *Trichiurus lepturus* was caught at a few stations, in both bottom-trawl and pelagic hauls. Small schools of PEL 2 species were detected on most of the shelf, both on the inner and outer shelf (Fig. 8a, b). The schools were mainly of low-medium density. The biomass of PEL 2 was estimated to be approximately 61 000 tonnes, applying an over-all average length of 15 cm (pooled length distributions).

4.4 Côte d'Ivoire

Clupeids

Sardinellas were recorded along the whole coast of Côte d'Ivoire, with highest concentrations in shallow waters in the western part of the area (Fig. 6b). Both *Sardinella aurita* and *S. maderensis* occurred frequently in the bottom-trawl catches, and were also caught in the pelagic-trawl hauls. *S. maderensis* was more abundant and dominated the inner shelf, while both species were found in low-medium densities on the outer shelf. Most of the sardinellas found on the shelf off Côte d'Ivoire were small size (Fig. 9), and the total biomass was estimated to be about 84 000 tonnes.

Ilisha africana was frequently taken in bottom and pelagic trawl hauls on the shallow area of the shelf but no s_A -values were allocated to this species.

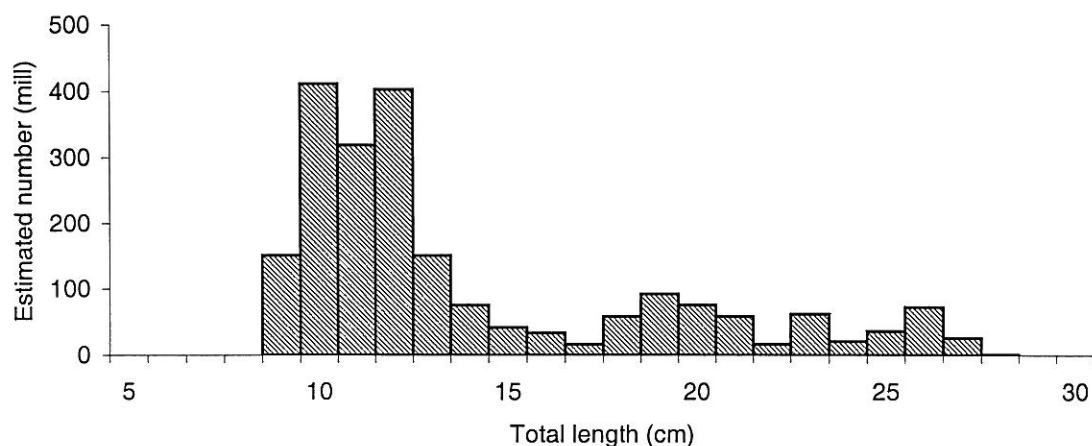


Figure 9. Length distribution of *Sardinella* spp. in Côte d'Ivoire, estimated acoustically.

Anchovy

Several schools of *Engraulis encrasicolus* (5-10 cm TL) were recorded in shallow. The main concentrations were found in the western area, west of Abidjan (Fig. 7b). Anchovy was

caught at several of the bottom-trawl stations on the inner shelf (see Annex I). Using pooled length distribution the biomass of anchovy was estimated to be 27 000 tonnes.

PEL 2 (carangids, scombrids, barracudas and hairtail)

Like in Benin, Togo and Ghana the species category PEL 2 consisted mostly of carangids, *Trachurus trecae* was the overall dominant species both at the inner and outer shelf. Other carangids such as *Chloroscombrus chrysurus*, *Alectis alexandrinus* and *Selene dorsalis* also occurred but at lower densities. *Sphyraena guachancho* was the barracuda found but in general low densities. The scombrids, *Scomberomorus tritor* and *Scomber japonicus*, occurred frequently and at low catch rates. Next to the carangids, hairtail was the most abundant species in bottom trawl hauls in the area. *Trichiurus lepturus* was found at about 70% of the bottom-trawl stations with the highest mean catch rate at the outer shelf.

Schools of PEL 2 species were found on most of the shelf, both on the inner and outer shelf. The schools were of medium to high densities; the highest densities found in the shallow area (Fig. 8a). Applying an over-all average length of 14 cm (pooled length distributions, weighted by the catch, for carangids, scombrids, barracudas and hairtails), the biomass of PEL 2 was estimated to be 18 000 tonnes.

4.5 Review of results

Estimated biomasses of PEL 1 species (sardinellas and anchovies) and PEL 2 species (carangids, scombrids, barracudas and hairtails) based on the Dr. Fridtjof Nansen surveys in 1981 (Strømme 1984), 1989 (Anon. 1989), 1999 (Mehl et al. 2000) and 2000 (this survey), are presented in Table 3. Benin and Togo sectors have in earlier years been covered as one area, due to the narrow coastline of Togo. During the present survey the design was made to have two transects in Togo and three in Benin. With few stations and relatively small areas covered by acoustic registrations, one high value might thus have a great effect on the results.

As shown during the previous surveys, in 1981, 1989 and 1999, pelagic fishes were present over large parts of the area, especially the central and western parts. In the central and eastern areas few schools of low densities were registered as the fish occurred mainly in dispersed distribution. All pelagic hauls were taken as blind hauls as little pelagic fish were seen on the echo sounder. The recorded catch rates show that during night-time the fish were distributed near the surface. Sardinellas and anchovy dominated on the inner shelf, while carangids, scombrids and barracudas were more widely distributed over the entire shelf. Important fishing areas (very shallow waters) for clupeids at this time of the year (up-welling season) were not covered as specified in the objectives. High density of artesian fishing vessels and

gears in these shallow areas, made them nearly inaccessible for the survey in the shallower areas as off Tema-Accra, near Cape Three Points and east of Abidjan.

The biomasses estimated for the sardinella-anchovies group were much higher than the 1999-estimates. This was mainly seen in the biomass estimated for the western part of Côte d'Ivoire, an increase that may be an effect of a stronger residual upwelling in this area. In Ghana the biomass of these combined species was almost the same as last year. The biomass of PEL 2 was at the same order as in 1999.

Table 3. Acoustic biomass estimates of main pelagic groups (tonnes) a) Sardinellas and anchovies (PEL 1) and b) carangids, scombrids, barracudas and hairtail (PEL 2) from surveys with "Dr. Fridtjof Nansen" off Côte d'Ivoire, Ghana, and Benin-Togo in June 1981, October 1989, April/May 1999 and the August/September 2000 survey. Note that Benin-Togo was not covered in 1989.

a) Sardinellas and anchovies (PEL 1)

Survey Year	Survey period	Côte d'Ivoire	Ghana	Benin-Togo	Benin	Togo	Total
1981	June	39 000	40 000	*			79 000
1989	12 - 20.10	6 000	41 000	not covered			47 000
1999	19.4 - 8.5	42 000	40 000	5 000			87 000
2000	29.8 - 15. 9	111 000	56 500		1 700	6 500	175 700

b) Carangids, scombrids, barracudas and hairtail (PEL 2)

Survey Year	Survey period	Côte d'Ivoire	Ghana	Benin - Togo	Benin	Togo	Total
1981	June	2 000	10 000	*			12 000
1989	12 - 20.10	33 000	57 000	not covered			90 000
1999	19.4 - 8.5	30 000	50 000	4 000			84 000
2000	29.8 - 15. 9	18 000	61 000		1 500	2 500	83 000

* The estimated biomass for pelagic species (PEL 1 + PEL 2) was 14 000 tonnes (Strømme, T., Føyn, L. and Sætersdal, G. 1983).

CHAPTER 5 RESULTS FROM THE TRAWL SURVEY: CATCH DISTRIBUTION, COMPOSITION AND SWEEP- AREA BIOMASS ESTIMATES OF DEMERSAL FISH

The composition of the fish fauna on the continental shelf and slope of the western Gulf of Guinea changes with depth (Williams 1968). The catch-distribution analyses were therefore performed for two depth strata on the shelf, 0-50 m (inner shelf) and 51-100 m (outer shelf). In the analyses the “Demersal” group includes commercially important families as Sciaenidae, Haemulidae (=Pomadasyidae), Serranidae, Sparidae and Lutjanidae, while the “Pelagic” group includes Engraulidae, Clupeidae, Carangidae, Scombridae, Sphyraenidae and Trichiuridae (the latter family is actually mainly benthopelagic). For the different 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. 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.

In the swept-area biomass estimates, only the shelf area down to depths of 100 m was included, divided into 0-30 m, 31-50 m and 51-100 m. Mean densities of the main demersal species by depth strata, occurrence and catch distributions are shown in Annex IV.

5.1 Benin

Nine swept-area trawl stations were made on the shelf off Benin. One additional haul was taken at 113-125 m depth. Due to a steep slope and rough bottom it was difficult to trawl in the deeper areas. Tables 4a and 4b show catch rates by main groups for the inner shelf (0-50 m) and outer shelf (51-100 m) respectively.

Pelagic fish dominated on the inner shelf with a relative contribution of 50%. The demersal group was the second most important, contributing 26% to the catches, followed by the “other” group (15%). Shrimps and cephalopods had low average catch rates and sharks were only caught at one station. On the outer shelf the demersal group was the most important with 48% of the average catch rate. The pelagic group made up 36% of the catches, “other” fish 11% and cephalopods 5%. On the outer shelf sharks were caught at all stations, but with low catch rates. *Sepia officinalis hierredda* was the dominant cephalopod. The catch of shrimps was negligible in this zone.

Table 4. Benin. Catch rates (kg/h) by main groups in swept-area bottom trawl hauls on a) inner shelf, 0-50 m, and b) outer shelf, 51-100 m. SE = standard error.

a) Inner shelf, 0-50 m

STAT	Depth	Demersal	Pelagic	Shrimp	Cephalopods	Sharks	Other	Total
116	46	11.6	14.2	0.0	8.7	0.0	7.0	41.4
117	26	2.8	18.0	0.0	10.3	0.0	21.1	52.3
118	24	13.7	181.9	0.1	0.0	0.0	33.1	228.9
119	44	127.6	14.6	16.0	10.6	0.0	26.4	195.2
123	28	32.0	78.1	0.0	0.0	0.0	15.3	125.5
124	48	11.2	79.5	0.6	6.0	14.1	9.4	120.8
Mean	36	33.1	64.4	2.8	5.9	2.3	18.7	127.3
SE		19.3	26.7	2.6	2.0	2.4	4.1	30.5
% Catch		26.0	50.6	2.2	4.7	1.8	14.7	

b) Outer shelf, 51-100 m

STAT	Depth	Demersal	Pelagic	Shrimp	Cephalopod	Sharks	Other	Total
115	57	38.8	3.2	0.0	29.0	11.5	20.6	103.1
120	64	46.2	1.8	0.5	20.7	1.9	43.3	114.4
125	81	780.4	632.5	0.0	33.1	1.1	125.0	1 572.0
Mean	67	288.5	212.5	0.2	27.6	4.8	63.0	596.5
SE		246.0	210.0	0.2	3.7	3.3	31.7	487.8
% Catch		48.4	35.6	0.0	4.6	0.8	10.6	

Catch rates of the most important pelagic families, caught by bottom trawl in the swept-area survey, are presented in Tables 5a and b. The clupeids and the carangids were the dominant species groups on both the inner and outer shelf. On the inner shelf the clupeids had the highest catch rates whereas the carangids had the highest catch rates on the outer shelf. The catch rates of both species groups were higher on the outer shelf as compared to the inner shelf. Of the carangids *Selene dorsalis*, *Alectis alexandrinus* and *Chloroscombrus chrysurus* occurred most frequently. *Sardinella aurita* and *Ilisha africana* were the two most frequently occurring clupeids. Barracudas (Sphyraenidae) were the third most important group on the inner shelf with a catch rate of around 7 kg/h. The average catch rates of Hairtails were low on the whole shelf, although higher on the inner than the outer shelf. Some scombrids were found on the inner shelf, whereas scombrids and barracudas were absent on the outer shelf.

Table 5. Benin. Catch rates (kg/h) by main pelagic families in swept-area bottom-trawl hauls on the a) Inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

STAT	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
116	46	0.6	8.6	1.7	0.0	3.3	27.2	41.4
117	26	1.6	11.2	3.5	0.0	1.8	34.3	52.3
118	24	121.2	44.6	0.0	0.0	16.1	46.9	228.9
119	44	0.0	8.9	0.0	4.1	1.6	180.5	195.2
123	28	64.2	9.9	0.0	3.2	0.8	47.3	125.5
124	48	2.8	54.5	0.0	3.9	18.4	41.3	120.8
Mean	36	31.7	22.9	0.9	1.9	7.0	62.9	127.4
SE		20.7	8.5	0.6	0.8	3.3	23.7	30.5
% Catch		24.9	18.0	0.7	1.5	5.5	49.4	

b) Outer shelf, 51-100 m

STAT	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
115	57	1.0	2.2	0.0	0.0	0.0	99.9	103.1
120	64	0.0	0.5	0.0	1.4	0.0	112.5	114.4
125	81	195.5	437.0	0.0	0.0	0.0	940.0	1 572.5
Mean	67	65.5	146.6	0.0	0.5	0.0	384.1	596.7
SE		65.0	145.2	0.0	0.5	0.0	278.0	487.9
% Catch		11.0	24.6	0.0	0.1	0.0	64.4	

Tables 6a and b show catch rates of the most commercially important demersal species on the shelf down to depths of 100 m, grouped as seabreams (*Sparidae* except *Boops boops*), snappers (*Lutjanidae*), groupers (*Serranidae*), grunts (*Haemulidae* except *Brachydeuterus auritus*) and croakers (*Sciaenidae*). All groups had low catch rates on the inner shelf. The catch rates of grunts, seabreams and croakers were all in the range 3.5-5 kg/h. Seabreams were more abundant on the outer shelf, where they dominated with an average catch rate of 82 kg/h or 14% of the total average catch rate. The most commonly occurring species were *Pagrus caeruleostictus* and *Pagellus bellottii*.

Table 6. Benin. Catch rates (kg/h) of commercially important demersal species grouped by families in swept-area bottom-trawl hauls on the a) inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

STAT	Depth	Seabream	Snappers	Groupers	Grunts	Croakers	Other	Total
116	46	7.9	0.0	0.0	1.8	0.0	31.8	41.4
117	26	2.8	0.0	0.0	0.0	0.0	49.5	52.3
118	24	3.9	0.0	0.0	0.0	3.3	221.6	228.9
119	44	3.5	2.8	0.0	21.4	0.0	167.5	195.2
123	28	5.5	0.5	0.0	7.9	16.9	94.7	125.5
124	48	0.5	0.0	0.0	0.0	0.6	119.8	120.8
Mean	36	4.0	0.6	0.0	5.2	3.5	114.1	127.4
SE		1.0	0.5	0.0	3.5	2.7	29.3	30.5
% Catch		3.2	0.4	0.0	4.1	2.7	89.6	

b) Outer shelf, 51-100 m

STAT	Depth	Seabream	Snappers	Groupers	Grunts	Croakers	Other	Total
115	57	13.1	8.5	17.2	0.0	0.0	64.4	103.1
120	64	40.1	0.0	0.0	0.0	4.7	69.6	114.4
125	81	191.4	0.0	3.4	0.0	0.0	1 377.0	1 571.9
Mean	67	81.5	2.8	6.9	0.0	1.6	503.7	596.4
SE		55.5	2.8	5.2	0.0	1.6	436.7	487.7
% Catch		13.7	0.5	1.2	0.0	0.3	84.4	

Annex IV gives the swept-area estimates of mean densities (t/NM^2) based on the 9 random bottom trawl stations for demersal species on the shelf of Benin. *Pseudotolithus senegalensis* and *Galeoides decadactylus* had the highest mean density in the shallowest zone (≤ 30 m), *B. auritus* in the 30-50 m zone, while *Dentex congoensis* had the highest density in the 51-100 m zone. *D. congoensis*, *Sepia officinalis hierredda* and *B. auritus* had the highest overall mean densities.

Table 7 presents swept-area biomass estimates for valuable demersal groups and other groups that occurred in sizeable quantities. Estimated total biomass of valuable demersal groups was about 900 tonnes. Seabreams had the highest biomass followed by croakers. The highest biomass of seabreams was found between 51-100 m depth and that of croakers between 31-50 m. Croakers, grunts, groupers and snappers all had low biomass estimates. Of the pelagic and semi-pelagic groups, carangids had the highest estimated biomass.

Table 7. Benin. Biomass estimates (tonnes) of important species/groups of fish on the shelf, by depth.

Group/species	0-30 m	31-50 m	51-100m	Sum	95% confidence limits	
Seabreams ¹	43	16	642	700	0	1 574
Grunts ¹	27	39	0	66	0	154
Croakers	70	1	12	83	0	193
Groupers	0	0	59	59	0	148
Snappers	4	5	24	34	0	84
Sum dem.val.¹	143	62	737	942	0	1 776
Bigeye grunt ¹	27	190	5	222	0	524
Carangids	232	99	1 159	1 490	0	3 803
Barracudas	70	32	0	102	0	221

¹ Corrected

5.2 Togo

Six swept-area trawl stations were made on the shelf off Togo. One deep-water bottom trawl was taken at 287-299 m. Tables 8a and 8b present catch rates by main groups for the inner and outer shelf. On the inner shelf the pelagic and demersal groups made about the same part of the total average catch, 23% and 28%, respectively. The group “other” species had somewhat higher average catch with a relative contribution of 38%. The mean catch of Cephalopods made up 11% of the total catch at the inner shelf. *Sepia officinalis hierredda* was the dominant species, with the highest density in 0-30 m depth. No shrimps or sharks were caught. On the outer shelf demersal fish made up 65%, pelagic 18%, sharks, cephalopods and “other” each made up of less than 10% of the totals and no shrimps were caught in this zone either.

Table 8. Togo. Catch rates (kg/h) by main groups in swept-area bottom trawl hauls on a) inner shelf, 0-50 m, and b) outer shelf, 51-100 m.

a) Inner shelf, 0-50 m

STAT	Depth	Demersal	Pelagic	Shrimp	Cephalopods	Sharks	Other	Total
129	24	5.6	120.4	0.0	19.8	0.0	5.5	151.3
131	48	120.3	71.2	0.0	7.7	0.0	12.6	211.8
134	46	98.7	16.2	0.0	35.8	0.0	29.3	180.0
135	27	66.7	23.2	0.0	48.4	0.0	341.6	479.9
Mean	36	72.8	57.8	0.0	27.9	0.0	97.3	255.8
SE		25.0	24.2	0.0	8.9	0.0	81.6	75.7
% Catch		28.5	22.6	0.0	10.9	0.0	38.0	

b) Outer shelf, 51-100 m

STAT	Depth	Demersal	Pelagic	Shrimp	Cephalopods	Sharks	Other	Total
132	72	20.0	103.1	0.0	21.4	26.5	5.4	176.4
133	88	387.6	9.2	0.0	3.4	19.2	27.5	446.9
Mean	80	203.8	56.2	0.0	12.4	22.8	16.4	311.6
SE		183.8	46.9	0.0	9.0	3.6	11.1	135.3
% Catch		65.4	18.0	0.0	4.0	7.3	5.3	

Catch rates of the most important pelagic families, caught by bottom trawl in the swept-area survey, are presented in Tables 9a and b. In both inner and outer parts of the shelf, families other than those listed in the tables made up large portions of the catch, being 77.4% on the inner shelf and 82% on the outer.

Carangids and clupeids were equally represented on the inner shelf making up 11% and 9.6% respectively of the total catch. *Chloroscombrus chrysurus* and *Alectis alexandrinus* represented the carangids while the clupeids were made up of both *Sardinella aurita* and *S. maderensis*. There was a low representation of scombrids and barracudas and no hairtails were caught at these depths or on the outer shelf. The anchovy *Engraulis encrasicolus* dominated one of the two swept-area bottom trawl hauls made in the 20-30 m depth zone. On the outer shelf, carangids dominated the important pelagic species with a mean catch of 51.4 kg/h (or 16.5% of the catch). This was followed by scombrids and clupeids. No barracudas were caught on this part of the shelf. The clupeids consisted of *S. aurita* and *S. maderensis*.

Table 9. Togo. Catch rates (kg/h) by main pelagic families in swept-area bottom-trawl hauls on the a) inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

STAT	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
129	24	93.1	27.3	0.0	0.0	0.0	30.9	151.3
131	48	0.0	68.7	0.0	0.0	2.6	140.6	211.8
134	46	5.1	11.1	0.0	0.0	0.0	163.8	180.0
135	27	0.0	5.4	8.5	0.0	9.3	456.7	479.9
Mean	36	24.6	28.1	2.1	0.0	3.0	198.0	255.8
SE		22.9	14.3	2.1	0.0	2.2	91.0	75.7
% Catch		9.6	11.0	0.8	0.0	1.2	77.4	

b) Outer shelf, 51-100 m

STAT	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
132	72	1.9	93.5	7.7	0.0	0.0	73.2	176.4
133	88	0.0	9.2	0.0	0.0	0.0	437.6	446.9
Mean	80	0.9	51.4	3.9	0.0	0.0	255.4	311.6
SE		0.9	42.1	3.9	0.0	0.0	182.2	135.3
% Catch		0.3	16.5	1.2	0.0	0.0	82.0	

Tables 10a and 10b present catch rates of the most commercially important demersal species on the shelf down to depths of 100 m, grouped as seabreams (*Sparidae* except *Boops boops*), snappers (*Lutjanidae*), groupers (*Serranidae*), grunts (*Haemulidae* except *Brachydeuterus auritus*) and croakers (*Sciaenidae*). The seabreams dominated both the inner and outer parts of the shelf. *Dentex canariensis*, *Pagrus caeruleostictus* and *Pagellus bellottii* were the important sparids on the inner shelf while *Dentex congoensis* and *D. angolensis* were found mainly on the outer shelf. No grunts were encountered in the sector and croakers and snappers were caught only on the inner shelf.

Table 10. Togo. Catch rates (kg/h) of commercially important demersal species grouped by families in swept-area bottom-trawl hauls on the a) inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

STAT	Depth	Seabream	Snappers	Groupers	Grunts	Croakers	Other	Total
129	24	5.6	0.0	0.0	0.0	0.0	145.7	151.3
131	48	83.5	6.0	18.6	0.0	8.7	95.0	211.8
134	46	96.4	0.0	2.3	0.0	0.0	81.3	180.0
135	27	66.7	0.0	0.0	0.0	0.0	413.2	479.9
Mean	36	63.0	1.5	5.2	0.0	2.2	183.8	255.8
SE		20.1	1.5	4.5	0.0	2.2	77.7	75.7
% Catch		24.7	0.6	2.0	0.0	0.8	71.9	

b) Outer shelf, 51-100 m

STAT	Depth	Seabream	Snappers	Groupers	Grunts	Croakers	Other	Total
132	72	15.9	0.0	0.0	0.0	0.0	160.5	176.4
133	88	384.0	0.0	3.6	0.0	0.0	59.3	446.9
Mean	80	199.9	0.0	1.8	0.0	0.0	109.9	311.6
SE		184.1	0.0	1.8	0.0	0.0	50.6	135.3
% Catch		64.2	0.0	0.6	0.0	0.0	35.3	

Table 11 presents swept-area biomass estimates for valuable demersal groups and other groups that occurred in sizeable quantities in the hauls taken off Togo. Estimated total biomass of valuable demersal groups averaged about 1 200 tonnes. Seabreams made up nearly 95% of this total, followed by groupers and croakers. The deepest zone (51-100 m) was the most productive accounting for 59.3% of the total. This was followed by the middle zone (25.5%) and then the shallowest zone (15.2%). Seabreams had the highest biomass in the deepest zone (51-100 m). Surprisingly no croakers or grunts were recorded in the hauls taken in the shallowest zone (≤ 30 m). Of the pelagic and semi-pelagic groups, carangids had the highest estimated biomass. The bigeye grunt was not represented in the catches.

Table 11. Togo. Biomass estimates (tonnes) of important species/groups of fish on the shelf, by depth.

Group / species	0-30 m	31-50 m	51-100 m	Sum	95% confidence limits	
Seabreams	176	245	681	1 102	0	2 392
Grunts	0	5	0	5	5	5
Croakers	0	11	0	11	0	33
Groupers	0	27	6	33	0	77
Snappers	0	8	0	8	0	23
Sum dem. val.	176	296	687	1 159	0	2 460
Bigeye grunt	0	0	0	0	0	0
Carangids	73	101	165	339	16	662
Barracudas	22	3	0	25	0	70

5.3 Ghana

Thirty swept-area trawl hauls were made on the shelf off Ghana. In addition 5 bottom-trawl hauls were made in waters deeper than 100 m. Tables 12 a and b present catch rates by main groups for the inner (0-50) and outer (51-100) shelf respectively. The demersal species group had the highest average catch rate on the inner shelf with a relative contribution of 34%. The “other” group contributed 30% to the total followed by the pelagic group, which had a relative contribution of 27%. Cephalopods made up about 7.5% of the catch, while shrimps and sharks were scarce. On the outer shelf the pelagic and “other” group dominated the catches, contributing 42% and 40% respectively to the total. The demersal group had a relative contribution of 17% on this part of the shelf. Cephalopods and sharks both contributed 0.7% to the total catch, whereas no shrimps were found on the outer shelf in Ghana. In general the average catch rates of the three main groups i.e. demersal, pelagic and “other” were higher on the outer shelf than on the inner shelf. The average catch rate of the demersal group was 231 kg/h on the outer shelf as compared to 169 kg/h on the inner shelf. The pelagic and “other” group had catch rates of 573 kg/h and 556 kg/h on the outer shelf, compared to 131 kg/h and 150 kg/h on the inner shelf.

Table 12. Ghana. Catch rates (kg/h) by main groups in swept-area bottom-trawl hauls on the a) inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

Station	Depth	Demersal	Pelagic	Shrimp	Cephalopods	Sharks	Other	Total
140	45	31.5	41.6	0.1	22.8	0.0	18.4	114.5
141	25	7.3	8.1	0.0	2.1	0.0	127.6	145.1
142	22	15.6	69.3	0.3	9.2	0.0	97.8	192.2
143	34	88.8	0.5	0.0	0.5	0.0	159.1	248.9
146	26	410.3	149.0	0.0	9.1	0.0	172.9	741.2
147	46	17.9	11.7	0.8	23.9	0.0	10.5	64.8
148	50	88.6	84.7	0.3	42.5	20.9	30.2	267.2
152	45	80.4	159.5	0.5	35.4	2.9	60.7	339.4
153	28	672.5	156.9	1.1	54.3	0.0	46.0	930.8
154	35	198.0	1.9	0.0	10.4	0.0	103.7	314.0
155	40	46.2	0.6	0.0	11.0	0.0	51.3	109.2
161	22	27.2	30.4	0.0	377.0	0.0	336.6	771.1
162	40	8.7	1.1	0.0	16.1	0.5	638.5	664.8
169	25	87.4	345.1	0.0	34.3	0.0	345.0	811.8
170	40	26.4	0.0	0.0	1.6	0.0	341.7	369.7
174	47	931.9	1 426.3	0.0	2.4	89.1	366.7	2 816.4
178	35	533.3	70.1	11.0	1.3	0.0	48.4	664.1
189	44	9.6	34.7	0.0	60.3	7.1	13.0	124.8
190	25	23.7	18.9	0.0	15.6	0.0	19.4	77.7
191	26	73.4	14.8	0.0	15.2	0.0	7.5	110.9
Mean	35	168.9	131.3	0.7	37.2	6.0	149.7	493.9
SE		58.1	70.8	0.6	18.3	4.5	38.0	137.8
% Catch		34.2	26.6	0.1	7.5	1.2	30.3	

b) Outer shelf, 51-100 m

Station	Depth	Demersal	Pelagic	Shrimp	Cephalopods	Sharks	Other	Total
139	78	180.0	18.2	0.0	8.7	61.4	64.1	332.4
151	81	257.7	320.9	0.0	12.9	0.0	122.6	714.0
156	56	168.4	502.0	0.0	6.0	2.2	154.3	832.8
163	65	45.9	842.5	0.0	44.9	3.3	162.1	1 098.7
171	53	6.3	0.0	0.0	14.8	3.4	44.9	69.4
172	55	383.6	0.0	0.0	5.7	0.0	1 870.1	2 259.4
180	63	0.1	0.0	0.0	0.0	0.0	4.7	4.7
181	86	868.3	2 311.8	0.0	0.0	0.0	92.2	3 272.3
187	60	28.8	594.4	0.0	0.8	0.0	1.2	625.2
188	66	369.0	1 138.5	0.0	3.6	23.0	3 042.3	4 576.4
Mean	66	230.8	572.8	0.0	9.7	9.3	555.8	1 378.5
SE		84.0	230.4	0.0	4.2	6.2	329.0	479.2
% Catch		16.7	41.6	0.0	0.7	0.7	40.3	

Tables 13a and b show catch rates of the most important pelagic families caught in the bottom-trawl hauls. Carangids dominated both on the inner and outer shelf with catch rates of 104 kg/h on the inner shelf and 354 kg/h on the outer shelf. The most frequently occurring species of carangids were *Trachurus trecae*, *Selene dorsalis*, *Decapterus punctatus* and *Chloroscombrus chrysurus*. On the inner shelf, the second most important group was the Clupeids followed by Barracudas. These groups had catch rates of 16 kg/h and 8 kg/h respectively. The most frequently observed clupeid was *Sardinella aurita*. The Scombrids had low catch rates on the inner shelf (0.6 kg/h) but was the second largest group on the outer shelf where the average catch rate was around 122 kg/h. The Clupeids had the third highest catch rate on the outer shelf (96 kg/h). Hairtails (*Trichiurus lepturus*) were only found at two stations, one on the inner and one on the outer shelf, and at low catch rates. Barracudas were absent on the outer shelf.

Table 13. Ghana. Catch rates (kg/h) by main pelagic families in swept-area bottom-trawl hauls on the a) inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

Station	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
140	45	0.0	41.6	0.0	0.0	0.0	72.8	114.5
141	25	2.2	5.9	0.0	0.0	0.0	136.9	145.1
142	22	42.8	16.7	0.0	0.0	9.9	122.9	192.2
143	34	0.0	0.5	0.0	0.0	0.0	248.4	248.9
146	26	0.0	12.8	9.1	0.0	127.1	592.2	741.2
147	46	0.0	9.6	0.0	0.0	2.0	53.1	64.8
148	50	4.8	79.9	0.0	0.0	0.0	182.5	267.2
152	45	0.0	146.9	0.0	0.0	12.6	179.9	339.4
153	28	1.7	146.8	0.0	0.0	8.4	773.9	930.8
154	35	0.0	1.9	0.0	0.0	0.0	312.1	314.0
155	40	0.0	0.0	0.0	0.0	0.6	108.6	109.2
161	22	0.1	30.2	0.0	0.0	0.0	740.7	771.1
162	40	0.0	1.1	0.0	0.0	0.0	663.7	664.8
169	25	243.8	99.8	1.4	0.0	0.0	466.6	811.8
170	40	0.0	0.0	0.0	0.0	0.0	369.7	369.7
174	47	0.0	1 426.3	0.0	0.0	0.0	1 390.1	2 816.4
178	35	8.8	16.6	0.0	44.7	0.0	594.0	664.1
189	44	0.7	31.0	1.4	0.0	1.6	90.0	124.8
190	25	0.1	17.4	0.0	0.0	1.3	58.8	77.7
191	26	9.1	2.1	0.0	0.0	3.6	96.1	110.9
Mean	35	15.7	104.4	0.6	2.2	8.4	362.7	493.9
SE		12.2	70.4	0.5	2.2	6.3	76.9	137.8
% Catch		3.2	21.1	0.1	0.5	1.7	73.4	

b) Outer shelf, 51-100 m

Station	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
139	78	0.0	15.2	3.0	0.0	0.0	314.2	332.4
151	81	0.0	320.9	0.0	0.0	0.0	393.1	714.0
156	56	139.3	356.8	5.9	0.0	0.0	330.8	832.8
163	65	28.6	807.2	6.8	0.0	0.0	256.2	1 098.7
171	53	0.0	0.0	0.0	0.0	0.0	69.4	69.4
172	55	0.0	0.0	0.0	0.0	0.0	2 259.4	2 259.4
180	63	0.0	0.0	0.0	0.0	0.0	4.7	4.7
181	86	438.9	918.4	951.8	2.7	0.0	960.5	3 272.3
187	60	151.6	442.0	0.8	0.0	0.0	30.8	625.2
188	66	198.9	684.0	255.6	0.0	0.0	3 437.9	4 576.4
Mean	66	95.7	354.4	122.4	0.3	0.0	805.7	1 378.5
SE		45.2	112.2	95.6	0.3	0.0	361.9	479.2
% Catch		6.9	25.7	8.9	0.0	0.0	58.4	

Catch rates of the most valuable demersal groups on the shelf are presented in Tables 14a and 14b. From these tables it can be seen that the seabreams have the highest catch rates both on the inner and outer shelf with catch rates of 51 kg/h and 72 kg/h respectively. The most common species of seabreams were *Pagellus bellottii*, *Dentex canariensis* and *Pagrus caeruleostictus*. *D. congoensis* was found only on the outer shelf, *D. canariensis* and *Pagrus caeruleostictus* mainly on the inner shelf whereas *Pagellus bellottii* was found both on the inner and outer shelf (See Annex IV). The second most important group on the inner shelf was the snappers with an average catch rate of around 30 kg/h followed by groupers and grunts both with average catch rates of around 6.5-7 kg/h. Croakers had an average catch rate of 4.8 kg/h on the inner shelf. Grunts had the second highest average catch rate on the outer shelf (31 kg/h) followed by groupers and snappers. Croakers were not found on the outer shelf of Ghana.

Annex IV gives the swept-area estimates of mean densities (t/NM²) based on 30 random trawl stations for demersal species on the shelf. *Chlamys purpuratus* and *Brachydeuterus auritus* had the highest densities in both of the two shallowest depth zones (≤ 30 m and 31-50 m) followed by *Sepia officinalis hierredda* in the ≤ 30 m zone and by *Dasyatis pastinaca* in the 31-50 m zone. *Priacanthus arenatus* had by far the highest mean density in the deepest depth zone (51-100 m) followed by *Chromis cadenati*, *Boops boops* and *Pomadasys incius*. *Priacanthus arenatus* had the highest overall mean density, followed by *Chlamys purpuratus* and *B. auritus*.

Table 14. Ghana. Catch rates (kg/h) of valuable demersal species grouped by families in swept area bottom trawl hauls on the shelf. A: Inner shelf (0-50 m), B: Outer shelf (51-100 m).

a) Inner shelf, 0-50 m

Station	Depth	Seabreams	Snappers	Groupers	Grunts	Croakers	Other	Total
140	45	28.7	0.0	2.9	0.0	0.0	82.9	114.5
141	25	7.3	0.0	0.0	0.0	0.0	137.8	145.1
142	22	11.3	0.0	0.1	0.0	0.0	180.8	192.2
143	34	60.6	4.6	8.5	0.0	0.0	175.3	248.9
146	26	108.1	289.3	0.0	9.1	3.7	331.0	741.2
147	46	6.6	0.0	0.7	0.2	0.0	57.2	64.8
148	50	53.0	0.0	0.5	0.0	0.0	213.8	267.2
152	45	79.7	0.0	0.0	0.0	0.0	259.7	339.4
153	28	86.4	0.0	0.0	0.0	0.0	844.5	930.8
154	35	103.8	0.4	6.5	61.5	0.0	141.7	314.0
155	40	32.0	0.8	3.4	6.2	0.0	66.7	109.2
161	22	24.3	0.0	0.0	0.0	0.0	746.8	771.1
162	40	8.7	0.0	0.0	0.0	0.0	656.1	664.8
169	25	49.4	0.0	0.0	0.0	0.0	762.3	811.8
170	40	26.4	0.0	0.0	0.0	0.0	343.3	369.7
174	47	305.8	286.8	101.8	46.1	0.0	2 075.8	2 816.4
178	35	0.0	0.0	0.0	2.1	92.9	569.1	664.1
189	44	8.7	0.0	0.2	0.0	0.0	115.8	124.8
190	25	11.4	0.0	10.4	1.9	0.0	53.9	77.7
191	26	13.3	7.6	0.0	4.3	0.0	85.7	110.9
Mean	35	51.3	29.5	6.8	6.6	4.8	395.0	493.9
SE		15.4	19.8	5.1	3.7	4.6	106.1	137.8
% Catch		10.4	6.0	1.4	1.3	1.0	80.0	

b) Outer shelf, 51-100 m

Station	Depth	Seabreams	Snappers	Groupers	Grunts	Croakers	Other	Total
139	78	106.4	0.0	73.3	0.0	0.0	152.7	332.4
151	81	151.7	0.0	1.0	0.0	0.0	561.3	714.0
156	56	120.9	45.3	0.3	0.0	0.0	666.4	832.8
163	65	42.4	0.8	2.7	0.0	0.0	1 052.9	1 098.7
171	53	2.1	0.0	0.0	0.0	0.0	67.3	69.4
172	55	34.3	40.4	2.4	306.5	0.0	1 875.8	2 259.4
180	63	0.1	0.0	0.0	0.0	0.0	4.7	4.7
181	86	155.5	0.0	12.8	0.0	0.0	3 104.0	3 272.3
187	60	0.0	0.0	0.0	0.0	0.0	625.2	625.2
188	66	108.9	0.0	0.0	0.0	0.0	4 467.4	4 576.4
Mean	66	72.2	8.6	9.2	30.7	0.0	1 257.8	1 378.5
SE		20.0	5.7	7.2	30.7	0.0	466.4	479.2
% Catch		5.2	0.6	0.7	2.2	0.0	91.2	

Table 15 presents swept-area biomass estimates for the valuable demersal groups and other groups that occur in sizeable quantities. The estimated total biomass was about 26 000

tonnes, of which seabreams made up around 50%. The highest biomass of seabreams was found between depths of 51 and 100 m. Snappers had the second highest biomass with around 5 000 tonnes. Seabreams and snappers together made up around 70% of the total biomass. Snappers had the third highest biomass followed by groupers and croakers. Of the pelagic and semi-pelagic groups, bigeye grunt (*B. auritus*) had an estimated biomass of around 9 000 tonnes. The biomass of carangids was estimated to around 47 000 tonnes.

Table 15. Ghana. Biomass estimates (tonnes) of important species/groups of fish on the shelf, by depth.

Group/species	0-30 m	31-50 m	51-100m	Sum	95% Confidence limits	
Seabreams ¹	1 666	5 325	6 355	13 346	7 596	19 096
Grunts ¹	85	929	3 384	4 397	0	10 965
Croakers ¹	14	1 032	0	1 046	0	3 202
Groupers	56	1 176	688	1 921	0	4 151
Snappers ¹	1 511	3 013	798	5 322	0	11 951
Sum dem. val.¹	3 332	11 476	11 224	26 032	11 217	40 847
Bigeye grunt ¹	3 671	4 954	495	9 120	0	20 412
Carangids ¹	1 821	16 512	28 720	47 054	19 407	74 700
Barracudas ¹	791	124	0	915		

¹ Corrected

5.4 Côte d'Ivoire

A total of 32 swept-area trawl hauls were made on the Ivorian shelf. For lack of suitable bottom, no trawl hauls were made in waters deeper than 100 m. Tables 16 a and b show catch rates by main groups for the inner (20-50 m) and outer (51-100 m) shelf. The pelagic group had the highest average catch rate on the inner shelf with a relative contribution of nearly 48% (Table 16 a). The demersal group was the second most important group contributing to 39% of the catches, followed by the group "other", which had a relative contribution of 10% and cephalopods (2.1%). There were low average catch rates of shrimps and sharks on this part of the shelf. The pelagic group also dominated catches on the outer shelf with a contribution of nearly 47%. This was followed by the demersal group (22.6%), cephalopods (2%) and sharks (1.4%). No shrimps were caught on the outer shelf.

The species of shrimp found in Côte d'Ivoire were *Penaeus notialis*, *P. kerathurus* and small quantities of *Parapenaeus longirostris*. The main species of cephalopods were *Sepia officinalis hierredda*, *Octopus vulgaris* and *Alloteuthis africana*.

Table 16. Côte d'Ivoire. Catch rates (kg/h) by main groups in swept-area bottom-trawl hauls on the a) inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

Station	Depth	Demersal	Pelagic	Shrimp	Cephalopods	Sharks	Other	Total
195	23	321.3	820.7	16.2	19.2	0.0	182.3	1 359.7
196	37	425.1	17.8	0.0	18.8	0.0	34.9	496.6
199	40	30.5	19.6	0.0	18.1	0.0	25.9	94.1
200	28	4 054.4	405.2	4.0	16.6	0.0	10.1	4 490.2
202	42	267.7	90.0	0.0	29.1	5.9	91.3	483.9
203	26	115.3	13.3	0.0	35.5	0.0	31.4	195.5
204	25	456.1	689.6	0.0	21.6	0.0	1 257.6	2 424.9
208	24	561.1	553.8	2.9	8.4	0.0	12.3	1 138.5
209	47	6.1	81.8	1.3	19.6	1.2	40.4	150.4
212	37	100.3	81.7	8.2	11.6	0.0	27.8	229.6
213	22	268.6	274.0	18.4	97.9	0.0	41.4	700.2
218	21	39.5	117.4	32.0	55.8	0.0	56.8	301.6
219	47	3.5	729.9	0.0	35.8	28.3	19.2	816.7
221	22	258.6	71.2	0.5	10.4	4.4	31.5	376.6
222	41	24.8	4 509.7	0.0	34.7	3.1	197.1	4 769.4
228	40	49.8	23.1	1.6	8.5	0.0	27.6	110.6
229	29	256.8	226.1	2.6	2.6	0.0	45.5	533.7
231	27	275.3	210.1	2.2	3.9	0.0	36.8	528.3
232	37	301.6	83.1	5.1	5.7	1.7	1.6	398.7
239	48	121.4	1 065.7	0.1	0.3	0.0	1.6	1 189.0
240	47	407.5	81.1	1.0	3.7	0.0	12.1	505.4
Mean	34	397.4	484.0	4.6	21.8	2.1	104.1	1 014.0
SE		186.3	212.3	1.8	4.9	1.4	58.8	287.6
% Catch		39.2	47.7	0.4	2.1	0.2	10.3	

b) Outer shelf, 51-100 m

Station	Depth	Demersal	Pelagic	Shrimp	Cephalopods	Sharks	Other	Total
197	61	641.9	68.6	0.0	3.0	16.8	41.2	771.3
198	57	126.0	1 502.4	0.0	19.2	95.9	2 007.6	3 751.1
201	93	234.4	535.8	0.0	26.8	7.4	315.8	1 120.2
205	67	458.0	163.4	0.0	19.5	1.8	187.9	830.6
210	65	145.1	499.6	0.0	31.2	0.0	75.4	751.3
211	69	50.4	25.4	0.0	28.0	2.8	43.1	149.7
220	87	177.4	0.1	0.0	6.8	0.0	18.7	203.0
223	62	67.9	52.3	0.0	22.9	6.2	69.8	219.1
227	86	309.9	6.7	0.0	5.2	4.8	81.5	408.0
237	66	71.4	1 852.6	0.0	33.5	0.0	8.7	1 966.2
241	56	95.4	216.1	0.1	17.3	6.7	10.8	346.4
Mean	70	216.2	447.5	0.0	19.4	12.9	260.0	956.1
SE		56.3	193.2	0.0	3.2	8.4	176.9	321.7
% Catch		22.6	46.8	0.0	2.0	1.4	27.2	

Tables 17a and b show the catch rates of the most important pelagic families caught in the bottom trawls. The clupeids were the dominant pelagic group on the inner shelf with an average catch rate of around 259 kg/h constituting 25.6% of the catch (Table 17a). The clupeid species that occurred most frequently were the sardinellas, *Sardinella aurita*, *S. maderensis* and *S. rouxi*. The anchovy, *Engraulis encrasicolus* and *Ilisha africana* were also found. The second most important group was the carangids, which contributed 17.5% to the total. The most frequently caught species of this group were *Chloroscombrus chrysurus* and *Selene dorsalis*. Hairtails (*Trichiurus lepturus*) contributed 4%, while scombrids and barracudas added little to the total catch. The carangids had the highest average catch rate on the outer shelf (347 kg/h or 36.3% of the catch) followed by hairtails (78 kg/h or 8.2%). The most frequently caught carangid on the outer shelf was *Trachurus trecae*, which also had the highest catch rates of this group. The main clupeid species was *S. aurita*. The catch rate of barracudas on the outer shelf was 1.1 kg/h, which is lower than on the inner shelf where the catch rate was 4.7 kg/h.

Table 17. Côte d'Ivoire. Catch rates (kg/h) by main pelagic families in swept-area bottom-trawl hauls on the a) inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

Station	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
195	23	83.7	621.9	0.0	30.5	84.6	539.0	1 359.7
196	37	0.2	15.2	0.0	0.0	2.5	478.7	496.6
199	40	0.2	19.3	0.0	0.0	0.0	74.5	94.1
200	28	29.1	376.1	0.0	0.0	0.0	4 085.0	4 490.2
202	42	0.0	89.0	0.9	0.0	0.0	394.0	483.9
203	26	0.0	10.2	0.0	3.1	0.0	182.2	195.5
204	25	66.5	623.2	0.0	0.0	0.0	1 735.3	2 424.9
208	24	0.9	518.8	0.3	33.6	0.2	584.6	1 138.5
209	47	0.0	56.9	0.8	24.2	0.0	68.6	150.4
212	37	0.8	25.9	0.0	54.0	1.0	147.9	229.6
213	22	148.3	17.3	1.8	106.6	0.0	426.2	700.2
218	21	35.0	10.7	0.0	68.2	3.5	184.2	301.6
219	47	665.9	22.2	0.0	41.7	0.0	86.9	816.7
221	22	7.6	9.0	0.0	54.4	0.2	305.4	376.6
222	41	4 108.0	379.4	20.5	0.0	1.8	259.8	4 769.4
228	40	0.0	6.8	0.0	14.6	1.8	87.5	110.6
229	29	187.5	15.4	0.0	23.3	0.0	307.5	533.7
231	27	110.8	33.2	0.0	64.0	2.2	318.2	528.3
232	37	0.0	9.7	0.0	73.3	0.0	315.6	398.7
239	48	0.3	786.2	0.0	279.2	0.0	123.3	1 189.0
240	47	0.4	70.0	0.0	10.2	0.5	424.2	505.4
Mean	34	259.3	177.0	1.2	41.9	4.7	529.9	1 014.0
SE		195.1	55.9	1.0	13.6	4.0	193.7	287.6
% Catch		25.6	17.5	0.1	4.1	0.5	52.3	

b) Outer shelf, 51-100 m

Station	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
197	61	0.0	65.3	2.1	1.2	0.0	702.8	771.3
198	57	14.4	1 464.0	12.0	0.0	12.0	2 248.7	3 751.1
201	93	0.0	531.0	4.8	0.0	0.0	584.4	1 120.2
205	67	1.4	48.4	0.0	113.6	0.0	667.2	830.6
210	65	0.0	486.8	9.6	3.2	0.0	251.7	751.3
211	69	0.0	7.6	0.0	17.8	0.0	124.4	149.7
220	87	0.0	0.1	0.0	0.0	0.0	202.9	203.0
223	62	0.0	39.6	0.1	12.6	0.0	166.8	219.1
227	86	0.3	2.9	0.5	2.9	0.0	401.3	408.0
237	66	0.0	1 175.2	0.0	677.4	0.0	113.6	1 966.2
241	56	181.7	0.0	0.3	34.1	0.0	130.3	346.4
Mean	70	18.0	347.4	2.7	78.4	1.1	508.5	956.1
SE		16.4	157.4	1.3	60.7	1.1	186.6	321.7
% Catch		1.9	36.3	0.3	8.2	0.1	53.2	

Catch rates of the most valuable demersal groups on the shelf are presented in Tables 18a and b. From Table 18a it can be seen that the catch rates of the valuable demersal species on the inner shelf were low. Among these, seabreams had the highest catch rate of 24.1 kg/h, and a relative contribution to the total catch of 13.2%. This was followed by croakers (13.6 kg/h) and grunts (12.1 kg/h). *Pomadasys incisus* and *P. rogeri* occurred in 21% and 12% of trawl hauls respectively. Snappers and groupers did not contribute significantly to the catch in the inner shelf. On the outer shelf, seabreams dominated the valuable demersal species with a relative contribution of nearly 11% and an average catch rate of 103 kg/h. *Dentex angolensis*, *Pagellus bellottii* and *D. canariensis* were the most frequently occurring seabreams. Croakers, with *Pteroscion peli* and *Umbrina canariensis*, constituted the second most important group (4.1%) followed by grunts and groupers. Snappers made up only 0.1% of the catch on the outer shelf. On both the inner and outer shelves, non-valuable demersal species made up a large percentage of the catch (95% on the inner and 82.2% on the outer).

Table 18. Côte d'Ivoire. Catch rates (kg/h) of valuable demersal species grouped by families in swept-area bottom-trawl hauls on the a) inner shelf (0-50 m) and b) outer shelf (51-100 m).

a) Inner shelf, 0-50 m

Station	Depth	Seabreams	Snappers	Groupers	Grunts	Croakers	Other	Total
195	23	6.9	3.6	0.0	32.3	43.9	1 273.1	1 359.7
196	37	2.1	0.0	0.0	4.1	0.0	490.4	496.6
199	40	9.1	0.0	0.0	15.5	0.0	69.5	94.1
200	28	2.6	0.0	2.6	0.0	0.0	4 485.0	4 490.2
202	42	267.4	0.0	0.0	0.0	0.0	216.5	483.9
203	26	89.6	0.0	0.0	4.2	0.0	101.7	195.5
204	25	65.6	0.0	0.0	0.0	0.0	2 359.3	2 424.9
208	24	2.2	0.0	0.0	0.0	8.4	1 127.9	1 138.5
209	47	2.7	0.0	2.3	0.0	0.0	145.4	150.4
212	37	1.0	0.0	0.0	0.0	21.4	207.2	229.6
213	22	0.0	0.0	0.0	0.0	72.0	628.2	700.2
218	21	0.0	0.0	0.0	0.0	39.0	262.5	301.6
219	47	3.5	0.0	0.0	0.0	0.0	813.2	816.7
221	22	4.4	0.0	4.0	4.2	14.0	350.1	376.6
222	41	24.8	0.0	0.0	0.0	0.0	4 744.6	4 769.4
228	40	5.4	0.0	0.5	0.2	0.0	104.5	110.6
229	29	0.0	0.0	0.0	174.9	48.2	310.6	533.7
231	27	0.0	0.0	1.2	3.4	36.6	487.0	528.3
232	37	0.0	0.0	0.0	12.5	2.7	383.5	398.7
239	48	0.0	0.0	0.0	0.0	0.0	1 189.0	1 189.0
240	47	18.4	0.0	0.0	2.2	0.0	484.8	505.4
Mean	34	24.1	0.2	0.5	12.1	13.6	963.5	1 014.0
SE		13.2	0.2	0.2	8.3	4.7	290.1	287.6
% Catch		2.4	0.0	0.0	1.2	1.3	95.0	

b) Outer shelf, 51-100 m

Station	Depth	Seabreams	Snappers	Groupers	Grunts	Croakers	Other	Total
197	61	196.2	0.0	38.8	236.6	114.6	185.2	771.3
198	57	24.0	0.0	0.0	0.0	0.0	3 727.1	3 751.1
201	93	116.2	0.0	0.0	0.0	59.8	944.2	1 120.2
205	67	223.0	0.0	1.2	13.0	180.6	412.8	830.6
210	65	80.0	5.6	0.0	0.0	0.0	665.7	751.3
211	69	28.6	0.0	0.2	0.0	2.4	118.5	149.7
220	87	159.8	0.0	0.0	0.0	0.0	43.2	203.0
223	62	40.9	0.0	11.3	0.0	0.0	166.9	219.1
227	86	153.8	0.0	2.4	0.0	58.6	193.2	408.0
237	66	23.2	0.0	0.0	0.0	17.8	1 925.2	1 966.2
241	56	87.0	0.0	1.2	0.0	0.0	258.2	346.4
Mean	70	103.0	0.5	5.0	22.7	39.4	785.5	956.1
SE		21.7	0.5	3.5	21.4	18.1	337.1	321.7
% Catch		10.8	0.1	0.5	2.4	4.1	82.2	

Appendix IV gives the swept-area estimates of mean densities (t/NM²) based on 32 random trawl stations for demersal species on the shelf. As in last year's survey, *Brachydeuterus auritus* had the highest mean densities in both of the two depth zones (0-30 m, 31-50 m) on the inner shelf. The species occurred in 65% of the hauls. It was followed by *Priacanthus arenatus* in the shallowest depth zone and *P. bellottii* in the 31-50 m zone. *Priacanthus arenatus* was the most dominant species in the 51-100 m depth zone followed by *D. angolensis* and *P. bellottii* the latter of which occurred in 76% of the hauls. The cephalopod *Sepia officinalis hierredda* recorded the highest percentage incidence occurring in 31 of the 32 hauls.

Table 19 presents the swept-area biomass estimates for the valuable demersal groups and other groups that occur in sizeable quantities. The estimated total biomass of valuable demersal groups was about 11 000 tonnes of which seabreams made up almost 60%. The highest biomass of seabreams was found in the 51-100 m depth zone. Croakers had the second highest biomass with nearly 3 000 tonnes. This was followed by croakers, grunts and snappers.

Of the pelagic and semi-pelagic species, Carangids had the highest estimated biomass (about 26 000 tonnes), followed by bigeye grunt (*B. auritus*) with 14 000 tonnes, while few barracudas were caught in the hauls.

Table 19. Côte d'Ivoire. Biomass estimates (tonnes) of important species/groups of fish on the shelf, by depth.

Group/species	0-30 m	31-50 m	51-100m	Sum	95% Confidence limits	
Seabreams ¹	332	764	5 569	6 666	3 999	9 332
Grunts ¹	512	70	1 085	1 667	0	3 870
Croakers ¹	552	42	2 137	2 731	741	4 721
Groupers	17	7	259	283	0	647
Snappers ¹	6	0	32	38	0	104
Sum dem. val.¹	1 419	883	9 083	11 385	5 455	17 315
Bigeye grunt ¹	11 508	2 657	81	14 245	0	30 559
Carangids ¹	4 369	2 944	19 056	26 369	0	54 119
Barracudas ¹	180	14	65	259		

¹ Corrected

5.5 Review of results

Table 20 summarizes the catch rates of valuable demersal groups and a few other common groups in the four regions covered during the present survey. Average catch rates for the whole shelf area from 0 to 100 m is used in the comparisons.

Table 20. Comparison of mean catch rates (kg/h) of valuable demersal and some other groups in swept-area bottom-trawl hauls on the shelf (0-100 m) off Benin, Togo, Ghana and Côte d'Ivoire for the Nansen surveys of 1999 and 2000.

Group/species	Togo-Benin	Benin	Togo	Ghana		Côte d'Ivoire	
	1999	2000	2000	1999	2000	1999	2000
Seabreams	28.6 ¹	29.9	108.7	32.8 ¹	58.3	26.1 ¹	51.2
Grunts	0.9	3.5	0.0	7.1	14.6	6.6	15.7
Croakers	4.6	2.9	1.5	0.7	3.2	9.5	22.5
Groupers	10.3	2.3	4.1	2.5	7.6	2.5	2.1
Snappers	0.3	1.3	1.0	0.7	22.5	2.3	0.3
Sum dem. val.	44.7¹	39.9	115.3	43.8¹	106.2	47.0¹	91.8
Bigeye grunt	5.5	10.1	0.6	213.4	39.1	91.9	216.3
Carangids	37.0	64.2	35.9	33.3	187.7	62.2	235.5
Barracudas	6.3	4.7	2.0	5.9	5.6	13.2	3.5

¹ Corrected

For this year's survey the highest overall catch rate of valuable demersal fish was in Togolese waters (115.3 kg/h). This high catch rate in Togo was caused by one big catch of seabreams of 384 kg/h at station 133 (Table 10). As only 6 stations were sampled in Togo, this high catch rate had a strong influence on the final result. The corresponding catch rates in Benin, Ghana and Côte d'Ivoire were around 40 kg/h, 106 kg/h and 92 kg/h respectively. Seabreams was the major group in all of the four countries followed by snappers and grunts in Ghana, croakers and grunts in Côte d'Ivoire and grunts and croakers in Benin.

Of the separate species groups, the highest catch rate of seabreams was in Togo (115.3 kg/h) followed by Ghana (58.3 kg/h), Côte d'Ivoire (51.2 kg/h) and Benin (29.9 kg/h). The catch rate of snappers was highest in Ghana (22.5 kg/h) but very low in the other three areas. Côte d'Ivoire had the highest catch rates of croakers (22.5 kg/h). The other zones had low catch rates of croakers, ranging from 3.2 kg/h in Ghana to 2.9 kg/h in Benin and 1.5 kg/h in Togo. Ghana had the highest catch rate of Groupers followed by Togo. For grunts and the bigeye grunt (*Brachydeuterus auritus*) catch rates were highest in Côte d'Ivoire, 15.7 and 216.3 kg/h respectively. The corresponding rates were 14.6 and 39.1 kg/h for Ghana, and 3.5 and 10.1 kg/h for Benin. The catches of grunts and big-eye grunt in Togo were negligible.

Carangids were most abundant in Côte d'Ivoire followed Ghana, Benin and Togo. Catch rates of barracudas was highest in Ghana followed by Benin.

Table 21 summarizes the biomass estimates for the four sectors covered in this survey and the three sectors covered in the 1999 survey. The shelf area in each sector is also given. Due to a much shorter coastline and also a narrower shelf than off Ghana, Benin and Togo had the lowest biomass of most fish groups. In this year's the biomass of seabreams was highest off Ghana. Grunt and bigeye grunt was more abundant in Côte d'Ivoire than in the three other areas.

When comparing the results of last year's survey with this year's one should take cognisance of the fact that the two surveys were conducted in two different seasons. Whereas the 1999 survey was conducted during the thermocline season, this year's survey was conducted during the upwelling season.

Table 21. Biomass estimates (tonnes) of valuable demersal species and some other groups from swept-area bottom-trawl hauls on the shelf (0-100 m) off Benin, Togo, Ghana and Côte d'Ivoire from the 1999 and 2000 survey. The shelf area (NM²) in each area is given.

Group/ Species	Benin	Benin	Togo	Ghana		Côte d'Ivoire		Total	
	1999	2000	2000	1999	2000	1999	2000	1999	2000
Seabreams	823	700 ¹	1 102	8 478	13 346 ¹	3 457 ¹	6 666 ¹	12 758 ¹	21 814 ¹
Grunts	59	66 ¹	5	1 431	4 397 ¹	417	1 667 ¹	1 907	6 135 ¹
Croakers	280	83	11	125	1 046 ¹	941	2 731 ¹	1 346	3 871 ¹
Groupers	312	59	33	557	1 921	305	283	1 174	2 296
Snappers	22	34	8	151	5 322 ¹	145	38	318	5 402 ¹
Sum dem. val.	1 495	942¹	1 159	10 743	26 032¹	5 265	11 385¹	17 503¹	39 518¹
Bigeye grunt	171	222 ¹	0	70 314	9 120 ¹	9 913	14 245 ¹	80 398	23 587 ¹
Carangids	1 143	1 490	339	6 860	47 054 ¹	5 477	26 369 ¹	13 480	75 252 ¹
Barracudas	246	102	25	1 084	915 ¹	811	259 ¹	2 141	1 301 ¹
Area (NM ²)									
0-100 m	1 092	765	327	6 227	6 227	2 883	2 883	10 202	10 202

¹ Corrected

CHAPTER 6 FISHING TRIALS ON THE DEEP CONTINENTAL SHELF AND UPPER SLOPE

Following the interest expressed by Ghana to have a fair idea about fishery resources in waters deeper than 100 m, an effort was made during the survey to trawl at such depths. Generally, trawling at such depths was extremely difficult because of uneven bottom topography. Seven hauls were made as follows: 1 each in the Benin and Togo and 5 in the Ghana at depths of between 99 and 360 m (Table 22). No deep water hauls were made in the Côte d'Ivoire because of general lack of suitable bottom conditions there where the continental shelf is very narrow and the slope is extremely steep.

Table 22: Positions, catch rates and principal species encountered in trawl hauls taken beyond 100 m depth

Sector	Position		Depth (m)	Catch (kg/h)	Top three species caught at the station
	Latitude	Longitude			
Benin	06° 06'N	02° 29'E	125-113	293.2	<i>Dentex congoensis</i> <i>Dentex angolensis</i> <i>Squatina oculata</i>
Togo	05° 53'N	01° 16'E	287-299	315.5	<i>Rhizoprionodon acutus</i> <i>Squatina oculata</i> <i>Chlorophthalmus atlanticus</i>
Ghana	05° 32'N	00° 16'W	323-336	1 188.9	<i>Hypoclydonia bella</i> <i>Chlorophthalmus atlanticus</i> <i>Setarches guentheri</i>
	04° 53'N	00° 32'W	99-109	2 950.1	<i>Priacanthus arenatus</i> <i>Promethichthys prometheus</i> <i>Ephippion guttifer</i>
	04° 40'N	00° 45'W	121-126	158.2	<i>Antigonia capros</i> <i>Dentex congoensis</i> <i>Zeus faber</i>
	04° 22'N	02° 00'W	253-199	650.0	<i>Zenopsis conchifer</i> <i>Chlorophthalmus atlanticus</i> <i>Ariomma bondi</i>
	04° 29'N	02° 17'W	317-328	370.4	<i>Chlorophthalmus atlanticus</i> <i>Parasudis fraser-bruenneri</i> <i>Zenopsis conchifer</i>

Catch rates of between 150 and 3 000 kg/h (average of 846.6 kg/h) were obtained from the seven hauls. The average catch rate amounted to a stock density of 26.48 t/NM² for all species combined. The corresponding figure for the area between 20 and 100 m was

14.51 t/NM² implying much higher catch rates on the upper continental slope than on the shelf. However, whereas catch rates of commercially important species on the shelf were high, other less known species made up the bulk of the catch at the deeper stations. Table 22 also gives the three most abundant species recorded in each deep.

Table 23. Deep stations: catch rates (kg/h) of the most abundant species and 'others' in the swept-area bottom trawl hauls, 100-400 m.

Station	Depth	Sparidae	Merluccidae	Priacanthus	<i>Aristeus varidens</i>	<i>Parapenaeus longirostris</i>	Other	Total
126	119	249.4	0.0	1.3	0.0	0.0	42.5	293.2
136	293	0.0	0.0	0.0	2.6	7.9	304.9	315.5
149	330	0.0	8.0	0.0	0.0	17.5	1 163.4	1 188.9
157	104	8.0	0.0	2 767.4	0.0	0.0	174.8	2 950.1
164	124	39.3	0.0	2.2	0.0	0.0	116.7	158.2
182	226	16.1	0.0	0.0	0.0	0.0	633.9	650.0
183	323	0.0	6.8	0.0	0.0	0.4	363.1	370.4
Mean	217	44.7	2.1	395.8	0.4	3.7	399.9	846.6
SE		34.5	1.4	395.3	0.4	2.6	290.1	287.6
% Catch		5.3	0.3	46.8	0.0	0.4	47.2	

The most abundant species was *Priacanthus arenatus* with a mean catch rate of 395.8 kg/h (Table 23) but it was not encountered beyond 200 m depth (Table 22). Seabreams constituted an important group of species with an average catch rate of 44.7 kg/h) and the most abundant seabreams were the Congo dentex (*Dentex congolensis*) and the Angola dentex (*Dentex angolensis*). The deep-water shrimp (*Parapenaeus longirostris*) was the most abundant shrimp found in this depth range. The species occurred in 43% of the hauls and had a mean catch rate of 3.7 kg/h. Merluccidae (hake) also occurred in these hauls with an average catch rate of 2.1 kg/h.

Table 24 shows the 15 most abundant species (with their common English names) that made up at least 1% of the catch in all 7 hauls and their overall assessed density. At the top of the list is the bigeye (*Priacanthus arenatus*). The next three most abundant species; namely *Hypoclydonia bella*, *Chlorophthalmus atlanticus* and *Zenopsis conchifer* were encountered beyond 200 m depth. Other species that occurred in over 50% of the hauls were the Atlantic greeneye (*Chlorophthalmus atlanticus*), the smoothback angelshark (*Squatina oculata*) and the piper gurnard (*Trigla lyra*).

Table 24. Common English names, mean density and percent incidence of the top 15 species that occurred in the deep hauls.

Rank	Scientific Name	Common English Name	Mean Density	% incidence
1	<i>Priacanthus arenatus</i>	Atlantic bigeye	12.37	43
2	<i>Hypoclydonia bella</i>	-	2.67	29
3	<i>Chlorophthalmus atlanticus</i>	Atlantic greeneye	2.56	57
4	<i>Zenopsis conchifer</i>	Silvery John dory	1.17	29
5	<i>Dentex congoensis</i>	Congo dentex	0.91	43
6	<i>Dentex angolensis</i>	Angola dentex	0.65	43
7	<i>Promethichthys prometheus</i>	Promethean escolar	0.61	43
8	<i>Squatina oculata</i>	Smoothback angelshark	0.55	57
9	<i>Rhizoprionodon acutus</i>	Milk shark	0.47	14
10	<i>Setarches guentheri</i>	Deepwater scorpionfish	0.44	29
11	<i>Parasudis fraser-bruenneri</i>	Greeneye	0.37	29
12	<i>Antigonia capros</i>	Common boarfish	0.30	14
13	<i>Ariomma bondi</i>	Silver-rag driftfish	0.29	43
14	<i>Trichiurus lepturus</i>	Hairtail / Ribbonfish	0.24	14
15	<i>Trigla lyra</i>	Piper gurnard	0.24	57

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Annex I Records of fishing stations

PROJECT STATION: 115
 DATE: 30/8/00 start stop duration
 TIME :10:39:03 11:09:41 31 (min)
 LOG :1274.01 1275.51 1.47
 FDEPTH: 52 61
 BDEPTH: 52 61
 Towing dir: 180° Wire out: 180 m Speed: 30 kn*10
 Sorted: 56 Kg Total catch: 53.27 CATCH/HOUR: 103.10

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Sepia officinalis hierredda	21.29	20.65	
Epinephelus aeneus	17.11	16.60	
Squatina oculata	11.46	11.12	
Lutjanus fulgens	8.52	8.26	315
Pagrus caeruleostictus	6.85	6.64	312
Allotautis africana	6.74	6.54	
Zeus faber	4.06	3.94	
Dentex canariensis	3.41	3.31	
Fistularia petimba	3.10	3.01	
Pseudupeneus prayensis	2.86	2.77	316
Pagellus bellottii	2.97	2.91	314
Alectis alexandrinus	1.94	1.88	
Aluterus punctata	1.94	1.88	
Sea urchins (strong spines)	1.59	1.54	
Torpedo marmorata	1.55	1.50	
Acanthurus monroviae	0.27	0.26	
Scorpaena stephanica	1.08	1.05	
Octopus vulgaris	1.01	0.98	
Branchiostegus semifasciatus	0.62	0.60	
Sardinella maderensis	0.58	0.56	
Dentex canariensis	0.58	0.56	313
Sardinella aurita	0.41	0.40	
Syacium micrum	0.33	0.32	
Saurida brasiliensis	0.33	0.32	
Dentex gibbosus	0.29	0.28	317
Chilomycterus spinosus mauret.	0.27	0.26	
Chascaopsetta lugubris	0.27	0.26	
Syacium micrum	0.27	0.26	
Lepidotrigla cadmani	0.23	0.22	
Grammolites gruvelli	0.23	0.22	
Decapterus rhonchus	0.19	0.18	
Lophodes kempi	0.15	0.15	
Sphoeroides marmoratus	0.12	0.12	
PECTINIDAE	0.12	0.12	
Decapterus punctatus	0.08	0.08	
Serranus accraensis	0.04	0.04	
Microchirus fischkopi	0.04	0.04	
Bothus podas africanus	0.04	0.04	
Selene dorsalis	0.02	0.02	
Total	103.12	100.02	

PROJECT STATION: 118
 DATE: 30/8/00 start stop duration
 TIME :15:39:18 16:09:10 30 (min)
 LOG :1304.26 1306.08 1.81
 FDEPTH: 23 24
 BDEPTH: 23 24
 Towing dir: 90° Wire out: 180 m Speed: 30 kn*10
 Sorted: 53 Kg Total catch: 114.38 CATCH/HOUR: 228.76

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	118.38	51.75	326
Chloroscombrus chrysurus	31.84	13.92	
PECTINIDAE	14.00	6.12	
Sphyraena guachancho	8.30	3.63	330
Galeoides decadactylus	8.00	3.50	
Brachydeuterus auritus	5.92	2.59	
Selene dorsalis	5.50	2.40	
Sphyraena afra	5.06	2.21	
Elops lacerta	4.86	2.12	
Ephippion guttifer	3.86	1.69	
Selar crumenophthalmus	1.70	0.75	
Pseudolithus senegalensis	3.34	1.46	329
Sphyraena sphyraena	2.74	1.20	
Dentex canariensis	2.34	1.02	328
Caranx hippos	2.08	0.91	
Sardinella maderensis	1.56	0.68	
Pagrus caeruleostictus	1.56	0.68	327
Alectis alexandrinus	1.48	0.65	
Sardinella aurita	1.30	0.57	325
Albula vulpes	1.14	0.50	
Lethrinus atlanticus	0.54	0.24	
Braspans africana	0.32	0.14	
Chaetodipterus goreensis	0.40	0.17	
Balistes capricus	0.36	0.16	
Penaeus kerathurus	0.10	0.04	
Total	228.88	100.06	

PROJECT STATION: 119
 DATE: 30/8/00 start stop duration
 TIME :16:44:25 17:14:31 30 (min)
 LOG :1310.10 1311.42 1.28
 FDEPTH: 42 46
 BDEPTH: 42 46
 Towing dir: 270° Wire out: 160 m Speed: 30 kn*10
 Sorted: 52 Kg Total catch: 97.59 CATCH/HOUR: 195.18

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	69.76	35.74	332
Brachydeuterus auritus Juv.	30.00	15.37	
Pomadasyus jubelini	19.44	9.96	331
Penaeus notialis	15.96	8.13	
Sepia officinalis hierredda	10.62	5.44	
Raja miraletus	7.20	3.69	
Selene dorsalis	6.80	3.48	
Trichiurus lepturus	4.08	2.09	
Cymbium cymbium	3.56	1.82	
Lutjanus fulgens	2.76	1.41	
Pagrus caeruleostictus	2.72	1.39	
Syacium micrum	2.64	1.35	
Cynoglossus senegalensis	2.64	1.35	
Pomadasyus incisus	1.96	1.00	
Selar crumenophthalmus	1.76	0.90	
Stromateus fiatola	1.68	0.86	
Sphyraena guachancho	1.64	0.84	
Scyllarides herklotsii	1.56	0.80	
Galeoides decadactylus	1.44	0.74	
Grammolites gruvelli	1.36	0.70	
Fistularia petimba	1.28	0.66	
Psettodes belcheri	1.20	0.61	
Calappa pelli	0.88	0.45	
Pagellus bellottii	0.80	0.41	
Priacanthus arenatus	0.48	0.25	
Dactylopterus volitans	0.36	0.18	
Chloroscombrus chrysurus	0.36	0.18	
Brotula barbata	0.12	0.06	
Lepidotrigla cadmani	0.12	0.06	
Total	195.18	99.97	

PROJECT STATION: 120
 DATE: 30/8/00 start stop duration
 TIME :17:47:26 18:17:07 30 (min)
 LOG :1314.93 1316.61 1.68
 FDEPTH: 64 64
 BDEPTH: 64 64
 Towing dir: 110° Wire out: 220 m Speed: 30 kn*10
 Sorted: 24 Kg Total catch: 57.10 CATCH/HOUR: 114.20

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Dentex angolensis	18.82	16.48	334
Pagellus bellottii	18.42	16.13	333
Sepia officinalis hierredda	16.76	14.68	
Priacanthus arenatus	9.54	8.35	
Aluterus sp.	8.34	7.30	
Lepidotrigla cadmani	7.40	6.48	
Umbrina canariensis	4.70	4.12	
Sepia officinalis hierredda	3.90	3.42	
Saurida brasiliensis	3.50	3.06	
Chilomycterus spinosus mauret.	2.68	2.37	
Bothus podas africanus	2.42	2.12	
Raja miraletus	2.16	1.89	
Grammolites gruvelli	2.16	1.89	
Squatina oculata	1.88	1.65	
Brotula barbata	1.74	1.52	
Syacium micrum	1.48	1.30	
Brachydeuterus auritus	1.48	1.30	
Trichiurus lepturus	1.36	1.19	
Cymbium cymbium	0.76	0.67	
Torpedo marmorata	0.54	0.47	
Muraena sp.	0.54	0.47	
Selene dorsalis	0.48	0.42	
Penaeus notialis	0.48	0.42	
Total	114.36	100.15	

PROJECT STATION: 116
 DATE: 30/8/00 start stop duration
 TIME :12:08:22 12:38:07 30 (min)
 LOG :1281.41 1283.15 1.84
 FDEPTH: 39 53
 BDEPTH: 39 53
 Towing dir: 180° Wire out: 150 m Speed: 30 kn*10
 Sorted: 25 Kg Total catch: 20.72 CATCH/HOUR: 41.44

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Sepia officinalis hierredda	8.70	20.99	
Pagrus caeruleostictus	5.86	14.14	318
Selene dorsalis	4.92	11.87	
Sphyraena sphyraena	3.28	7.92	
Dasyatis marmorata	3.00	7.24	
Selar crumenophthalmus	2.28	5.50	320
Brachydeuterus auritus	1.90	4.58	
Pomadasyus incisus	1.76	4.25	
Scomberomorus tritor	1.74	4.20	
Stromateus fiatola	1.34	3.23	
Pagellus bellottii	1.08	2.61	
Balistes capricus	1.04	2.51	
Dentex canariensis	0.96	2.32	319
Alectis alexandrinus	0.82	1.98	
Sardinella maderensis	0.58	1.40	
Fistularia petimba	0.52	1.25	
Calappa rubroguttata	0.44	1.06	
Decapterus sp.	0.36	0.87	
Galeoides decadactylus	0.30	0.72	
Chelidonichthys gabonensis	0.26	0.63	
Chloroscombrus chrysurus	0.20	0.48	
Torpedo torpedo	0.04	0.10	
Trichiurus lepturus	0.04	0.10	
Grammolites gruvelli	0.02	0.05	
Total	41.44	100.00	

PROJECT STATION: 117
 DATE: 30/8/00 start stop duration
 TIME :13:27:28 14:03:14 36 (min)
 LOG :1287.99 1290.15 2.13
 FDEPTH: 26 26
 BDEPTH: 26 26
 Towing dir: 90° Wire out: 110 m Speed: 30 kn*10
 Sorted: 31 Kg Total catch: 31.39 CATCH/HOUR: 52.32

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Sepia officinalis hierredda	10.33	19.74	
Selar crumenophthalmus	6.63	12.67	321
Fistularia petimba	5.37	10.26	
Sea urchins (strong spines)	4.77	9.12	
Aluterus blankerti	4.70	8.98	
Alectis alexandrinus	4.32	8.26	
Ephippion guttifer	4.28	8.18	
Scomberomorus tritor	3.53	6.75	
Dentex canariensis	1.92	3.67	324
Sphyraena sphyraena	1.75	3.34	
Sardinella maderensis	1.57	3.00	322
Panulirus regius	1.55	2.96	
Pagrus caeruleostictus	0.90	1.72	323
Diodon holocanthus	0.23	0.44	
Chloroscombrus chrysurus	0.23	0.44	
Rypticus saponaceus	0.13	0.25	
Pseudupeneus prayensis	0.10	0.19	
Total	52.31	99.97	

PROJECT STATION: 121
 DATE: 30/ 8/00 GEAR TYPE: PT No:4 POSITION: Lat N 609 Long E 210
 start stop duration
 TIME :20:14:57 20:46:51 32 (min) Purpose code: 1
 LOG :1329.80 1331.69 1.87 Area code : 4
 FDEPTH: 5 5 GearCond.code: 4
 BDEPTH: 304 74 Validity code: 1
 Towing dir: 90° Wire out: 160 m Speed: 30 kn*10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Sardinella aurita	26.55 435	60.03	335
Decapterus rhonchus	7.95 345	17.97	336
Ariomma sp.	4.01 32	9.07	
Ariomma bondi	2.96 62	6.69	
Todaropsis sagittatus	41.04 306	15.11	337
Scomber japonicus	0.49 6	1.11	
Selar crumenophthalmus	0.45 2	1.02	
Unidentified fish	0.34 21	0.77	
Sphyraena guachancho	0.19 9	0.43	
Trachurus trecae	0.09 9	0.20	
Fistularia petimba	0.04 4	0.09	
Total	44.23	100.00	

PROJECT STATION: 122
 DATE: 31/ 8/00 GEAR TYPE: PT No:4 POSITION: Lat N 609 Long E 150
 start stop duration
 TIME :00:35:14 01:05:19 30 (min) Purpose code: 1
 LOG :1365.21 1367.11 1.90 Area code : 4
 FDEPTH: 0 0 GearCond.code: 8
 BDEPTH: 33 51 Validity code: 1
 Towing dir: 0° Wire out: 150 m Speed: 35 kn*10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Chloroscombrus chrysurus	111.04 1120	40.88	341
Engraulis encrasicolus	98.08 43156	36.11	340
Sardinella maderensis	41.04 306	15.11	337
Sardinella aurita	10.24 1128	3.77	338
Sardinella maderensis	5.28 392	1.94	339
Alectis alexandrinus	2.16 2	0.80	
Selar crumenophthalmus	0.96 8	0.35	
Brachydeuterus auritus	0.64 64	0.24	
Ariomma bondi	0.64 8	0.24	
Saurida brasiliensis	0.64 128	0.24	
Ilisha africana	0.32 16	0.12	
Sardinella aurita	0.20 2	0.07	
Alloteuthis africana	0.16 56	0.06	
Decapterus punctatus	0.16 40	0.06	
Selene dorsalis	0.08 8	0.03	
Total	271.64	100.02	

PROJECT STATION: 123
 DATE: 31/ 8/00 GEAR TYPE: BT No:7 POSITION: Lat N 616 Long E 238
 start stop duration
 TIME :07:21:25 07:50:46 29 (min) Purpose code: 3
 LOG :1431.32 1433.11 1.78 Area code : 4
 FDEPTH: 25 30 GearCond.code: 4
 BDEPTH: 25 30 Validity code: 1
 Towing dir: 180° Wire out: 90 m Speed: 30 kn*10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Ilisha africana	55.08 6528	43.91	
Pseudolithus senegalensis	13.24 19	10.55	343
Engraulis encrasicolus	8.88 5992	7.08	
Pomadourus jubelini	7.86 10	6.27	
Galeoides decadactylus	5.65 70	4.50	
Pagrus caeruleostictus	5.50 8	4.38	342
Chloroscombrus chrysurus	5.26 635	4.19	
Selene dorsalis	4.24 221	3.38	
Albula vulpes	3.64 10	2.90	
Pteroscion peli	3.64 81	2.90	
Trichiurus lepturus	3.23 372	2.57	
Uranoscopus polli	2.03 10	1.62	
Balistes caprisus	1.41 10	1.12	
Brachydeuterus auritus	1.22 70	0.97	
Cynoglossus sp.	1.16 2	0.92	
Sphyraena sphyraena	0.81 21	0.65	
Raja miraletus	0.74 2	0.59	
Eucinostomus melanopterus	0.60 10	0.48	
Lutjanus goreensis	0.54 2	0.43	
Trachinotus ovatus	0.21 31	0.17	
Naucrates ductor	0.21 21	0.17	
Sardinella maderensis	0.21 21	0.17	
Grammolites gruvelli	0.10 10	0.08	
Total	125.46	100.00	

PROJECT STATION: 124
 DATE: 31/ 8/00 GEAR TYPE: ET No:7 POSITION: Lat N 612 Long E 237
 start stop duration
 TIME :08:50:00 09:08:15 18 (min) Purpose code: 3
 LOG :1438.50 1439.50 0.98 Area code : 4
 FDEPTH: 43 53 GearCond.code: 9
 BDEPTH: 43 53 Validity code: 1
 Towing dir: 180° Wire out: 150 m Speed: 30 kn*10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Selene dorsalis	22.53 253	18.65	
Chloroscombrus chrysurus	20.53 250	16.99	
Sphyraena guachancho	18.40 117	15.23	
Rhizoprionodon acutus	14.07 3	11.64	
Brachydeuterus auritus	10.13 307	8.38	346
Alectis alexandrinus	7.33 10	6.07	
Galeoides decadactylus	4.47 90	3.70	344
Alloteuthis africana	4.33 760	3.58	
Trichiurus lepturus	3.87 63	3.20	
Sardinella maderensis	2.20 93	1.82	345
Caranx hippos	2.07 7	1.71	
Trachurus trecae	2.00 3	1.66	
Pseudupeneus prayensis	1.80 17	1.49	
Sepia officinalis hierredda	1.67 7	1.38	
Eucinostomus melanopterus	1.33 7	1.10	
Ephippion guttifer	1.13 3	0.94	
Ilisha africana	0.60 30	0.50	
Penaeus notialis	0.60 13	0.50	
Pseudolithus senegalensis	0.60 3	0.50	
Pagrus caeruleostictus	0.47 3	0.39	
Scyllium microrum	0.33 13	0.27	
Drepane africana	0.33 10	0.27	
Scyllarides herklotsii	0.03 7	0.02	
Total	120.82	99.99	

PROJECT STATION: 125
 DATE: 31/ 8/00 GEAR TYPE: BT No:7 POSITION: Lat N 609 Long E 238
 start stop duration
 TIME :10:03:24 10:32:00 29 (min) Purpose code: 3
 LOG :1445.22 1446.74 1.49 Area code : 4
 FDEPTH: 71 91 GearCond.code: 4
 BDEPTH: 71 91 Validity code: 1
 Towing dir: 180° Wire out: 240 m Speed: 30 kn*10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Boops boops	585.52 15004	37.23	
Decapterus punctatus	418.97 16603	26.64	
Sardinella aurita	195.52 8845	12.43	347
Dentex congoensis	190.34 4345	12.10	348
Priacanthus arenatus	74.48 569	4.74	
Sepia officinalis hierredda	33.06 41	2.10	
Ariomma bondi	22.76 517	1.45	
Branchiostegus semifasciatus	13.45 52	0.86	
Selar crumenophthalmus	13.45 259	0.86	
Fistularia petimba	5.17 52	0.33	
Alectis alexandrinus	4.55 6	0.29	
Erotula barbata	4.51 4	0.29	
Epinephelus aeneus	3.43 2	0.22	
Trigla lyra	3.10 52	0.20	
Pseudupeneus prayensis	2.07 52	0.13	
Squatina oculata	1.12 2	0.07	
Dentex canariensis	1.08 2	0.07	
Total	1572.58	100.01	

PROJECT STATION: 126
 DATE: 31/ 8/00 GEAR TYPE: BT No:7 POSITION: Lat N 606 Long E 229
 start stop duration
 TIME :13:41:09 14:11:10 30 (min) Purpose code: 3
 LOG :1468.54 1469.98 1.40 Area code : 4
 FDEPTH: 125 113 GearCond.code: 4
 BDEPTH: 125 113 Validity code: 1
 Towing dir: 70° Wire out: 430 m Speed: 30 kn*10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Dentex congoensis	135.04 2186	46.05	350
Dentex angolensis	112.80 564	38.47	349
Squatina oculata	20.00 4	6.82	
Zeus faber	10.32 8	3.52	
Erotula barbata	3.76 10	1.28	
Uranoscopus polli	3.20 56	1.09	
Spicara alta	1.84 24	0.63	
Sepia officinalis hierredda	1.68 44	0.57	
Dentex canariensis	1.60 4	0.55	
Priacanthus arenatus	1.28 12	0.44	
Lepidotrigla cadmani	0.80 16	0.27	
Citharus linguatula	0.48 20	0.16	
Fistularia petimba	0.40 4	0.14	
Raja miraletus	0.04 4	0.01	
Total	293.24	100.00	

PROJECT STATION: 127
 DATE: 31/ 8/00 GEAR TYPE: PT No:4 POSITION: Lat N 604 Long E 130
 start stop duration
 TIME :21:52:35 22:22:18 30 (min) Purpose code: 1
 LOG :1542.38 1543.82 1.38 Area code : 3
 FDEPTH: 2 2 GearCond.code: 3
 BDEPTH: 47 42 Validity code: 1
 Towing dir: 280° Wire out: 150 m Speed: 30 kn*10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Engraulis encrasicolus	182.40 66028	49.61	353
Alectis alexandrinus	142.56 108	38.77	
Scomberomorus titor	11.44 12	3.11	
Chloroscombrus chrysurus	9.60 126	2.61	
Brachydeuterus auritus	9.24 1398	2.51	
Sardinella maderensis	4.32 234	1.17	351
Saurida brasiliensis	3.36 774	0.91	
Alloteuthis africana	1.92 534	0.52	
Sardinella aurita	1.32 282	0.36	352
Decapterus punctatus	0.48 30	0.13	
Ariomma bondi	0.36 6	0.10	
Selar crumenophthalmus	0.36 6	0.10	
Sepia officinalis hierredda	0.24 18	0.07	
Lagocephalus laevigatus	0.06 6	0.02	
Total	367.66	99.99	

PROJECT STATION: 128
 DATE: 1/ 9/00 GEAR TYPE: PT No:4 POSITION: Lat N 556 Long E 119
 start stop duration
 TIME :00:50:32 01:20:21 30 (min) Purpose code: 1
 LOG :1563.85 1565.31 1.43 Area code : 3
 FDEPTH: 0 0 GearCond.code: 3
 BDEPTH: 298 72 Validity code: 1
 Towing dir: 334° Wire out: 150 m Speed: 35 kn*10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Epigonus telescopus	6.78 264	35.20	
Gempylus serpens	4.62 218	23.99	
Ommastrephes pteropus	2.68 44	13.91	
Hypoclydonia bella	1.54 48	8.00	
Todaropsis eblanae	1.48 40	7.68	
Ariomma bondi	1.12 20	5.82	
Priacanthus arenatus	0.40 16	2.08	
Sardinella aurita	0.30 2	1.56	
MYCTOPHIDAE	0.20 2	1.04	
Chilomycterus sp.	0.08 2	0.42	
Brama brama	0.06 2	0.31	
Total	19.26	100.01	

DATE: 1/9/00 GEAR TYPE: BT No:7 POSITION: Lat N 609 Long E 134
start stop duration
TIME :06:32:26 07:02:13 30 (min) Purpose code: 3
LOG :1596.34 1598.10 1.74 Area code : 3
FDEPTH: 21 27 GearCond.code: 3
BDEPTH: 21 27 Validity code: 94
Towing dir: 174° Wire out: 90 m Speed: 30 kn*10

Sorted: 76 Kg Total catch: 75.69 CATCH/HOUR: 151.38

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	88.74 43688	58.62	354
Sepia officinalis hierredda	19.80 16	13.08	
Alectis alexandrinus	18.28 28	12.08	
Selene dorsalis	6.36 16	4.20	
Pagrus caeruleostictus	4.60 8	3.04	
Chloroscombrus chrysurus	2.40 22	1.59	
Sardinella maderensis	2.20 220	1.45	
Sardinella aurita	2.20 220	1.45	
Torpedo torpedo	1.40 2	0.92	
Elops lactota	1.12 2	0.74	
Dentex canariensis	1.00 2	0.66	
MONACANTHIDAE	0.92 2	0.61	
Priacanthus arenatus	0.68 4	0.45	
Uranoscopus polli	0.60 2	0.40	
Aluterus blankerti	0.40 2	0.26	
Fistularia petimba	0.32 2	0.21	
Decapterus punctatus	0.24 2	0.16	
Eucinostomus melanopterus	0.08 2	0.05	
Total	151.34	99.97	

DATE: 1/9/00 GEAR TYPE: BT No:7 POSITION: Lat N 605 Long E 135
start stop duration
TIME :08:02:50 08:09:13 6 (min) Purpose code: 3
LOG :1600.28 1600.66 0.37 Area code : 3
FDEPTH: 43 44 GearCond.code: 9
BDEPTH: 43 44 Validity code: 9
Towing dir: 225° Wire out: 150 m Speed: 30 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
N O C A T C H	0.00		
Total			

DATE: 1/9/00 GEAR TYPE: BT No:7 POSITION: Lat N 605 Long E 136
start stop duration
TIME :08:52:49 09:22:06 29 (min) Purpose code: 3
LOG :1603.29 1604.84 1.52 Area code : 3
FDEPTH: 49 46 GearCond.code: 3
BDEPTH: 49 46 Validity code: 9
Towing dir: 70° Wire out: 150 m Speed: 30 kn*10

Sorted: 102 Kg Total catch: 102.39 CATCH/HOUR: 211.84

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Pagrus caeruleostictus	69.10 103	32.62	355
Selene dorsalis	57.93 176	27.35	
Epinephelus aeneus	15.56 10	7.35	
Dentex canariensis	12.79 27	6.04	
Alectis alexandrinus	2.94 6	1.39	
Umbra canariensis	8.69 17	4.10	
Lutjanus fulgens	6.04 6	2.85	
Alloteuthis africana	4.82 2748	2.28	
Brachydeuterus auritus	3.52 300	1.65	
Epinephelus guaza	1.36 2	0.63	
Sepia officinalis hierredda	1.32 2	0.62	
Dactylopterus volitans	2.86 4	1.35	
Fistularia petimba	2.48 4	1.17	
Cymbium sp.	2.13 10	1.01	
Sphyrna guanchancho	1.94 2	0.92	
Aluterus blankerti	1.46 2	0.68	
Sphyrna sphyrna	1.12 4	0.53	
Torpedo torpedo	1.08 2	0.51	
Bothus podas africanus	1.03 56	0.49	
Pagellus bellottii	0.83 14	0.39	
Seriola dumerilii	0.79 2	0.37	
Pagellus sp.	0.79 2	0.37	
Balistes capricus	0.66 2	0.31	
Chloroscombrus chrysurus	0.66 8	0.31	
Raja miraletus	0.62 2	0.29	
Sea urchins (strong spines)	0.50 8	0.24	
Saurida brasiliensis	0.41 95	0.19	
Selar crumenophthalmus	0.29 2	0.14	
Citharus linguatula	0.25 14	0.12	
Grammolites gruvelli	0.12 12	0.06	
Decapterus macarellus	0.08 56	0.06	
Serranus accraensis	0.08 6	0.04	
Ephippion guttifer	0.04 2	0.02	
Trichurus lepturus	0.02 4	0.01	
Total	211.84	100.02	

DATE: 1/9/00 GEAR TYPE: BT No:7 POSITION: Lat N 602 Long E 136
start stop duration
TIME :10:19:34 10:33:09 14 (min) Purpose code: 3
LOG :1609.72 1610.46 0.73 Area code : 3
FDEPTH: 67 77 GearCond.code: 3
BDEPTH: 67 77 Validity code: 9
Towing dir: 204° Wire out: 220 m Speed: 30 kn*10

Sorted: 41 Kg Total catch: 41.15 CATCH/HOUR: 176.36

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Trachurus trecae	90.60 1869	51.37	356
Squatina oculata	26.49 9	15.02	
Alloteuthis africana	18.26 3956	10.35	
Dentex congoensis	12.34 437	7.00	357
Scomberomorus tritor	7.71 4	4.37	
Boops boops	4.11 81	2.33	
Dentex angolensis	3.51 30	1.99	
Fistularia petimba	1.17 9	0.63	
Sepia officinalis hierredda	3.17 4	1.80	
Decapterus punctatus	3.17 4	1.80	
Sardinella aurita	2.91 103	1.65	
Chilomycterus sp.	1.89 43	1.07	
Lepidotrigla cadmani	1.63 4	0.92	
Aluterus blankerti	0.26 9	0.15	
Priacanthus arenatus	0.26 4	0.15	
Ariomma bondi	0.04 26	0.02	
Total	176.35	99.99	

DATE: 1/9/00 GEAR TYPE: BT No:7 POSITION: Lat N 557 Long E 121
start stop duration
TIME :12:54:23 13:24:17 30 (min) Purpose code: 3
LOG :1630.78 1632.29 1.48 Area code : 3
FDEPTH: 94 81 GearCond.code: 3
BDEPTH: 94 81 Validity code: 94
Towing dir: 60° Wire out: 310 m Speed: 30 kn*10

Sorted: 93 Kg Total catch: 223.43 CATCH/HOUR: 446.86

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Dentex congoensis	292.56 5902	65.47	360
Dentex angolensis	60.12 666	13.45	359
Dentex canariensis	16.92 18	3.79	358
Squatina oculata	12.20 2	2.73	
Dentex canariensis	9.96 36	2.23	362
Fistularia petimba	9.68 20	2.17	
Trachurus trecae	9.24 180	2.07	361
Mustelus mustelus	7.00 2	1.57	
Lepidotrigla cadmani	5.40 78	1.21	
Dentex gibbosus	4.44 6	0.99	
Raja miraletus	2.28 6	0.51	
Epinephelus aeneus	2.24 2	0.50	
zeus faber	2.04 4	0.46	
Priacanthus arenatus	1.98 6	0.45	
Sepia officinalis hierredda	1.56 66	0.35	
Chaetodon marcellae	1.44 48	0.32	
Epinephelus haifensis	1.32 6	0.30	
Brotula barbata	1.28 20	0.29	
Uranoscopus polli	1.08 12	0.24	
Sepia officinalis hierredda	1.08 2	0.24	
Lophiodon kempi	0.84 12	0.19	
Ommastrephes pteropus	0.72 12	0.16	
Branchiostegus semifasciatus	0.64 2	0.14	
Fistularia petimba	0.48 6	0.11	
Bothus podas africanus	0.24 60	0.05	
Grammolites gruvelli	0.24 6	0.05	
Calappa pelii	0.12 6	0.03	
MONACANTHIDAE	0.06 6	0.01	
Total	446.86	100.01	

DATE: 1/9/00 GEAR TYPE: BT No:7 POSITION: Lat N 601 Long E 120
start stop duration
TIME :14:36:59 15:00:14 23 (min) Purpose code: 3
LOG :1638.43 1639.47 1.02 Area code : 3
FDEPTH: 48 44 GearCond.code: 3
BDEPTH: 48 44 Validity code: 9
Towing dir: 250° Wire out: 180 m Speed: 30 kn*10

Sorted: 69 Kg Total catch: 69.01 CATCH/HOUR: 180.03

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Pagellus bellottii	34.80 402	19.33	365
Sepia officinalis hierredda	24.52 44	13.62	
Pagrus caeruleostictus	23.01 188	12.78	363
Dentex canariensis	19.30 34	10.72	364
Pagrus africanus	12.95 23	10.69	367
Alectis alexandrinus	8.09 5	4.49	
Fistularia petimba	7.57 60	4.20	
Octopus vulgaris	6.52 3	3.62	
Raja miraletus	5.50 13	3.06	
Sardinella aurita	5.11 146	2.84	366
Alloteuthis africana	4.80 1414	2.67	
Aluterus blankerti	4.59 10	2.55	
Caranx crysos	2.97 3	1.65	
Dactylopterus volitans	2.56 8	1.42	
Epinephelus aeneus	2.03 5	1.13	
Chilomycterus spinosus mauret.	1.98 8	1.10	
Balistes punctatus	1.72 3	0.96	
Syacium micrusaur	1.67 115	0.93	
Lepidotrigla cadmani	0.99 50	0.55	
Citharus linguatula	0.99 57	0.55	
Pseudupeneus prayensis	0.78 16	0.43	
Grammolites gruvelli	0.52 39	0.29	
Ephippion guttifer	0.42 10	0.23	
Serranus accraensis	0.31 10	0.17	
Total	180.00	99.98	

DATE: 1/9/00 GEAR TYPE: BT No:7 POSITION: Lat N 603 Long E 118
start stop duration
TIME :15:45:47 16:15:35 30 (min) Purpose code: 3
LOG :1643.14 1644.67 1.52 Area code : 3
FDEPTH: 27 26 GearCond.code: 3
BDEPTH: 27 26 Validity code: 9
Towing dir: 80° Wire out: 140 m Speed: 30 kn*10

Sorted: 122 Kg Total catch: 239.94 CATCH/HOUR: 479.88

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Dactylopterus volitans	200.64 594	41.81	
Sea urchins (strong spines)	56.08 616	11.69	
Dentex canariensis	54.40 112	11.34	369
Sepia officinalis hierredda	48.40 100	10.09	
Balistes capricus	32.08 112	6.89	
Balistes punctatus	12.88 24	2.68	
Pagrus caeruleostictus	12.32 44	2.57	368
Scomberomorus tritor	8.52 4	1.78	
Sphyrna sphyrna	7.36 20	1.53	
Lagoocephalus laevigatus	6.64 16	1.38	
Ephippion guttifer	4.32 4	0.90	
Fistularia petimba	4.08 32	0.85	
MONACANTHIDAE	4.08 12	0.85	
Alectis alexandrinus	3.92 12	0.82	
Sea cucumbers	3.20 4	0.67	
Aluterus blankerti	2.80 4	0.58	
Acanthostracion quadricornis	2.64 16	0.55	
Chilomycterus spinosus mauret.	2.32 8	0.48	
Torpedo torpedo	2.16 4	0.45	
Raja miraletus	2.00 4	0.42	
Diodon holocanthus	2.00 4	0.42	
Albula vulpes	1.92 4	0.40	
Sphyrna guanchancho	1.92 4	0.40	
Selene dorsalis	1.44 4	0.30	
Fistularia tabacaria	0.96 4	0.20	
Pseudupeneus prayensis	0.56 8	0.12	
Xyrichtys novacula	0.24 4	0.05	
Total	479.88	100.02	

PROJECT STATION: 136
 DATE: 1/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 553 Long E 116
 start stop duration
 TIME :18:51:25 19:21:57 31 (min) Purpose code: 3
 LOG :1662.64 1664.34 1.69 Area code : 3
 FDEPTH: 287 299 GearCond.code:
 BDEPTH: 287 299 Validity code:
 Towing dir: 45ø Wire out: 850 m Speed: 30 kn*10
 Sorted: 130 Kg Total catch: 163.00 CATCH/HOUR: 315.48

PROJECT STATION: 139
 DATE: 2/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 551 Long E 109
 start stop duration
 TIME :05:53:01 06:23:08 30 (min) Purpose code: 3
 LOG :1724.17 1725.88 1.68 Area code : 2
 FDEPTH: 83 72 GearCond.code:
 BDEPTH: 83 72 Validity code:
 Towing dir: 240ø Wire out: 300 m Speed: 30 kn*10
 Sorted: 103 Kg Total catch: 166.22 CATCH/HOUR: 332.44

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Rhizoprionodon acutus	106.61 31	33.79	
Squatina oculata	76.14 72	24.13	
Chlorophthalmus atlanticus	24.39 412	7.73	
Torpedo marmorata	14.71 12	4.66	
Xenomystax sp.	14.52 97	4.60	
Sea urchins (strong spines)	9.58 93	3.04	
Parasudis sp.	7.94 194	2.52	
Parapenaeus longirostris	7.94 461	2.52	
Dactylopterus volitans	7.65 25	2.42	
Zenion hololepis	7.55 1248	2.39	
Pterothrissus belloci	5.90 45	1.87	
Brotula barbata	5.69 6	1.80	
Promethichthys prometheus	3.77 25	1.20	
Trigla lyra	3.77 29	1.20	
Malacocephalus occidentalis	3.48 35	1.10	
Aristeus variidens	2.63 130	0.83	
Raja straeleni	2.48 8	0.79	
Grammolites gruvelli	2.13 15	0.68	
Lophiodes kempfi	2.03 6	0.64	
Plesionika martia	1.84 703	0.58	
C R A B S	1.86 35	0.59	
Todarodes sagittatus	1.06 6	0.34	
Cyttopsis roseus	0.77 45	0.24	
Fistularia petimba	0.58 6	0.18	
Epigonus telescopus	0.58 15	0.18	
Unidentified fish	0.29 74	0.09	
Monolene microstoma	0.19 19	0.06	
Dibranchius atlanticus	0.10 10	0.03	
Scyliorhinus canicula	0.10 6	0.03	
Total	315.48	99.98	

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Dentex congoensis	80.28 1920	24.15	377
Epinephelus aeneus	73.28 10	22.04	
Squatina oculata	61.40 36	18.47	
Ariomma bondi	43.32 702	13.03	
Dentex angolensis	26.16 714	7.87	
Trachurus trecae	15.24 342	4.58	376
Sepia officinalis hierredda	6.52 14	1.96	
Monolene microstoma	5.40 12	1.62	
Sarda sarda	2.96 2	0.89	
Fistularia petimba	2.62 8	0.79	
Chelidonichthys lucerna	2.16 72	0.65	
Sepia officinalis hierredda	1.92 90	0.58	
Zeus faber	1.92 6	0.58	
Uranoscopus polli	1.80 6	0.54	
Chilomycterus spinosus mauret.	1.56 6	0.47	
Priacanthus arenatus	1.56 18	0.47	
Grammolites gruvelli	1.44 54	0.43	
Calappa pelii	1.44 12	0.43	
MURAENIDAE	0.36 6	0.11	
Boops boops	0.32 6	0.10	
Todarodes sagittatus	0.24 6	0.07	
Lophiodes kempfi	0.24 6	0.07	
Microchirus frechkopi	0.12 6	0.04	
C R A B S	0.06 138	0.02	
Unidentified fish	0.06 6	0.02	
Gobius sp	0.06 6	0.02	
Total	332.44	100.00	

PROJECT STATION: 137
 DATE: 1/ 9/00 GEAR TYPE: PT No:6 POSITION:Lat N 559 Long E 110
 start stop duration
 TIME :22:08:21 22:38:15 30 (min) Purpose code: 1
 LOG :1687.58 1689.26 1.65 Area code : 2
 FDEPTH: 2 2 GearCond.code:
 BDEPTH: 37 32 Validity code:
 Towing dir: 260ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 38 Kg Total catch: 727.88 CATCH/HOUR: 1455.76

PROJECT STATION: 140
 DATE: 2/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 553 Long E 106
 start stop duration
 TIME :07:20:41 07:50:14 30 (min) Purpose code: 3
 LOG :1731.05 1732.52 1.45 Area code : 2
 FDEPTH: 46 43 GearCond.code:
 BDEPTH: 46 43 Validity code:
 Towing dir: 20ø Wire out: 1737 m Speed: 50 kn*10
 Sorted: 57 Kg Total catch: 57.23 CATCH/HOUR: 114.46

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	1340.24 337030	92.06	370
Sardinella maderensis	38.72 1672	2.66	372
Decapterus macarellus	18.48 1452	1.27	373
Decapterus punctatus	14.96 352	1.03	
Sardinella aurita	13.20 1760	0.91	371
Alectis alexandrinus	10.80 8	0.74	
Saurida brasiliensis	7.04 1320	0.48	
Chloroscombrus chrysurus	5.28 88	0.36	
Alloteuthis africana	3.52 484	0.24	
Selar crumenophthalmus	1.76 44	0.12	
Scomber japonicus	1.76 176	0.12	
Total	1455.76	99.99	

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Selene dorsalis	31.12 66	28.94	378
Pagrus caeruleostictus	22.16 346	19.26	
Alloteuthis africana	16.28 178	14.22	
Fistularia petimba	10.16 106	8.88	
Alectis alexandrinus	7.88 8	6.88	
Sepia officinalis hierredda	6.52 16	5.70	
Dentex canariensis	3.32 10	2.90	
Epinephelus aeneus	2.72 2	2.38	
Pagrus africanus	2.16 4	1.89	
Chilomycterus spinosus mauret.	1.72 12	1.50	
Dactylopterus volitans	1.48 4	1.29	
Syacium micrum	1.20 108	1.05	
Pagellus bellottii	0.92 20	0.80	
Sea cucumbers	0.80 2	0.70	
Priacanthus arenatus	0.76 6	0.66	
Grammolites gruvelli	0.64 44	0.56	
Decapterus macarellus	0.60 70	0.52	
Saurida brasiliensis	0.60 166	0.52	
Ariomma bondi	0.36 4	0.31	
Pseudupeneus prayensis	0.28 6	0.24	
Serranus accraensis	0.14 8	0.12	
Dentex congoensis	0.12 2	0.10	
Penaeus notialis	0.12 8	0.10	
Citharus linguatula	0.12 10	0.10	
Lepidotrigla carolae	0.10 10	0.09	
Pecten jacobus	0.04 2	0.03	
Chloroscombrus chrysurus	0.04 2	0.03	
Microchirus frechkopi	0.04 2	0.03	
Scyllarides herklotsii	0.02 6	0.02	
Scorpaena scrofa	0.02 2	0.02	
Raja miraletus	0.02 2	0.02	
Total	114.46	99.96	

PROJECT STATION: 138
 DATE: 2/ 9/00 GEAR TYPE: PT No:4 POSITION:Lat N 545 Long W 103
 start stop duration
 TIME :01:05:58 01:35:47 30 (min) Purpose code: 1
 LOG :1709.55 1711.37 1.81 Area code : 2
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 121 556 Validity code:
 Towing dir: 360ø Wire out: 150 m Speed: 35 kn*10
 Sorted: 31 Kg Total catch: 31.42 CATCH/HOUR: 62.84

PROJECT STATION: 141
 DATE: 2/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 555 Long E 103
 start stop duration
 TIME :08:53:32 09:21:26 28 (min) Purpose code: 3
 LOG :1738.27 1739.83 1.55 Area code : 2
 FDEPTH: 24 26 GearCond.code:
 BDEPTH: 24 26 Validity code:
 Towing dir: 200ø Wire out: 60 m Speed: 30 kn*10
 Sorted: 34 Kg Total catch: 67.70 CATCH/HOUR: 145.07

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Chelonia mydas	42.40 2	67.47	
Neolotus tripes	5.48 296	8.72	
Ariomma melanum	3.92 108	6.24	
Ommastrephes pteropus	3.24 64	5.16	
Euthynnus alletteratus	2.44 12	3.88	
Sardinella aurita	2.00 24	3.18	374
Sardinella maderensis	1.72 12	2.74	375
Hypoclydonia bella	0.28 14	0.45	
Scomber japonicus	0.28 2	0.45	
Promethichthys prometheus	0.24 18	0.38	
Ariomma bondi	0.24 4	0.38	
Unidentified fish	0.20 10	0.32	
Ariomma sp.	0.20 4	0.32	
Gempylus serpens	0.12 2	0.19	
Priacanthus arenatus	0.08 2	0.13	
Total	62.84	100.01	

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Chlamys purpuratus	124.97 4916	86.14	
Pagellus bellottii	6.94 1997	4.78	
Chloroscombrus chrysurus	3.51 9	2.42	
Pseudupeneus prayensis	2.57 26	1.77	
Decapterus macarellus	2.40 343	1.65	
Sepia officinalis hierredda	1.54 4	1.06	
Sardinella aurita	1.46 81	1.01	
Sardinella maderensis	0.77 17	0.53	
Alloteuthis africana	0.51 129	0.35	
Pagrus caeruleostictus	0.34 26	0.23	
C R A B S	0.04 4	0.03	
Total	145.05	99.97	

PROJECT STATION: 171
 DATE: 6/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 436
 start stop duration Long W 108
 TIME :12:50:26 13:20:12 30 (min) Purpose code: 3
 LOG :2354.29 2355.53 1.23 Area code : 2
 FDEPTH: 51 54 GearCond.code:
 BDEPTH: 51 54 Validity code:
 Towing dir: 250° Wire out: 180 m Speed: 30 kn*10
 Sorted: 35 Kg Total catch: 34.69 CATCH/HOUR: 69.38

PROJECT STATION: 174
 DATE: 6/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 442
 start stop duration Long W 130
 TIME :18:28:20 18:34:54 7 (min) Purpose code: 3
 LOG :2387.91 2388.14 0.21 Area code : 2
 FDEPTH: 47 47 GearCond.code:
 BDEPTH: 47 47 Validity code:
 Towing dir: 278° Wire out: 110 m Speed: 30 kn*10
 Sorted: 329 Kg Total catch: 328.63 CATCH/HOUR: 2816.83

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Dactylopterus volitans	12.48	17.99	
Sea urchins (weak spines)	11.32	16.32	
Sepia officinalis hierredda	10.00	14.41	
Pseudupeneus prayensis	5.20	7.49	462
Alloteuthis africana	4.80	6.92	
Boops boops	4.22	6.08	
Mustelus mustelus	3.36	4.84	
Fistularia petimba	3.16	4.55	
Sea urchins (strong spines)	2.56	3.69	
Torpedo torpedo	1.96	2.83	
Pagellus bellottii	1.80	2.59	1
Chlamys purpuratus	1.44	2.08	
Trachinocephalus myops	1.28	1.84	
Paraconger notialis	1.20	1.73	
Chelidonichthys gabonensis	0.68	0.98	
Priacanthus arenatus	0.60	0.86	
Zeus faber	0.52	0.75	
MONACANTHIDAE	0.44	0.63	
Arnoglossus capensis	0.36	0.52	
Kyrichtys novacula	0.32	0.46	
Pagrus caeruleostictus	0.32	0.46	
Balistes capricus	0.24	0.35	
Trachinus lineolatus	0.20	0.29	
Rypticus saponaceus	0.20	0.29	
Bothus podas africanus	0.16	0.23	
Grammolites gruvelli	0.16	0.23	
Coris julis	0.12	0.17	
Scorpaena scrofa	0.12	0.17	
Arnoglossus imperialis	0.08	0.12	
Chaetodon marcellae	0.08	0.12	
Total	69.38	99.99	

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Seriola dumerili	1390.97	49.38	463
Dasyatis pastinaca	248.57	8.82	
Lutjanus fulgens	207.60	7.37	465
Dentex canariensis	204.34	7.25	468
Boops boops	174.00	6.18	464
Mycteroperca rubra	101.66	3.61	
Pagrus caeruleostictus	98.23	3.49	466
Mustelus mustelus	89.14	3.16	
Lethrinus atlanticus	79.20	2.81	
Dasyatis marmorata	37.71	1.34	
Plectorhynchus mediterraneus	36.69	1.30	
Pseudupeneus prayensis	32.23	1.14	467
Decapterus punctatus	28.11	1.00	469
Lethrinus atlanticus	17.31	0.61	
Syacium micrum	12.00	0.43	
Pomadasys incisus	9.43	0.33	
Balistes capricus	8.66	0.31	
Dactylopterus volitans	7.89	0.28	
Decapterus rhonchus	7.20	0.26	
Chromis cadenati	4.11	0.15	
Acanthostracion quadricornis	3.94	0.14	
Priacanthus arenatus	3.60	0.13	
Pagrus caeruleostictus	3.26	0.12	
Sargocentron hastatus	2.57	0.09	
Acanthurus monroviae	1.54	0.05	
Grammolites gruvelli	1.54	0.05	
Alloteuthis africana	1.54	0.05	
Chaetodon hoefleri	1.03	0.04	
Sepia officinalis hierredda	0.86	0.03	
Chelidonichthys gabonensis	0.69	0.02	
Squilla mantis	0.34	0.01	
Serranus accraensis	0.17	0.01	
Monochirus hispidus	0.17	0.01	
Saurida brasiliensis	0.09	0.00	
Total	2816.39	99.97	

PROJECT STATION: 172
 DATE: 6/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 430
 start stop duration Long W 120
 TIME :15:24:21 15:54:11 30 (min) Purpose code: 3
 LOG :2369.64 2370.80 1.13 Area code : 2
 FDEPTH: 55 55 GearCond.code:
 BDEPTH: 55 55 Validity code:
 Towing dir: 270° Wire out: 200 m Speed: 30 kn*10
 Sorted: 107 Kg Total catch: 1129.67 CATCH/HOUR: 2259.34

PROJECT STATION: 175
 DATE: 6/ 9/00 GEAR TYPE: PT No:6 POSITION:Lat N 446
 start stop duration Long W 122
 TIME :20:59:14 21:30:04 31 (min) Purpose code: 1
 LOG :2407.25 2409.73 2.42 Area code : 2
 FDEPTH: 2 2 GearCond.code:
 BDEPTH: 42 42 Validity code:
 Towing dir: 150° Wire out: 150 m Speed: 30 kn*10
 Sorted: 12 Kg Total catch: 12.11 CATCH/HOUR: 23.44

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Chromis cadenati	844.20	37.36	
Priacanthus arenatus	730.60	32.34	
Pomadasys incisus	306.54	13.57	
Acanthurus monroviae	199.60	8.83	
Apsilus fuscus	34.96	1.55	
Fistularia petimba	24.82	1.10	
Aluterus blankerti	22.80	1.01	
Pagellus bellottii	16.20	0.72	
Balistes capricus	12.16	0.54	
Dactylopterus volitans	11.64	0.52	
Dentex canariensis	8.44	0.37	
Stephanolepis hispidus	7.08	0.31	
Pagrus caeruleostictus	6.52	0.29	
Sepia officinalis hierredda	5.68	0.25	
Lutjanus fulgens	5.40	0.24	
Trachinocephalus myops	5.06	0.22	
Dasyatis marmorata	2.90	0.13	
Lepidotrigla cadmani	2.60	0.12	
Zeus faber	2.52	0.11	
Epinephelus aeneus	2.36	0.10	
Dentex gibbosus	2.08	0.09	
Bothus podas africanus	1.52	0.07	
Raja miraletus	1.40	0.06	
Coris julis	1.24	0.05	
Pagellus bellottii	1.08	0.05	
Total	2259.40	100.00	

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Scomber japonicus	11.15	47.57	471
Decapterus punctatus	4.03	17.19	470
Sardinella aurita	3.91	16.68	472
Caranx crysos	2.63	11.22	
Lagocephalus laevigatus	1.08	4.61	
Trachurus trecae	0.33	1.41	
Rachycentron canadum	0.31	1.32	
Total	23.44	100.00	

PROJECT STATION: 176
 DATE: 7/ 9/00 GEAR TYPE: PT No:4 POSITION:Lat N 447
 start stop duration Long W 147
 TIME :02:17:40 02:42:56 25 (min) Purpose code: 1
 LOG :2445.05 2446.60 1.53 Area code : 2
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 38 39 Validity code:
 Towing dir: 200° Wire out: 160 m Speed: 36 kn*10
 Sorted: 38 Kg Total catch: 522.76 CATCH/HOUR: 1254.62

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	957.60	76.33	473
Sardinella maderensis	164.88	13.14	475
Sardinella aurita	30.24	2.41	474
Scomber japonicus	28.08	2.24	477
Trachurus trecae	26.64	2.12	476
Brachydeuterus auritus Juv.	10.80	0.86	
Brachydeuterus auritus	8.64	0.69	
Sarda sarda	7.58	0.60	
Saurida brasiliensis	4.32	0.34	
Priacanthus arenatus	2.88	0.23	
Trichiurus lepturus	2.88	0.23	
Selene dorsalis	2.88	0.23	
Chloroscombrus chrysurus	2.88	0.23	
Decapterus punctatus	2.16	0.17	
Alloteuthis africana	1.44	0.11	
Sepia officinalis hierredda	0.72	0.06	
Total	1254.62	99.99	

PROJECT STATION: 173
 DATE: 6/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 441
 start stop duration Long W 131
 TIME :17:41:46 17:46:36 5 (min) Purpose code: 3
 LOG :2385.40 2385.72 0.30 Area code : 2
 FDEPTH: 48 47 GearCond.code: 9
 BDEPTH: 48 47 Validity code: 9
 Towing dir: 318° Wire out: 180 m Speed: 30 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
N O C A T C H	0.00		
Total			

PROJECT STATION: 177
 DATE: 7/ 9/00 GEAR TYPE: PT No:4 POSITION:Lat N 435
 start stop duration Long W 147
 TIME :04:40:16 05:04:10 24 (min) Purpose code: 1
 LOG :2458.87 2460.14 1.25 Area code : 2
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 59 57 Validity code:
 Towing dir: 300° Wire out: 160 m Speed: 36 kn*10
 Sorted: 4 Kg Total catch: 3.64 CATCH/HOUR: 9.10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardinella aurita	6.80	74.73	478
Lagocephalus laevigatus	1.00	10.99	
Scomber japonicus	0.85	9.34	
Auxis thazard	0.30	3.30	
Decapterus punctatus	0.10	1.10	
Priacanthus arenatus	0.05	0.55	
Total	9.10	100.01	

PROJECT STATION: 199
DATE: 9/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 505
start stop duration Long W 325
TIME :12:32:27 13:02:12 30 (min) Purpose code: 3
LOG :2814.59 2815.98 1.38 Area code : 1
FDEPTH: 40 39 GearCond.code:
BDEPTH: 40 39 Validity code:
Towing dir: 100ø Wire out: 150 m Speed: 30 kn*10

Sorted: 47 Kg Total catch: 47.05 CATCH/HOUR: 94.10

Table with 4 columns: SPECIES, CATCH/HOUR (weight, numbers), % OF TOT. C, SAMP. Lists species like Selene dorsalis, Pomadasys rogeri, etc.

PROJECT STATION: 202
DATE: 10/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 513
start stop duration Long W 406
TIME :11:40:27 13:20:11 30 (min) Purpose code: 3
LOG :2870.80 2872.21 1.37 Area code : 1
FDEPTH: 44 40 GearCond.code:
BDEPTH: 44 40 Validity code:
Towing dir: 260ø Wire out: 160 m Speed: 30 kn*10

Sorted: 41 Kg Total catch: 241.97 CATCH/HOUR: 483.94

Table with 4 columns: SPECIES, CATCH/HOUR (weight, numbers), % OF TOT. C, SAMP. Lists species like Pagellus bellottii, Trachurus trecae, etc.

PROJECT STATION: 200
DATE: 10/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 509
start stop duration Long W 343
TIME :08:20:06 08:21:07 29 (min) Purpose code: 3
LOG :2840.86 2842.27 1.40 Area code : 1
FDEPTH: 27 28 GearCond.code:
BDEPTH: 27 28 Validity code:
Towing dir: 275ø Wire out: 110 m Speed: 30 kn*10

Sorted: 47 Kg Total catch: 2170.28 CATCH/HOUR: 4490.24

Table with 4 columns: SPECIES, CATCH/HOUR (weight, numbers), % OF TOT. C, SAMP. Lists species like Brachydeuterus auritus, Trachurus trecae, etc.

PROJECT STATION: 203
DATE: 10/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 514
start stop duration Long W 405
TIME :14:29:16 14:59:10 30 (min) Purpose code: 3
LOG :2877.31 2878.89 1.54 Area code : 1
FDEPTH: 26 25 GearCond.code:
BDEPTH: 26 25 Validity code:
Towing dir: 270ø Wire out: 110 m Speed: 30 kn*10

Sorted: 50 Kg Total catch: 97.74 CATCH/HOUR: 195.48

Table with 4 columns: SPECIES, CATCH/HOUR (weight, numbers), % OF TOT. C, SAMP. Lists species like Pagellus bellottii, Sepia officinalis hierredda, etc.

PROJECT STATION: 201
DATE: 10/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 509
start stop duration Long W 405
TIME :10:01:23 11:41:03 30 (min) Purpose code: 3
LOG :2863.38 2864.97 1.59 Area code : 1
FDEPTH: 37 89 GearCond.code:
BDEPTH: 37 89 Validity code:
Towing dir: 270ø Wire out: 300 m Speed: 30 kn*10

Sorted: 149 Kg Total catch: 560.10 CATCH/HOUR: 1120.20

Table with 4 columns: SPECIES, CATCH/HOUR (weight, numbers), % OF TOT. C, SAMP. Lists species like Trachurus trecae, Uranoscopus albesca, etc.

PROJECT STATION: 204
DATE: 10/ 9/00 GEAR TYPE: BT No:7 POSITION:Lat N 511
start stop duration Long W 420
TIME :16:29:50 16:59:49 30 (min) Purpose code: 3
LOG :2893.30 2894.71 1.38 Area code : 1
FDEPTH: 24 26 GearCond.code:
BDEPTH: 24 26 Validity code:
Towing dir: 260ø Wire out: 110 m Speed: 30 kn*10

Sorted: 31 Kg Total catch: 1212.45 CATCH/HOUR: 2424.90

Table with 4 columns: SPECIES, CATCH/HOUR (weight, numbers), % OF TOT. C, SAMP. Lists species like Priacanthus arenatus, Trachurus trecae, juvenile, etc.

DATE:14/ 9/00 GEAR TYPE: BT No:2 PROJECT STATION: 240
 start stop duration POSITION:Lat N 425
 TIME :15:12:53 15:42:32 30 (min) Long W 716
 LOG :3445.87 3447.40 1.52 Purpose code: 3
 FDEPTH: 45 48 Area code : 1
 BDEPTH: 45 48 GearCond.code:
 Towing dir: 60° Wire out: 160 m Speed: 31 kn*10
 Sorted: 36 Kg Total catch: 252.62 CATCH/HOUR: 505.24

DATE:14/ 9/00 GEAR TYPE: PT No:6 PROJECT STATION: 243
 start stop duration POSITION:Lat N 420
 TIME :21:38:46 22:08:12 29 (min) Long W 713
 LOG :3480.92 3482.27 1.35 Purpose code: 1
 FDEPTH: 2 2 Area code : 1
 BDEPTH: 72 69 GearCond.code:
 Towing dir: 40° Wire out: 150 m Speed: 30 kn*10
 Sorted: 13 Kg Total catch: 39.20 CATCH/HOUR: 81.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	386.58	6374	76.51	639
Selene dorsalis	58.82	766	11.64	
Pagellus bellottii	18.36	222	3.63	640
Trachurus trecae	10.54	800	2.09	641
Trichiurus lepturus	10.20	4420	2.02	
Raja miraletus	3.36	6	0.67	
Grammolites gruvelli	3.06	120	0.61	
Pomadourus peroteti	2.16	2	0.43	
Zeus faber	1.96	2	0.39	
Sepia officinalis hierredda	1.88	2	0.37	
Galeoides decadactylus	1.56	4	0.31	
Octopus vulgaris	1.44	2	0.29	
Penaeus notialis	0.96	46	0.19	
Trachurus trecae, juvenile	0.68	544	0.13	
Sphyræna guachancho	0.52	4	0.10	
Cynoglossus canariensis	0.40	2	0.08	
Syacium micurum	0.40	2	0.08	
Brotula barbata	0.36	2	0.07	
Saurida brasiliensis	0.34	154	0.07	
Priacanthus arenatus	0.34	18	0.07	
Sardinella aurita - Juveniles	0.18	34	0.04	
C R A B S	0.18	18	0.04	
GOBIIDAE	0.18	18	0.04	
Stromateus fiatola	0.18	18	0.04	
Engraulis encrasicolus	0.18	18	0.04	
Citharus linguatula	0.18	18	0.04	
Alloteuthis africana	0.18	102	0.04	
Lolligoncula mercatoris	0.18	238	0.04	
Total	505.36		100.07	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	48.06	9505	59.26	
Trichiurus lepturus	13.66	23	16.84	
Caranx crysos	8.73	10	10.76	653
Saurida brasiliensis	3.27	3331	4.03	
Decapterus punctatus	2.19	54	2.70	
Scomber japonicus	1.92	46	2.37	652
Trachurus trecae, juvenile	1.10	54	1.36	
Ariomma bondi	1.10	163	1.36	
Todarodes sagittatus	0.54	54	0.67	
Todaropsis eblanae	0.54	54	0.67	
Total	81.11		100.02	

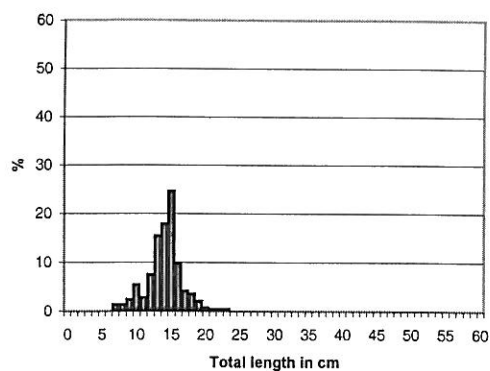
DATE:14/ 9/00 GEAR TYPE: BT No:2 PROJECT STATION: 241
 start stop duration POSITION:Lat N 424
 TIME :16:32:16 17:02:10 30 (min) Long W 714
 LOG :3449.94 3451.58 1.63 Purpose code: 3
 FDEPTH: 56 56 Area code : 1
 BDEPTH: 56 56 GearCond.code:
 Towing dir: 240° Wire out: 180 m Speed: 30 kn*10
 Sorted: 44 Kg Total catch: 173.21 CATCH/HOUR: 346.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	163.24	56506	47.12	644
Pagellus bellottii	68.08	600	19.65	642
Trichiurus lepturus	34.12	52	9.85	
Sardinella aurita - Juveniles	18.48	4774	5.33	
Dentex angolensis	14.20	274	4.30	643
Mustelus mustelus	6.72	2	1.94	
Illex coindetii	6.16	1848	1.78	
Sepia officinalis hierredda	5.00	10	1.44	
Octopus vulgaris	4.64	6	1.34	
Brachydeuterus auritus	4.58	60	1.32	
Zeus faber	4.52	12	1.30	
Pagrus caeruleostictus	3.26	8	0.94	
Priacanthus arenatus	2.82	30	0.81	
Boops boops	1.54	154	0.44	
Lolligoncula mercatoris	1.54	616	0.44	
Dentex canariensis	1.48	8	0.43	
Epinephelus aeneus	1.20	2	0.35	
Raja miraletus	1.20	2	0.35	
Brotula barbata	1.04	2	0.30	
Perulibatrachus elminensis	0.88	14	0.25	
Grammolites gruvelli	0.44	14	0.13	
Citharus linguatula	0.36	14	0.10	
Dicologlossa hexophthalma	0.30	8	0.09	
Scomber japonicus	0.30	22	0.09	
Fistularia petimba	0.24	2	0.07	
Parapenaeus longirostris	0.08	8	0.02	
Total	346.42		99.98	

DATE:14/ 9/00 GEAR TYPE: PT No:6 PROJECT STATION: 242
 start stop duration POSITION:Lat N 421
 TIME :19:17:41 19:47:21 30 (min) Long W 721
 LOG :3461.42 3462.79 1.36 Purpose code: 1
 FDEPTH: 2 2 Area code : 1
 BDEPTH: 46 50 GearCond.code:
 Towing dir: 232° Wire out: 150 m Speed: 30 kn*10
 Sorted: 152 Kg Total catch: 268.56 CATCH/HOUR: 537.12

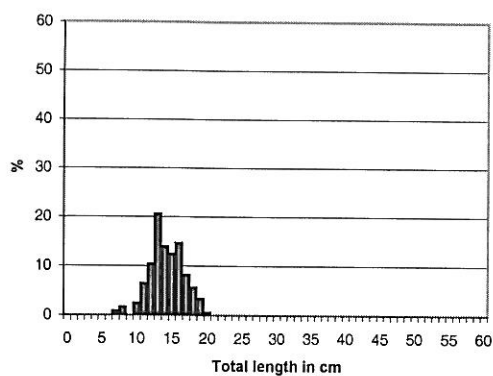
SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	275.56	462	51.30	
Engraulis encrasicolus	100.08	52542	18.63	648
Trachurus trecae, juvenile	64.08	19224	11.93	651
Saurida brasiliensis	48.96	22276	9.12	
Selene dorsalis	33.60	392	6.26	647
Sardinella aurita - Juveniles	5.04	1980	0.94	650
Sepia officinalis hierredda	2.68	4	0.50	
Lagocephalus	1.80	2	0.34	
Sardinella maderensis	1.68	10	0.11	646
Scomber japonicus	1.44	144	0.27	649
Lolligoncula mercatoris	0.72	468	0.13	
Sardinella aurita	0.68	4	0.13	645
Brachydeuterus auritus	0.32	2	0.06	
Sphyræna sphyraena	0.32	2	0.06	
Trichiurus lepturus	0.16	8	0.03	
Total	537.12		100.01	

Annex II Length distributions of main species



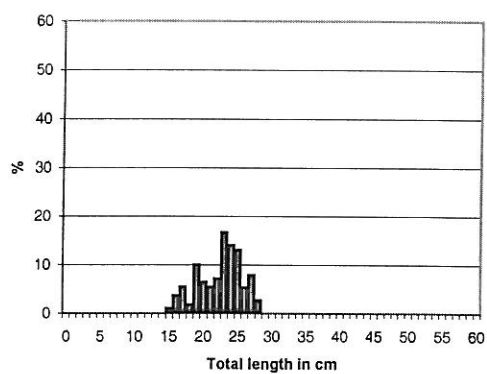
Pagellus bellottii
Mean length = 14.6 cm

Benin
N = 96



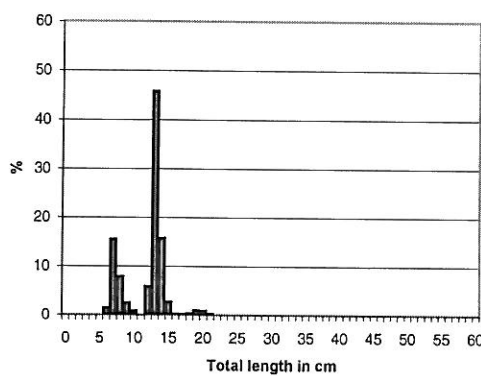
Brachydeuterus auritus
Mean length = 10.6 cm

Benin
N = 103



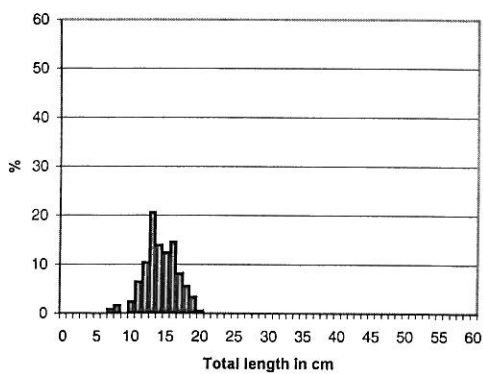
Dentex angolensis
Mean length = 23.0 cm

Benin
N = 53



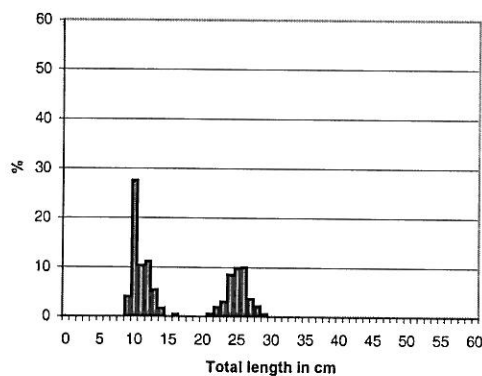
Sardinella aurita
Mean length = 12.3 cm

Benin
N = 252



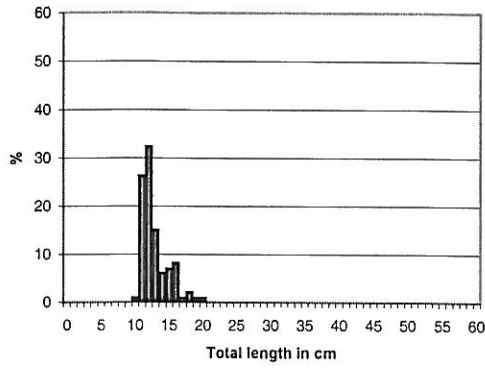
Dentex congoensis
Mean length = 14.7 cm

Benin
N = 152

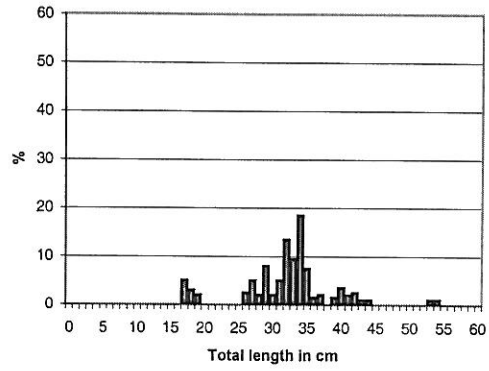


Sardinella maderensis
Mean length = 17.0 cm

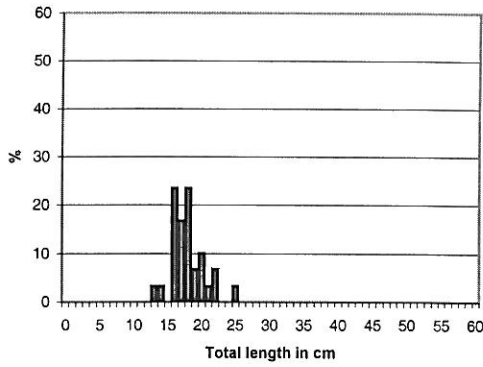
Benin
N = 167



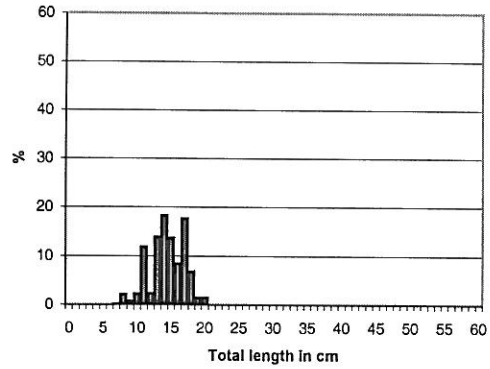
Decapterus rhonchus Benin
Mean length = 13.2 cm
N = 100



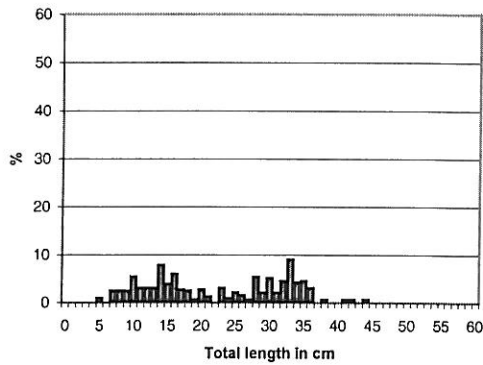
Dentex canariensis Togo
Mean length = 32.6 cm
N = 56



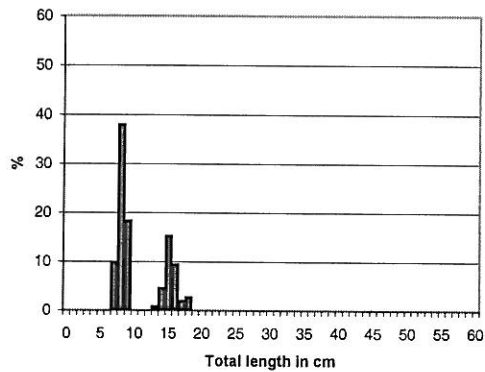
Pagellus bellottii Togo
Mean length = 18.4 cm
N = 30



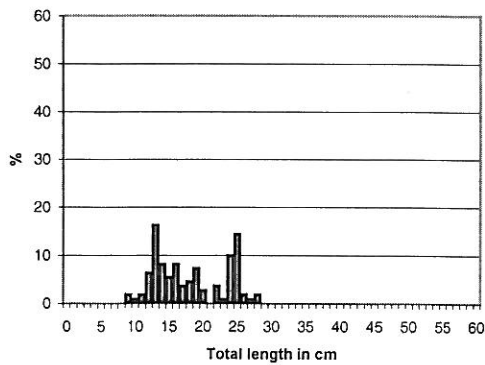
Dentex congoensis Togo
Mean length = 15.0 cm
N = 171



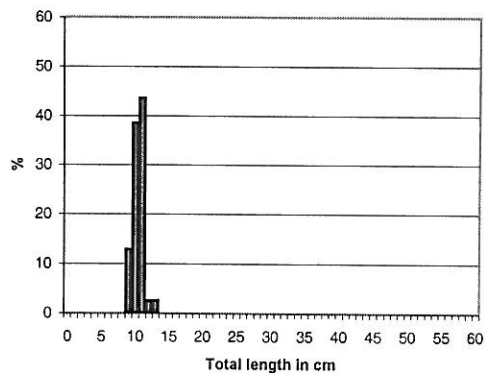
Pagrus caeruleostictus Togo
Mean length = 22.9 cm
N = 133



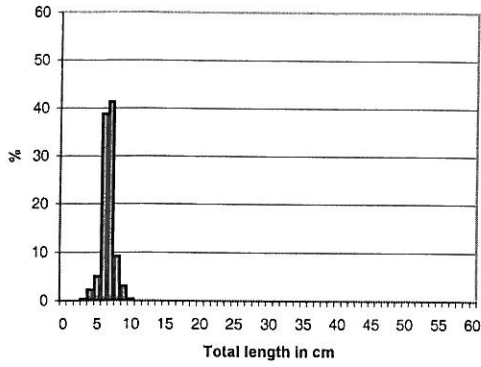
Sardinella aurita Togo
Mean length = 11.1 cm
N = 101



Dentex angolensis Togo
Mean length = 18.6 cm
N = 111

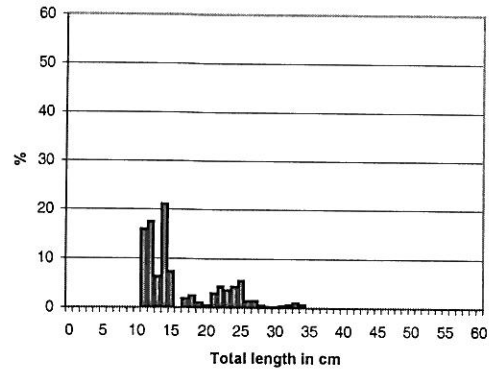


Sardinella maderensis Togo
Mean length = 11.9 cm
N = 39



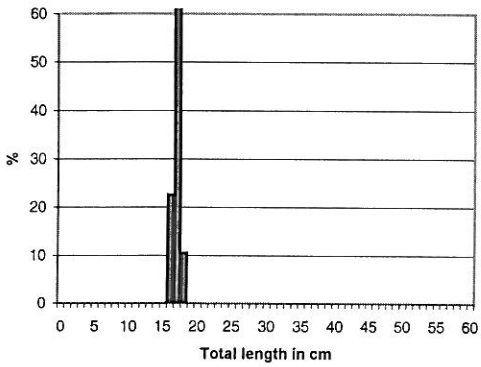
Engraulis encrasicolus
Mean length = 7.1 cm

Togo
N = 309



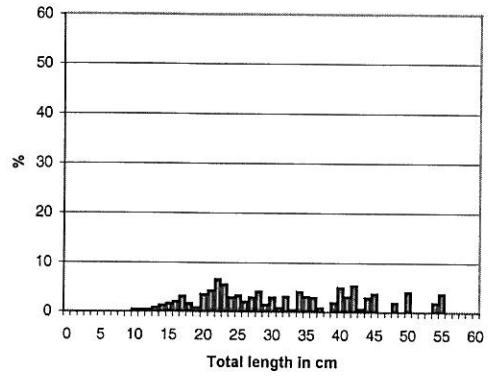
Dentex angolensis
Mean length = 16.7 cm

Ghana
N = 203



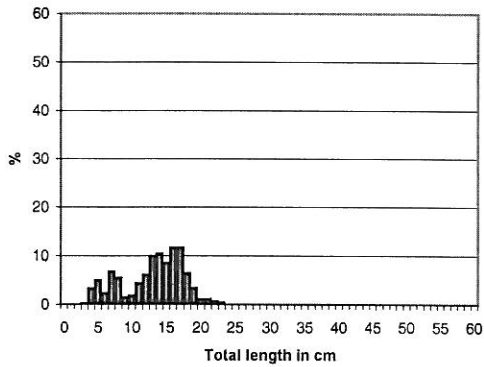
Trachurus trecae
Mean length = 17.4 cm

Togo
N = 75



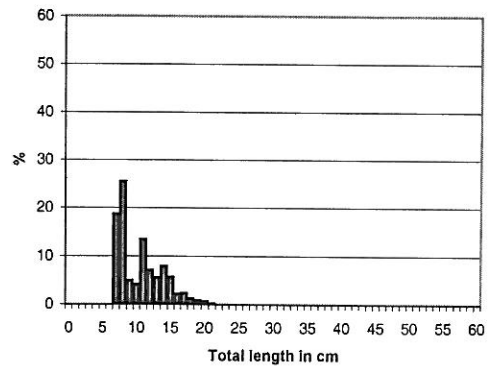
Dentex canariensis
Mean length = 32.3 cm

Ghana
N = 121



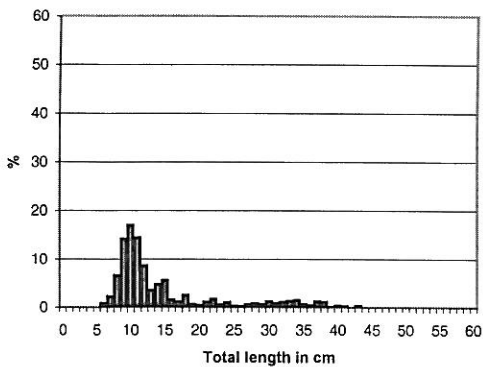
Pagellus bellottii
Mean length = 13.6 cm

Ghana
N = 576



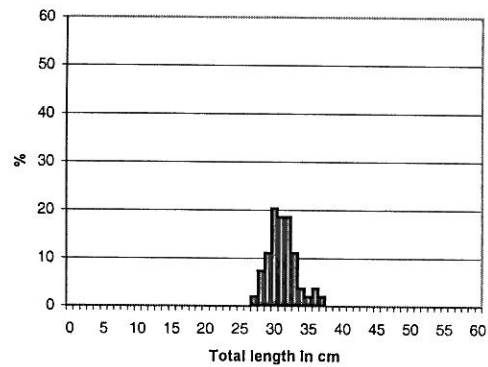
Dentex congoensis
Mean length = 11.0 cm

Ghana
N = 238



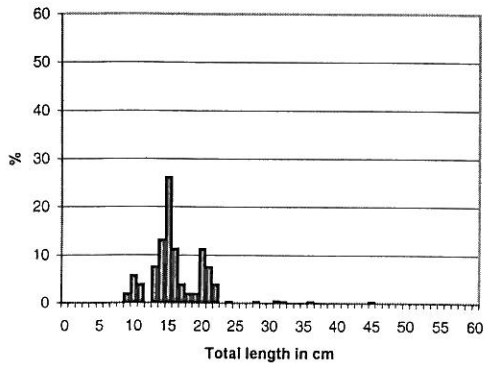
Pagrus caeruleostictus
Mean length = 14.9 cm

Ghana
N = 477



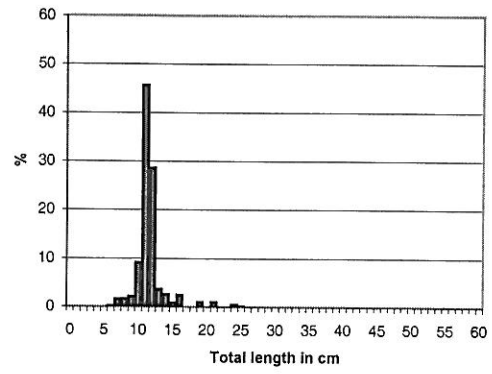
Lutjanus fulgens
Mean length = 31.7 cm

Ghana
N = 54



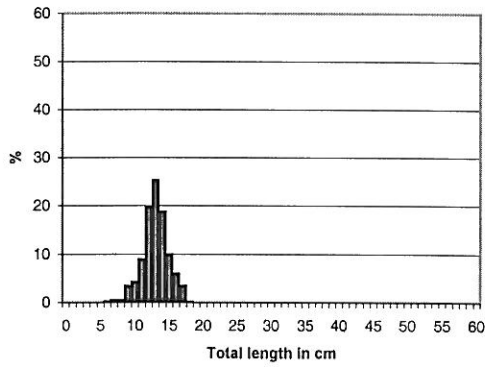
Pseudotolithus senegalensis
Mean length = 16.48 cm

Ghana
N = 60



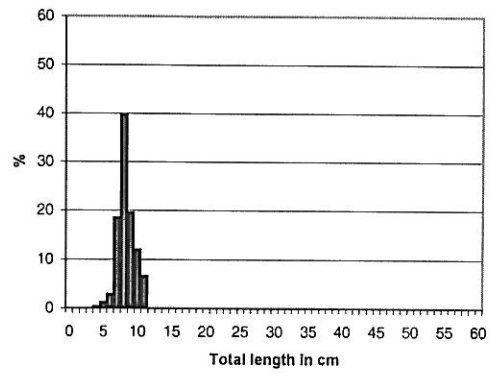
Sardinella maderensis
Mean length = 12.1 cm

Ghana
N = 165



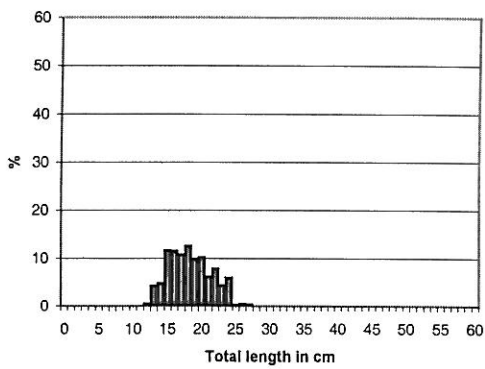
Brachydeuterus auritus
Mean length = 13.5 cm

Ghana
N = 286



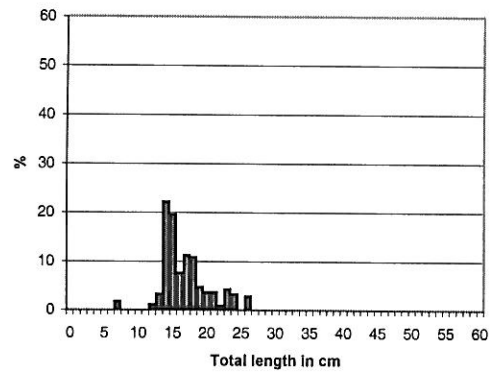
Engraulis encrasicolus
Mean length = 8.8 cm

Ghana
N = 1028



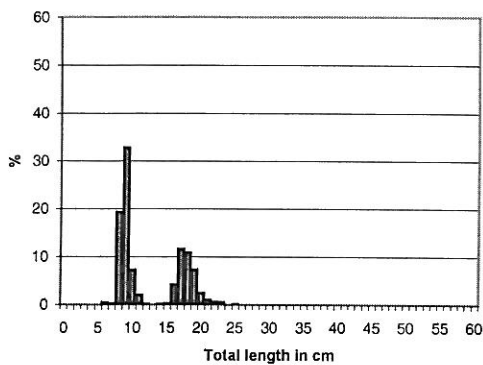
Pseudupeneus prayensis
Mean length = 18.8 cm

Ghana
N = 172



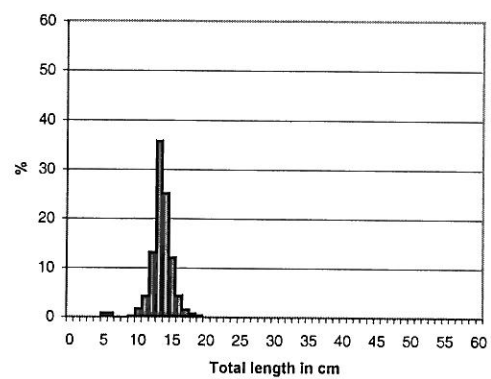
Chloroscombrus chrysurus
Mean length = 17.2 cm

Ghana
N = 106



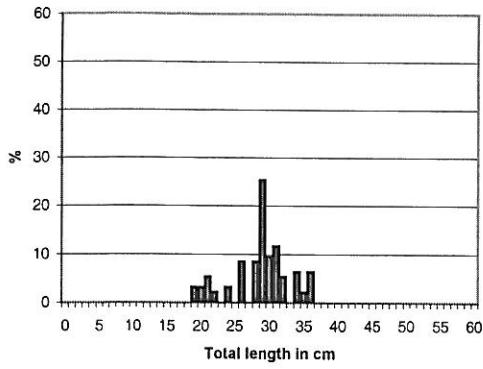
Sardinella aurita
Mean length = 12.9 cm

Ghana
N = 1012



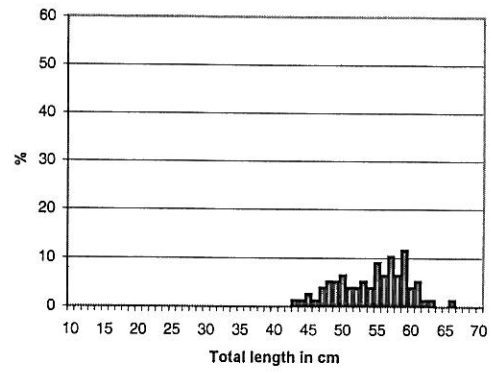
Decapterus punctatus
Mean length = 13.8 cm

Ghana
N = 475



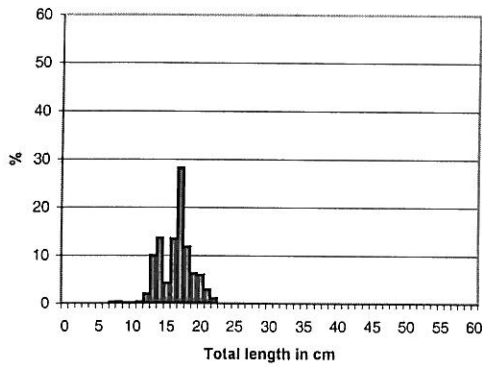
Selene dorsalis
Mean length = 29.2 cm

Ghana
N = 40



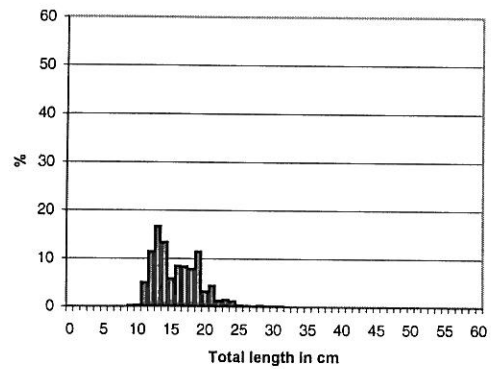
Zenopsis conchifer
Mean length = 54.9 cm

Ghana
N = 78



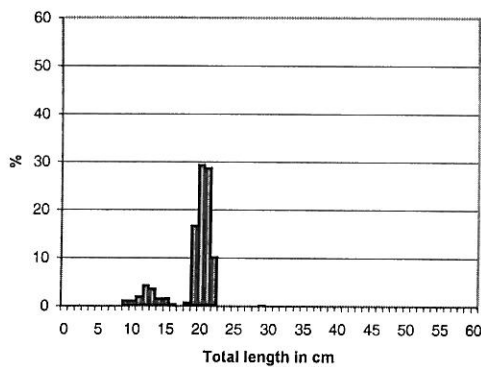
Trachurus trecae
Mean length = 16.9 cm

Ghana
N = 709



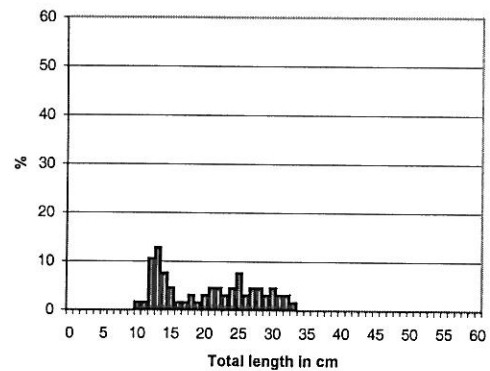
Pagellus bellottii
Mean length = 16.2 cm

Côte d'Ivoire
N = 514



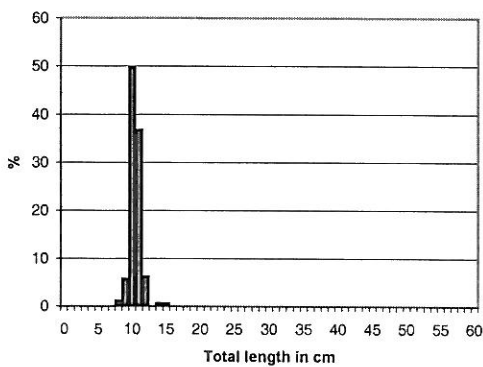
Scomber japonicus
Mean length = 19.7 cm

Ghana
N = 368



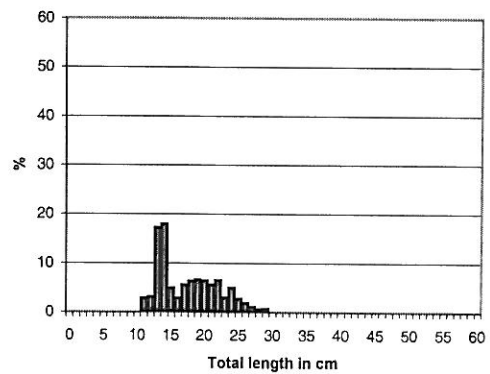
Pagrus caeruleostictus
Mean length = 20.9 cm

Côte d'Ivoire
N = 67



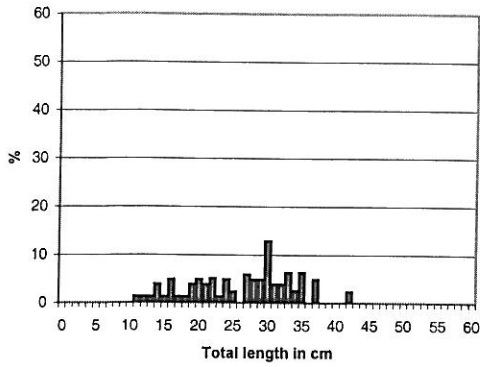
Priacanthus arenatus
Mean length = 11.0 cm

Ghana
N = 146



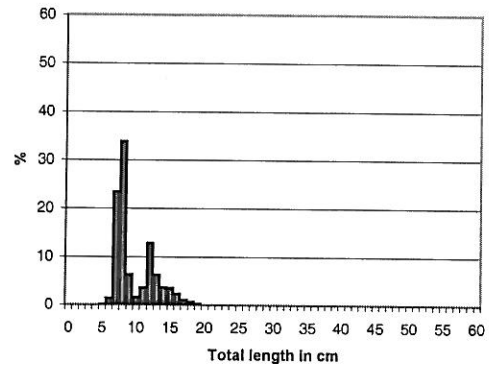
Dentex angolensis
Mean length = 17.9 cm

Côte d'Ivoire
N = 512



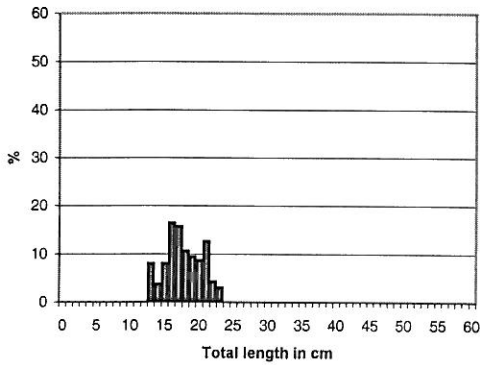
Dentex canariensis
Mean length = 26.9 cm

Côte d'Ivoire
N = 71



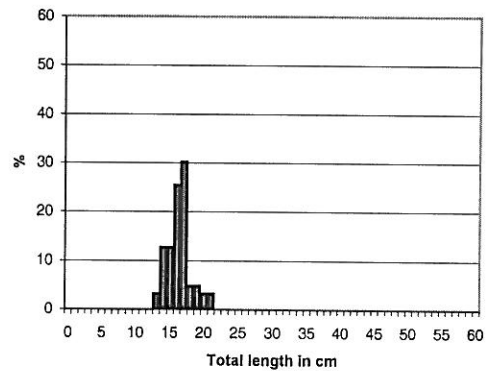
Brachdeuterus auritus
Mean length = 10.1 cm

Côte d'Ivoire
N = 727



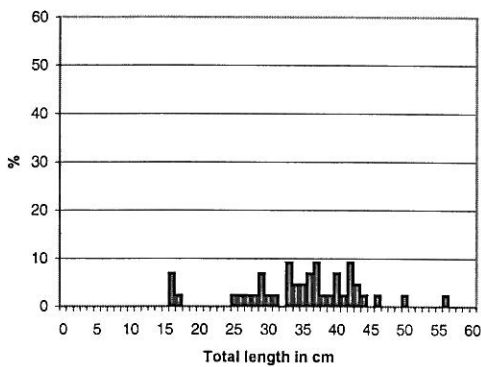
Dentex congoensis
Mean length = 18.2 cm

Côte d'Ivoire
N = 103



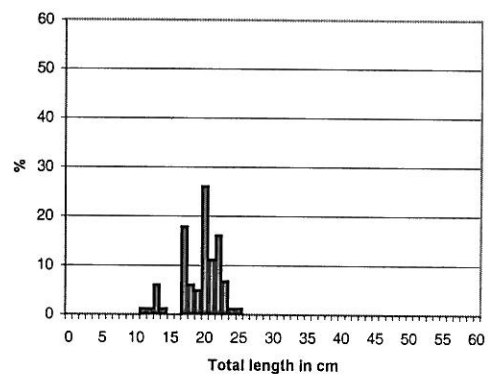
Pomadasys incisus
Mean length = 16.9 cm

Côte d'Ivoire
N = 63



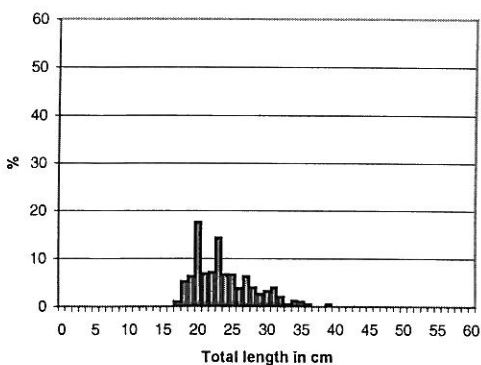
Dentex gibbosus
Mean length = 35.3 cm

Côte d'Ivoire
N = 44



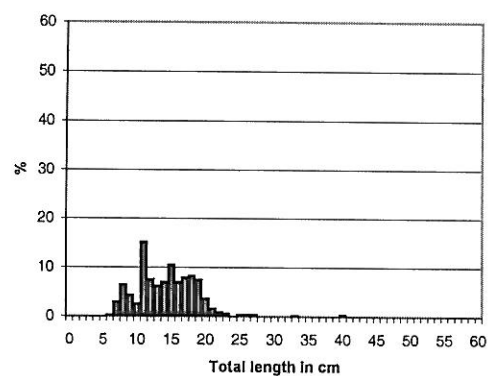
Pseudupeneus prayensis
Mean length = 19.9 cm

Côte d'Ivoire
N = 48



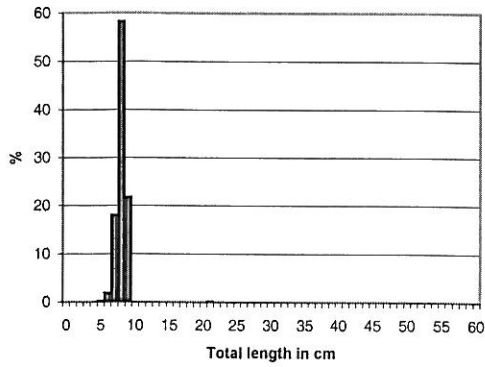
Umbrina canariensis
Mean length = 24.3 cm

Côte d'Ivoire
N = 138

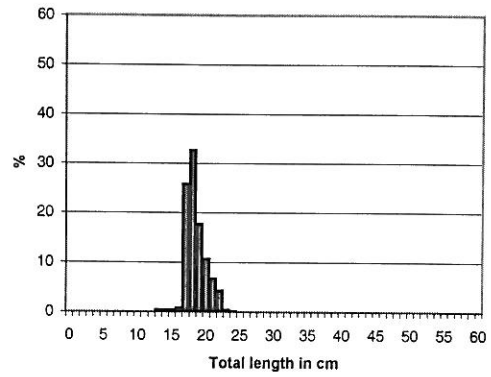


Galeoides decadactylus
Mean length = 14.7 cm

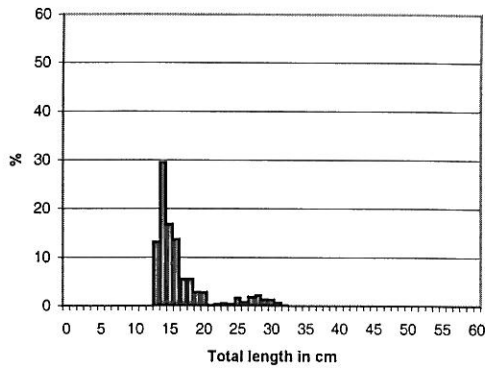
Côte d'Ivoire
N = 190



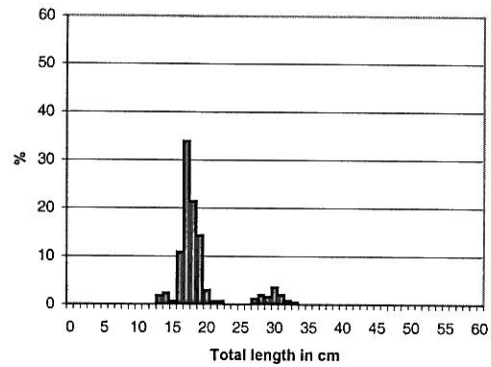
Sardinella aurita Côte d'Ivoire
Mean length = 8.5 cm N = 272



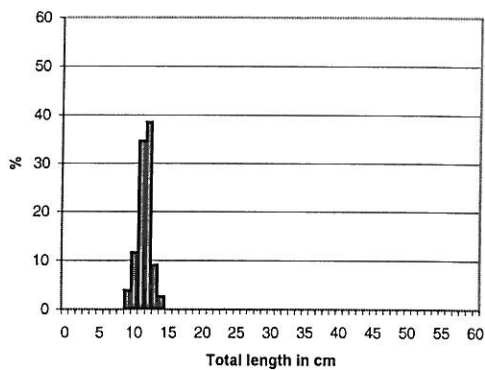
Chloroscombrus chrysurus Côte d'Ivoire
Mean length = 19.0 cm N = 227



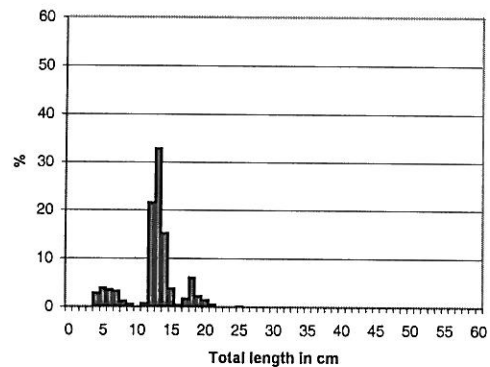
Sardinella maderensis Côte d'Ivoire
Mean length = 12.9 cm N = 390



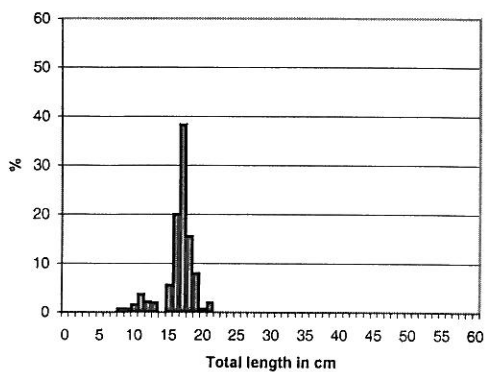
Selene dorsalis Côte d'Ivoire
Mean length = 19.3 cm N = 100



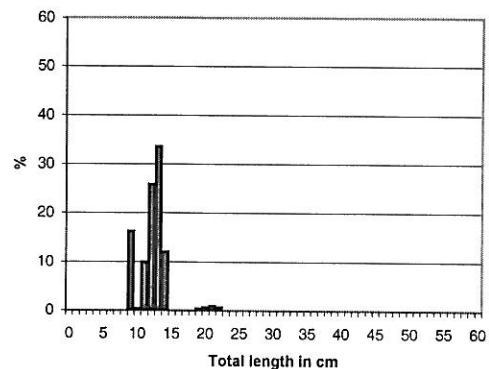
Sardinella rouxi Côte d'Ivoire
Mean length = 12.0 cm N = 78



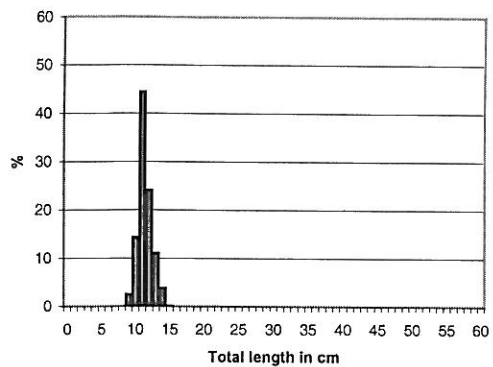
Trachurus trecae Côte d'Ivoire
Mean length = 13.1 cm N = 1115



Engraulis encrasicolus Côte d'Ivoire
Mean length = 8.3 cm N = 563



Scomber japonicus Côte d'Ivoire
Mean length = 12.7 cm N = 50



Priacanthus arenatus
Mean length = 11.9 cm

Côte d'Ivoire
N = 122

Annex III Families/genera in swept area estimates

1) Main groups in swept-area bottom trawl hauls:

Demersal: Sciaenidae, Sparidae, Haemulidae, Ariidae, Serranidae, Lutjanidae, Merluccidae, Ophididae, Lethrinidae

Pelagic:

Canangidae, Scombridae, Sphyraenidae, Trichiuridae, Clupeidae, Engraulididae

Shrimp:

Shrimps

Cephalopods:

Cephalopods

Sharks:

Sharks

2) Main pelagic families in swept-area bottom trawl hauls:

Clupeids:

Clupeidae, Engraulididae

Carangids:

Canangidae

Scombrids:

Scombridae

Hairtails:

Trichiuridae

Barracudas:

Sphyraenidae

3) Commercially important demersal species grouped by families in swept-area bottom trawl hauls:

Seabream: *Dentex* spp., *Diplodus* spp., *Lithognathus* spp., *Pagellus* spp., *Pagrus* spp., *Sparus* spp.

Snappers:

Lutjanidae

Groupers:

Serranidae

Grunts:

Plectorhynchus spp., *Pomadasys* spp.

Croakers:

Sciaenidae

Annex IV Swept-area biomass estimates

SWEPT AREA ANALYSIS FROM STATION 115 TO STATION 126

Bénin 2000

SPECIES NAME	SAMPLE DISTRIB. BY CATCH CLASSES Lower limits, Kg/nm					% inci- dence	Mean dens. t/nm ²	Mean densities by bottom depth strata t/nm ²			
	>0	10	30	100	300 1000			- 30m	30- 50m	50-100m	100-100m
Boops boops				1		11	2.11			6.33	
Decapterus punctatus	1			1		22	1.51			4.53	
Sardinella aurita	2		1			33	0.71	0.01		2.12	
Dentex congoensis	1		1			22	0.70			2.09	
Engraulis encrasicolus	1		1			11	0.39	1.17			
Sepia officinalis hierredda	7	1				67	0.38	0.10	0.23	0.81	
Brachydeuterus auritus	5	1				67	0.37	0.07	1.03	0.02	
Priacanthus arenatus	2	1				22	0.30		0.01	0.90	
Chloroscombrus chrysurus	6					67	0.19	0.34	0.22		
Ilisha africana	1	1				22	0.17	0.50	0.01		
Selene dorsalis	7					78	0.15	0.09	0.36		
Brachydeuterus auritus Juv.			1			11	0.13		0.39		
Pomadasyds jubelini	2					11	0.11	0.07	0.25		
Sphyræna guachancho	3					33	0.10	0.08	0.21		
Selar crumenophthalmus	5					56	0.10	0.10	0.04	0.15	
Pagrus caeruleostictus	7					78	0.08	0.07	0.09	0.08	
Pagellus bellottii	4					33	0.08		0.02	0.21	
Epinephelus aeneus	2					11	0.08			0.24	
Ariomma bondi	1					11	0.08			0.25	
Penaeus notialis	3					33	0.07		0.21		
Alectis alexandrinus	6					67	0.07	0.05	0.08	0.07	
Dentex angolensis	1					11	0.06			0.19	
Squatina oculata	3					33	0.06			0.17	
Galeoides decadactylus	5					56	0.06	0.13	0.07		
Fistularia petimba	5					56	0.06	0.05	0.02	0.09	
Trichiurus lepturus	5					56	0.05	0.03	0.09	0.01	
Rhizoprionodon acutus	1					11	0.05		0.14		
Pseudotolithus senegalensis	3					33	0.05	0.15	0.01		
Lutjanus fulgens	2					22	0.05		0.04	0.10	
Branchiostegus semifasciatus	2					22	0.05			0.15	
Penaeus kerathurus	1					11					
Other fish							0.75	0.76	0.61	0.84	
Sum all species							9.12	3.77	4.13	19.35	
Sum Snappers							0.05	0.01	0.04	0.10	
Sum Groupers							0.08			0.24	
Sum Grunts							0.62	0.14	1.71	0.02	
Sum Croakers							0.08	0.18	0.01	0.05	
Sum Seabreams							3.07	0.11	0.12	8.96	
Sum Sharks							0.11		0.14	0.17	
Sum Rays							0.06	0.01	0.12	0.04	
Sum Squids							0.42	0.10	0.27	0.90	
Sum Carangids							2.04	0.60	0.74	4.75	
Sum Barracuda							0.15	0.18	0.24		
0.21											

Number of stations included in analysis, total and by depth strata

9 3 3 3

SWEPT AREA ANALYSIS FROM STATION 127 TO STATION 136

Togo 2000

SPECIES NAME	SAMPLE DISTRIB. BY CATCH CLASSES					% inci- dence	Mean dens. t/nm ²	Mean densities by bottom depth strata t/nm ²				
	Lower limits, Kg/nm							- 30m	30- 50m	50-100m	100-100m	
	>0	10	30	100	300	1000						
Dentex congoensis	1		1				33	1.71			5.14	
Dactylopterus volitans	2		1				50	1.13	3.30	0.09		
Dentex canariensis	5	1					83	0.64	0.91	0.57	0.45	
Pagrus caeruleostictus	3	1					67	0.60	0.27	1.53		
Sepia officinalis hierredda	6	1					100	0.56	1.08	0.51	0.10	
Trachurus trecae	1	1					33	0.54			1.60	
Engraulis encrasicolus		1						0.43	1.28			
Dentex angolensis	1	1					17	0.36			1.07	
Selene dorsalis	2	1					50	0.35	0.12	0.92		
Sea urchins (strong spines)	1	1					33	0.31	0.92	0.01		
Pagellus bellottii	1	1					17	0.22		0.67		
Squatina oculata	2						33	0.21			0.63	
Alectis alexandrinus	4						67	0.21	0.33	0.29		
Balistes caprisus	1	1					33	0.18	0.53	0.01		
Fistularia petimba	7						83	0.16	0.07	0.18	0.22	
Alloteuthis africana	3						50	0.15		0.17	0.29	
Pagrus africanus	1							0.12		0.36		
Epinephelus aeneus	3						50	0.11		0.29	0.04	
Scomberomorus tritor	2						33	0.09	0.14		0.12	
Balistes punctatus	2						33	0.08	0.21	0.03		
Raja miraletus	4						67	0.06	0.03	0.11	0.04	
Sphyræna sphyraena	2						33	0.05	0.12	0.02		
Umbrina canariensis	1						17	0.05		0.14		
Aluterus blankerti	4						67	0.05	0.05	0.11		
Sardinella aurita	3						50	0.05	0.03	0.10	0.03	
Other fish								0.70	0.68	0.69	0.64	
Sum all species								9.12	10.07	6.80	10.37	
Sum Snappers								0.03		0.10		
Sum Groupers								0.14		0.35	0.06	
Sum Grunts								0.02		0.06		
Sum Croakers								0.05		0.14		
Sum Seabreams								3.70	1.18	3.14	6.81	
Sum Sharks								0.25			0.75	
Sum Rays								0.08	0.09	0.13	0.04	
Sum Squids								0.75	1.08	0.80	0.40	
Sum Carangids								1.16	0.49	1.30	1.65	
Sum Barracuda								0.07	0.15	0.04		

Number of stations included in analysis, total and by depth strata

6 2 2 2

SWEPT AREA ANALYSIS FROM STATION 137 TO STATION 192

Ghana 2000

SPECIES NAME	SAMPLE DISTRIB. BY CATCH CLASSES Lower limits, Kg/nm					% inci- dence	Mean dens. t/nm ²	Mean densities by bottom depth strata t/nm ²			
	>0	10	30	100	300			1000	- 30m	30- 50m	50-100m
Priacanthus arenatus	15				2	57	4.36	0.01	0.06	11.82	
Trachurus trecae	8			6		47	3.79	0.17	0.01	10.20	
Seriola dumerilli					1	3	2.58		7.03		
Chlamys purpuratus	4		3	2		30	1.69	2.96	2.46	0.01	
Brachydeuterus auritus	5	3			2	33	1.64	2.60	2.40	0.18	
Boops boops	8		3	1		40	1.46	0.03	0.89	3.07	
Chromis cadenati	6	1			1	27	1.34		0.03	3.62	
Scomber japonicus	6		1	1		27	1.27	0.01		3.45	
Sardinella aurita	5		4	1		33	1.25	0.91	0.05	2.71	
Lutjanus fulgens	3	1	1	1		17	0.67	0.87	1.05	0.15	
Sepia officinalis hierredda	26	1		1		90	0.66	1.88	0.25	0.17	
Pagellus bellottii	21	4	1			77	0.55	0.53	0.51	0.60	
Dentex canariensis	18	1		1		63	0.55	0.21	1.13	0.22	
Pomadasys incisus	5	1		1		23	0.55	0.03	0.25	1.23	
Pagrus caeruleostictus	25	2	1			77	0.48	0.36	0.90	0.14	
Dasyatis pastinaca				1		3	0.46		1.26		
Acanthurus monroviae	4	1	1			20	0.42	0.37	0.08	0.80	
Dentex congolensis	3	2	1			20	0.38			1.03	
Chloroscombrus chrysurus	5	1	2			27	0.34	0.41	0.41	0.21	
Pseudupeneus prayensis	18	3				70	0.26	0.05	0.42	0.26	
Mustelus mustelus	7		1			27	0.21		0.48	0.10	
Alloteuthis africana	13	2				50	0.20	0.04	0.26	0.25	
Apsilus fuscus	3	1	1			17	0.20		0.40	0.14	
Mycteroperca rubra			1			3	0.19		0.51		
Fistularia petimba	19	1				67	0.18	0.05	0.12	0.32	
Balistes punctatus	4		1			17	0.14	0.06	0.35		
Sphyræna sphyræna	4		1			17	0.13	0.47	0.01		
Decapterus punctatus	6	2				27	0.13	0.28	0.15	0.01	
Epinephelus aeneus	9	1				33	0.12	0.04	0.06	0.24	
Selene dorsalis	9	1				30	0.12	0.16	0.20	0.01	
Dactylopterus volitans	11					37	0.11		0.08	0.21	
Ariomma bondi	2	2				13	0.11			0.29	
Trichiurus lepturus	2	1				10	0.09		0.24	0.01	
Dentex angolensis	2	1				10	0.09			0.25	
Pteroscion peli		1					0.09		0.25		
Pseudolithus senegalensis	1	1					0.09		0.25		
Lethrinus atlanticus	6					20	0.09	0.04	0.21		
Squatina oculata	1	1				7	0.08			0.23	
Zeus faber	12					40	0.07			0.18	
Dasyatis marmorata	1	1				7	0.07		0.19	0.01	
Plectorhynchus mediterraneus		1				3	0.07		0.19		
Grammolites gruvelli	18					60	0.07	0.01	0.07	0.12	
Sea urchins (strong spines)	8	1				23	0.07		0.02	0.18	
Lepidotrigla cadmani	9					30	0.06		0.02	0.15	
Engraulis encrasicolus	3	1				10	0.06	0.24			
Drepane africana	2	1				10	0.06	0.20	0.01		
Balistes capriscus	9					30	0.06		0.10	0.05	
Aluterus blankerti	2	1				10	0.05	0.04		0.09	
Lutjanus dentatus	1	1				7	0.05	0.18			
Trachurus trecae, juvenile	2					7	0.05	0.06	0.08		
Syacium micrurum	18					60	0.05		0.10	0.04	
Penaeus notialis	7					23	0.02	0.01	0.04		
Parapenaeopsis atlantica	1					3	0.01		0.03		
Penaeus kerathurus	1					3					
Other fish							0.76	1.12	0.80	0.55	
Sum all species							28.65	14.40	24.41	43.30	
Sum Snappers							0.93	1.07	1.46	0.29	
Sum Groupers							0.32	0.04	0.57	0.25	
Sum Grunts							2.27	2.66	2.85	1.41	
Sum Croakers							0.18	0.01	0.50		
Sum Seabreams							3.58	1.21	3.47	5.38	
Sum Sharks							0.29		0.48	0.33	
Sum Rays							0.58	0.08	1.49	0.04	
Sum Squids							0.87	1.93	0.54	0.43	
Sum Carangids							7.11	1.29	8.00	10.44	
Sum Barracuda							0.17	0.56	0.06		
0.07											

Number of stations included in analysis, total and by depth strata

30

8

11

11

SWEPT AREA ANALYSIS FROM STATION 193 TO STATION 243

Côte d'Ivoire 2000

SPECIES NAME	SAMPLE DISTRIB. BY CATCH CLASSES Lower limits, Kg/nm					% incidence	Mean dens. t/nm ²	Mean densities by bottom depth strata t/nm ²			
	>0	10	30	100	300			1000	- 30m	30- 50m	50-100m
Brachydeuterus auritus	8	4	6	3	1	66	7.36	19.32	3.79	0.05	
Trachurus trecae	17	4	2	5	1	88	4.65	3.14	2.79	7.88	
Engraulis encrasicolus	3	1	1	1	1	22	4.26	0.19	11.77	0.46	
Priacanthus arenatus	16	2			2	63	3.61	4.51	0.14	6.26	
Trachurus trecae, juvenile	3			2	1	19	2.32	1.93	1.11	3.89	
Trichiurus lepturus	21	8	2	1		72	1.87	1.41	1.36	2.81	
Sardinella aurita - Juveniles	4				1	16	1.02	0.03	2.89	0.05	
Pagellus bellottii	22	4	2			78	0.88	0.51	1.08	1.02	
Chloroscombrus chrysurus	8	1		1		31	0.79	2.50	0.02		
Dentex angolensis	8	3	2			34	0.51			1.49	
Ilisha africana	3	3	2			25	0.50	1.59			
Sepia officinalis hierredda	28	3	1			94	0.44	0.91	0.27	0.18	
Pteroscion pelli	8	4	1			41	0.38	0.69	0.01	0.48	
Brachydeuterus auritus Juv.					1	3	0.35	1.12			
Boops boops	13	3	1			53	0.33	0.18	0.02	0.77	
Umbrina canariensis	4	3	1			25	0.30	0.02		0.84	
Galeoides decadactylus	9	1	1			25	0.28	0.89	0.01		
Pomadasys incisus	7		1			22	0.25	0.06		0.67	
Brotula barbata	7	2	1			31	0.24			0.70	
Pomadasys peroteti	1		1			6	0.23	0.74	0.01		
Mustelus mustelus	10	2				38	0.16	0.02	0.13	0.31	
Uranoscopus albesca	2		1			9	0.15			0.43	
Dentex canariensis	8	2				31	0.15	0.07		0.37	
Selene dorsalis	12	1				38	0.14	0.18	0.24		
Sardinella maderensis	9	2				31	0.13	0.42			
Raja miraletus	14	1				47	0.12	0.02	0.28	0.04	
Balistes capriscus	6	1				19	0.12	0.02	0.34		
Sphyræna guachancho	8	1				28	0.11	0.32	0.02		
Dentex congoensis	2	1				9	0.11			0.31	
Saurida brasiliensis	10	1				34	0.10		0.01	0.27	
Pseudotolithus senegalensis	10					25	0.10	0.27	0.05		
Chelidonichthys gabonensis	3	1				13	0.08		0.01	0.22	
Octopus vulgaris	11					34	0.08		0.18	0.06	
Alloteuthis africana	14					44	0.08		0.10	0.12	
Pseudupeneus prayensis	11					34	0.08	0.10	0.02	0.12	
Sardinella rouxi		1				3	0.08	0.24			
Citharus linguatula	17					53	0.08		0.03	0.21	
Zeus faber	13					41	0.07		0.03	0.16	
Illex coindetii	10					31	0.07		0.01	0.18	
Pomadasys rogeri	3	1				13	0.07	0.11	0.09		
Dactylopterus volitans	7	1				25	0.07	0.01	0.20		
Branchiostegus semifasciatus	4	1				16	0.07			0.22	
Dentex gibbosus		1				3	0.06			0.16	
Parapenaeopsis atlantica	8					22	0.06	0.19			
Epinephelus aeneus	7	1				25	0.06	0.03	0.01	0.14	
Scomber japonicus	13					38	0.06	0.01	0.07	0.09	
Grammolites gruvelli	20					59	0.06		0.12	0.05	
Lepidotrigla cadmani	5	1				19	0.05			0.14	
Polydactylus quadrifilis		1				3	0.05	0.14			
Penaeus notialis	13					41	0.03	0.05	0.04		
Penaeus kerathurus	3					9	0.02	0.05			
Sicyonia galeata	8					22	0.01	0.01	0.01		
Sicyonia sp.	1					3					
Parapenaeus longirostris	2					6					
Shrimps, small, non comm.	1					3					
Other fish							0.64	0.69	0.39	0.91	
Sum all species							33.88	42.69	27.65	32.06	
Sum Snappers							0.01	0.01		0.02	
Sum Groupers							0.06	0.03	0.01	0.16	
Sum Grunts							8.26	21.35	3.89	0.72	
Sum Croakers							0.78	0.98	0.06	1.32	
Sum Seabreams							2.08	0.77	1.11	4.21	
Sum Sharks							0.20	0.02	0.13	0.42	
Sum Rays							0.19	0.21	0.33	0.05	
Sum Squids							0.72	0.95	0.59	0.64	
Sum Carangids							7.91	7.76	4.20	11.77	
Sum Barracuda							0.12	0.32	0.02	0.04	
0.05											

Number of stations included in analysis, total and by depth strata

32

10

11

11

Annex V Total length-fork length and L-W-relationships

CONVERSION FACTORS

Species	$L_t = x \cdot L_f$	$W = aL_t^b$		N
	x =	a	b	
<i>Sardinella aurita</i>	1.145	0.0039	3.274	89
<i>Sardinella maderensis</i>	1.178	0.0243	2.681	78
<i>Sardinella</i> sp.	1.159	0.0053	3.181	167
<i>Engraulis encrasicolus</i>	1.088	0.0054	3.131	173
<i>Dentex angolensis</i>	1.140	0.0015	3.734	71
<i>Sparus caeruleostictus</i>	1.152	0.0212	2.897	49
<i>Dentex canariensis</i>	1.144	0.0151	2.974	36
<i>Pagellus bellottii</i>	1.147	0.0145	2.973	90
<i>Dentex gibbosus</i>	1.134	*	*	35**
<i>Dentex congoensis</i>	1.097	0.0124	3.021	79
<i>Selene dorsalis</i>	1.180	0.0420	2.616	43
<i>Chloroscombrus chrysurus</i>	1.200	0.0157	2.769	80
<i>Trachurus trecae</i>	1.076	0.0147	2.874	157
<i>Scomber japonicus</i>	1.070	0.0058	3.141	46
<i>Brachydeuterus auritus</i>	1.100	0.0145	2.941	60
<i>Balistes capriscus</i>	1.142	*	*	200**
<i>Pseudupeneus prayensis</i>	1.135	0.0091	3.110	62
<i>Galeoides decadactylus</i>	1.217	0.0341	2.667	75
<i>Lutjanus fulgens</i>	1.077	*	*	52**
<i>Lethrinus atlanticus</i>	1.104	0.0189	2.919	37

* insufficient data

** used for LF-LT conversion only

Source: Koranteng et al. (in prep.)

Annex VI Instruments and fishing gear used

Echo sounder

The SIMRAD EK500/38 kHz scientific sounder was used during the survey for fish abundance estimation. The lowering keel was not submerged during the survey. The Bergen Echo Integrator system (BEI) was used to scrutinise the acoustic records. System calibration experiment using a standard copper sphere was performed 12.06.2000 (see BENEFIT Cruise Report 4/2000). The settings of 38 kHz echo sounder were as follows:

Tranceiver-1 menu (38 kHz, mounted in lowering keel)

Transducer depth	5.5 m (lowering keel not submerged)
Absorption coeff.	10 dB/km
Pulse length	medium (1 ms)
Bandwith	wide
Max Power	2000 Watt
2-way beam angle	-21.0 dB
Sv Transducer gain	27.39 dB
TS Transducer gain	27.52 dB
Angle sensitivity	21.9
3 dB beamwidth	6.8 ° alongship 6.7 ° athwardship
Alongship offset	-0.03 °
Athwardship effect	0.06 °

Display menu

Echogram	1 (38 kHz)
Bottom range	15 m
Bottom range start	10 m
Sv colour min	-67 dB

Printer menu

Echogram	1 (38 kHz)
Range	100 m, 250 m, 500 m
Range start	0
Bottom range	12 m
Bottom range start	10 m
TVG	20 log R
Sv Colour min	- 67 dB

Bottom detection menu Minimum level -50 dB

Fishing gear

The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super bottom trawl".

The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm meshsize in the codend with an innernet of 10 mm meshsize. The estimated opening is 6 m (observed 5.7) and distance between wings during towing about 18 m. The sweeps are 40 m long. The trawl is equipped with a 12" rubber bobbins gear. The doors are of 'Thyborøn' combi type, 7.81 m², 1670 kg, their distance while trawling about 45 - 55 m in average, depending on the depth (least distance at low depths). This distance can be kept constant (about 50 m) at all depths by the use of a 9.5 m strap between the wires at 130 m distance from the doors (normally applied at depths greater than 80 m). On the present survey, however, the strap was not applied because most of the trawl hauls were made at bottom depths less than 60 m.

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 a height sensor is fitted to the bottom trawl to measure the trawl opening and provide information on clearance and bottom contact.

The pelagic trawl can be equipped with a trawleye that provides information on the trawl opening and the distance of the footrope to the bottom.